ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH **TRƯỜNG ĐẠI HỌC QUỐC TẾ**

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM Độc lập - Tự do - Hạnh phúc

CHƯƠNG TRÌNH ĐÀO TẠO KHÓA 2024 – NGÀNH CÔNG NGHỆ THÔNG TIN TRÌNH ĐỘ ĐẠI HỌC

(Kèm theo Quyết định số: /QĐ-ĐHQT ngày tháng năm 2024 của Hiệu trưởng trường Đại học Quốc tế)

1. Thông tin chung

- Tên ngành đào tạo:
- + Tiếng Việt: Công nghệ Thông Tin (CNTT)
- + Tiếng Anh: Information Technology
- Mã ngành đào tạo: 7480201
- Trình độ đào tạo: Bậc Đại học, trình độ kỹ sư
- Loại hình đào tạo: Chính quy
- Thời gian đào tao: 4,5 năm
- Tên văn bằng sau khi tốt nghiệp:
- + Tiếng Việt: Kỹ sư Công Nghệ Thông Tin
- + Tiếng Anh: Bachelor of Engineering in Information Technology
- Nơi đào tạo: Trường Đại Học Quốc Tế (ĐHQT) ĐH Quốc Gia Tp. Hồ Chí Minh

2. Thông tin tuyển sinh và kế hoạch đào tạo

a. Đối tượng tuyển sinh

Mọi công dân nước Cộng Hòa Xã Hội Chủ Nghĩa Việt Nam đủ điều kiện dự thi kỳ thi tuyển sinh quốc gia theo quy chế tuyển sinh đại học, cao đẳng hệ chính quy của Bộ Giáo dục và Đào tạo ban hành; dự thi đủ số môn quy định và đạt điểm trúng tuyển do trường Đại học Quốc Tế, Đại học Quốc Gia TP HCM quy định.

Các công dân nước ngoài hoặc công dân nước Cộng Hòa Xã Hội Chủ Nghĩa Việt Nam đang theo học các chương trình quốc tế được xét tuyển theo quy định của trường Đại học Quốc Tế, Đại học Quốc Gia TP HCM

b. Hình thức tuyển sinh

Theo các phương thức tuyển sinh đang thực hiện tại Trường ĐHQT hiện nay.

c. Tổ hợp môn xét tuyển: A (Toán, Lý, Hoá), A1(Toán, Lý, Anh)

3. Mục tiêu đào tạo

a. Mục tiêu chung: đào tạo kỹ sư CNTT có kiến thức cơ bản vững vàng, nắm vững các công nghệ tiên tiến trong lĩnh vực CNTT, trong môi trường học tập hiện đại. Kỹ sư CNTT tốt nghiệp có kỹ năng về CNTT chuyên nghiệp, có khả năng anh ngữ tốt trong môi trường làm việc, học tập và nghiên cứu quốc tế, có kỹ năng làm việc nhóm và trình bày hiệu quả. Chương trình đào tạo tuân thủ theo các quy định của Bộ GDĐT, ĐHQG TP.HCM và các chuẩn mực quốc tế.

Bảng 1. Sự phù hợp của mục tiêu đào tạo với Tầm nhìn, sứ mạng và Mục tiêu giáo dục của Luật giáo dục đại học.

| Mục tiêu đào tạo | Tầm nhìn | Sứ mạng | Luật giáo dục |
|----------------------|--------------------|--------------------------|--|
| của CTĐT | | (tô đậm những nội hàm | (tô đậm những nội |
| | | mà mục tiêu thể hiện | hàm mà mục tiêu thể |
| | | hoặc gắn kết) | hiện hoặc gắn kết) |
| Ngành IT tại Khoa | Khoa CNTT là | Đào tạo chất lượng cao | Mục tiêu giáo dục |
| CNTT đào tạo kỹ sư | một trong các khoa | đa ngành – đa lĩnh vực | nhằm phát triển toàn |
| CNTT có kiến thức | của Trường Đại | cho bậc đại học và sau | diện con người Việt |
| cơ bản vững vàng, | học Quốc tế, | đại học. Tất cả các | Nam có đạo đức, tri |
| nắm vững các công | ĐHQG-TP.HCM. | CTĐT được đánh giá | thức, văn hóa, sức |
| nghệ tiên tiến trong | Do đó, tầm nhìn | theo tiêu chuẩn trong | khỏe, thẩm mỹ và nghề |
| lĩnh vực CNTT, | của Khoa phụ | nước và quốc tế AUN. | nghiệp; có phẩm chất, |
| trong môi trường | thuộc và tầm nhìn | Nâng cao nghiên cứu cơ | năng lực và ý thức công |
| học tập hiện đại. Kỹ | của Trường | bản và nghiên cứu ứng | dân; có lòng yêu nước, |
| sư CNTT tốt nghiệp | (Trường ĐHQT | dụng để đáp ứng được | tinh thần dân tộc, trung |
| có kỹ năng về | là trường đại học | nhu cầu của doanh | thành với lý tưởng độc |
| , , | nghiên cứu thuộc | nghiệp, địa phương, xã | lập dân tộc và chủ nghĩa |
| CNTT chuyên | tốp đầu tại châu | hội và tiêu chuẩn quốc | xã hội; phát huy tiềm |
| nghiệp, có khả năng | Á; là cơ sở giáo | tế. | năng, khả năng sáng |
| anh ngữ tốt trong | dục quốc tế, tự | Đảm nhận vai trò tiên | tạo của mỗi cá nhân; |
| môi trường làm | chủ, sáng tạo; là | phong tại Việt Nam bằng | nâng cao dân trí, phát |
| việc, học tập và | nơi vun đắp và | cách thực hành quản lý | triển nguồn nhân lực, |
| nghiên cứu quốc tế, | phát triển nguồn | xuất sắc, truyền cảm | bồi dưỡng nhân tài, đáp |
| có kỹ năng làm việc | nhân lực chất | hứng và hỗ trợ các thành | ứng yêu cầu của sự |
| nhóm và trình bày | lượng cao cho thị | viên của ĐHQG | nghiệp xây dựng, bảo vệ Tổ quốc và hội nhập |
| hiệu quả. Chương | trường lao động | TP.HCM trong việc phát | quốc tế (Điều 2) |
| trình đào tạo tuân | trong nước và | triển toàn diện | quoc le (Dieu 2) |
| thủ theo các quy | quốc tế.) | | |
| định của Bộ GDĐT, | | | |
| ĐHQG TP.HCM và | | | |
| các chuẩn mực | | | |
| quốc tế | | | |
| quoc te | | | |

b. Mục tiêu cụ thể (Program Objectives - POs): Kỹ sư CNTT sau khi tốt nghiệp tại ĐHQT có kiến thức, kỹ năng và năng lực như sau:

Kiến thức:

(PO1) Kiến thức và lập luận ngành

- kiến thức cơ bản vững chắc về máy tính, hệ thống máy tính, mạng máy tính và ứng dụng CNTT, bao gồm các khía cạnh lý thuyết và ứng dụng.
- kiến thức chuyên ngành sâu, rộng về máy tính, hệ thống máy tính, mạng máy tính và ứng dụng công nghệ thông tin; có kỹ năng phân tích và giải quyết vấn đề; thiết kế, phát triển và tích hợp hệ thống thông tin cho các ứng dụng kỹ thuật liên quan đến máy tính, hệ thống mạng máy tính và các ứng dụng và hệ thống dựa trên mạng máy tính; khả năng giải quyết các vấn đề kỹ thuật, xã hội, chính trị và kinh tế liên ngành.

Kỹ năng:

(PO2) Kỹ năng và phẩm chất cá nhân

- kiến thức về hội nhập và khởi nghiệp; có ý thức bảo vệ môi trường, thiết kế và vận hành hệ thống thân thiện với môi trường.

(PO3) Kỹ năng làm việc nhóm và giao tiếp

- các kỹ năng mềm cần thiết và giải quyết vấn đề; có khả năng làm việc theo nhóm, kỹ năng lãnh đạo và quản lý; có khả năng giao tiếp và làm việc chuyên nghiệp bằng tiếng Anh (ở mức độ thành thạo).
- có ý thức về chuyên môn, đạo đức nghề nghiệp và tinh thần trách nhiệm đối với bản thân và xã hội; có phẩm chất chính trị tốt, sống và làm việc tuân thủ pháp luật của nhà nước Việt Nam.

Tự chủ và trách nhiệm:

(PO4) Năng lực thực hành nghề nghiệp

- khả năng tự học và nghiên cứu hoặc tham gia các khóa bồi dưỡng để nắm bắt công nghệ mới.
 - có đủ năng lực học tiếp các chương trình cao hơn trong và ngoài nước.

4. Chuẩn đầu ra của chương trình đào tạo (Program Learning Outcomes –PLOs)

Cách tuyên bố mục tiêu theo hướng dẫn tại Điều 5, Chương II, Thông tư 17/2021/TT-BGDĐT). Thầy/Cô trình bày CĐR rõ ràng, đo được theo cấp độ tư duy và được sắp xếp theo các khối: kiến thức, kỹ năng, mức tự chủ và trách nhiệm theo Khung trình độ Quốc gia Việt Nam.

Danh sách 6 CĐR được xem xét trong chương trình đào tạo gồm:

Kiến thức:

- (**PLO1**) khả năng áp dụng kiến thức, kỹ thuật, kỹ năng và các công cụ hiện đại của toán học, khoa học, kỹ thuật và công nghệ để giải quyết các vấn đề kỹ thuật thuộc chuyên ngành;
- (**PLO2**) khả năng thiết kế các hệ thống, thành phần hoặc quy trình đáp ứng các nhu cầu cụ thể cho các vấn đề kỹ thuật trong chuyên ngành;

Kỹ năng:

- (**PLO3**) khả năng giao tiếp bằng văn bản, lời nói và đồ họa trong các môi trường kỹ thuật và phi kỹ thuật; và khả năng tìm kiếm và sử dụng tài liệu kỹ thuật phù hợp;
 - (PLO4) khả năng phân tích và diễn giải các kết quả để cải tiến quy trình;

Mức tự chủ và trách nhiệm:

- (PLO5) khả năng hoạt động hiệu quả với tư cách là thành viên cũng như lãnh đạo trong các nhóm kỹ thuật;
 - (PLO6) khả năng tiến hành kiểm tra, đo đạt, và thử nghiệm hệ thống.

5. Ma trận giữa mục tiêu đào tạo và chuẩn đầu ra

CĐR sẽ gắn kết với mục tiêu cụ thể đã được xác định ở Mục 3.

Bảng 2. Mối quan hệ giữa CĐR của CTĐT và mục tiêu đào tạo

| | Mục tiêu giáo dục của chương trình | PO1 | PO2 | PO3 | PO4 |
|---------------|---------------------------------------|-----|-----|-----|-----|
| Kiến thức | PLO 1 | X | | | |
| | PLO 2 | X | | | X |
| Kỹ năng | PLO 3 | | | X | |
| | PLO 4 | | X | | X |
| Mức tự chủ và | PLO 5 | | | X | |
| trách nhiệm | PLO 6 | X | | | X |

6. Quy trình đào tạo, điều kiện tốt nghiệp

- Căn cứ Quyết định số 1342/QĐ-ĐHQG ngày 30 tháng 9 năm 2022 của Giám đốc Đại học Quốc gia Thành phố Hồ Chí Minh về việc ban hành Quy chế đào tạo trình độ đại học.
- Căn cứ Quyết định số 719/QĐ-ĐHQT ngày 06 tháng 12 năm 2021 của Hiệu trưởng trường Đại học Quốc tế về việc ban hành Quy chế đào tạo trình độ đại học theo hệ thống tín chỉ tại trường Đại học Quốc tế.

7. Thang điểm (theo thang điểm chính thức của trường)

Trường quy định thang điểm đánh giá kết quả học tập của người học (Quy chế đào tạo trình độ đại học theo hệ thống tín chỉ tại trường Đại học Quốc tế)

Bảng 3: Thang điểm

| Xếp loại | Thang điểm 100 | Điểm chữ | Thang điểm 4 |
|----------|------------------|----------|--------------|
| Xuất sắc | Từ 90 đến 100 | A+ | 4,0 |
| Giỏi | Từ 80 đến cận 90 | A | 3,5 |
| Khá | Từ 70 đến cận 80 | B+ | 3,0 |

| Trung bình khá | Từ 60 đến cận 70 | В | 2,5 |
|-------------------|------------------|----|-----|
| Trung bình | Từ 50 đến cận 60 | С | 2,0 |
| Yếu | Từ 40 đến cận 50 | D+ | 1,5 |
| Vám | Từ 30 đến cận 40 | D | 1,0 |
| Kém | Dưới 30 | F | 0,0 |

Quy chế đào tạo theo học chế tín chỉ trên cơ sở các quyết định, nghị định hướng dẫn của Bộ GĐDT, ĐHQG TPHCM và ĐHQT:

- Văn bản hợp nhất số 17/VBHN-BGDĐT ngày 15/5/2014 của Bộ Giáo dục và Đào tạo về Văn bản hợp nhất Quyết định số 43/2007/QĐ-BGDĐT ngày 15/08/2007 và Thông tư số 57/2012/TT-BGDĐT ngày 27/12/2012 về việc ban hành quy chế đào tạo đại học và cao đẳng hệ chính quy theo hệ thống tín chỉ
- Văn bản hướng dẫn của ĐHQG-HCM (Công văn số 85/ĐHQG-ĐH ngày 15/01/2020 của Giám Đốc ĐHQG TPHCM về việc rà soát cập nhật chương trình đào tạo các ngành đào tạo chuyên sâu đặc thù trình độ đại học tại ĐHQG-HCM năm 2020)
- Quy chế đào tạo theo học chế tín chỉ bậc đại học do Hiệu Trưởng Trường Đại học Quốc Tế, Đại học Quốc Gia TP HCM ban hành.

8. Khối lượng kiến thức toàn khoá

Ngành Công nghệ Thông Tin có 2 chuyên ngành: **kỹ sư Kỹ Thuật Mạng (150 tín chỉ) và kỹ sư Kỹ Thuật máy tính (150 tín chỉ)**. Phân bổ kiến thức cho 02 chuyên ngành như sau (không bao gồm giáo dục thể chất và giáo dục quốc phòng):

| TT | Các khối kiến thức | Số tín chỉ | % | Số tín chỉ | % |
|----|---|---------------|-------|----------------------|------|
| | | Kỹ Thuật Mạng | | Kỹ Thuật Máy Tính | |
| 1 | Khối kiến thức giáo dục đại cương | 45 | 30.0 | 45 | 30.0 |
| 2 | Khối kiến thức cơ sở ngành | 35 | 23.3 | 35 | 23.3 |
| 3 | Kiến thức chuyên ngành (tính cả khối kiến thức tự chọn) | 44 | 29.3 | 44 | 29.3 |
| 4 | Kiến thức bổ trợ | 6 | 4.0 | 6 | 4.0 |
| 5 | Thực tập, khóa luận/luận văn tốt nghiệp | 20 | 13.33 | 20 | 13.3 |
| | Tổng cộng | 150 | 100 | 150 | 100 |

9. Nội dung chương trình đào tạo

9.1. Chuyên ngành Kỹ Thuật Mạng

| | Mã môn | Tên môn học (M | ИН) | Loại MH (bắt | | Tín ch | í | Phòng thí nghiệm (TN) |
|------------|---------------------------|--|--|----------------------|--------------|--------------|--------------------------------|--------------------------------|
| STT | học | Tiếng Việt | Tiếng Anh | buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | |
| I | Kiến thức | giáo dục đại cươ | ng | | 45 | 44 | 1 | |
| <i>I.1</i> | Các môn lý luận chính trị | | | | 11 | 11 | 0 | |
| 1 | PE015IU | Triết học Mác- Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | |
| 2 | PE016IU | Kinh tế chính trị Mác-Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | |
| 3 | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | |
| 4 | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | |
| 5 | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | |
| <i>I.2</i> | Khoa học x | xã hội - Nhân văn | - Nghệ thuật | | 3 | 3 | 0 | |
| 6 | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | |
| <i>I.3</i> | Ngoại ngữ | | | | 8 | 8 | 0 | |
| 7 | EN008IU | Tiếng Anh chuyên ngành 1 (kỹ năng nghe) | Academic English 1 (listening skill) | Bắt buộc | 2 | 2 | 0 | |
| 8 | EN007IU | Tiếng Anh chuyên ngành 1 (kỹ năng viết) | Academic English 1 (writing skill) | Bắt buộc | 2 | 2 | 0 | |

| 9 | EN012IU | Tiếng Anh chuyên ngành 2 (kỹ năng nói) | Academic English 2 (speaking skill) | Bắt buộc | 2 | 2 | 0 | |
|-----|------------|---|---|-------------|----|----|---|------------------------|
| 10 | EN011IU | Tiếng Anh chuyên ngành 2 (kỹ năng viết) | Academic English 2 (writing skill) | Bắt buộc | 2 | 2 | 0 | |
| I.4 | Toán - Kho | Toán - Khoa học tự nhiên - Môi trường | | | 23 | 22 | 1 | |
| 11 | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | |
| 12 | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | |
| 13 | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | |
| 14 | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | |
| 15 | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | |
| 16 | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | |
| 17 | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | |
| 18 | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý |
| II | Kiến thức | cơ sở ngành | | | 35 | 27 | 8 | |
| 19 | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | |
| 20 | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 21 | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | |

| 1 | | | | | 1 | | | |
|-------|--------------------|--|---|-------------|-------------|----|----|-----------------------------|
| 22 | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT |
| 23 | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 24 | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 25 | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 26 | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 27 | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 28 | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| Ш | Kiến thức | chuyên ngành | | | 44 | 33 | 11 | |
| III.1 | Kiến thức bắt buộc | | | | | | | |
| | Kien thực l | bắt buộc | | | 32 | 24 | 8 | |
| 29 | IT096IU | bắt buộc Lập trình Mạng | Net-Centric Programming | Bắt buộc | 32 4 | 3 | 8 | Phòng TN. CNTT |
| 30 | | Lập trình | | | | | | TN. |
| | IT096IU | Lập trình Mạng Quản lý hệ | Programming Information System | buộc Bắt | 4 | 3 | 1 | TN. CNTT Phòng TN. |

| 33 | IT125IU | Quản trị hệ thống mạng | System and Network Administration | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT |
|-------|---|--------------------------------------|--|-------------|-----|-----|----|----------------------|
| 34 | IT139IU | Tính toán phân tán | Scalable and Distributed Computing | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 35 | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 36 | IT159IU | Trí thông minh nhân tạo | Artificial Intelligent | Bắt Buộc | 4 | 3 | 1 | |
| III.2 | Kiến thức ngành tự chọn (sinh viên chọn tối thiểu 16 tín chỉ trong nhóm môn học sau) | | | | 12 | 9 | 3 | |
| 37 | | Tự chọn 1 | Elective 1 | Tự chọn | 4 | 3 | 1 | |
| 38 | | Tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | |
| 39 | | Tự chọn 3 | Elective 3 | Tự chọn | 4 | 3 | 1 | |
| IV | Kiến thức | bổ trợ | | | 6 | 6 | 0 | |
| 40 | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt Buộc | 3 | 3 | 0 | |
| 41 | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | |
| V | Thực tập, | khóa luận/luận v | ăn tốt nghiệp | | 20 | 0 | 20 | |
| 42 | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | |
| 43 | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | |
| 44 | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | |
| | Tổng số (tí | n chỉ) | | | 150 | 110 | 40 | |

Các môn tự chọn của kỹ thuật mạng

| STT | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng thí |
|-----|---------|--|--|--------------|--------------|--------------|----------------------|
| 511 | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | nghiệm (TN) |
| 1 | IT163IU | Tối ưu hóa và ứng dụng | Optimization and Applications | 4 | 3 | 1 | Phòng TN.CNTT |
| 2 | IT024IU | Đồ hoạ Máy tính | Computer Graphics | 4 | 3 | 1 | Phòng TN. CNTT |
| 3 | IT056IU | Quản lý dự án CNTT | IT Project Management | 4 | 3 | 1 | Phòng TN. CNTT |
| 4 | IT068IU | Các nguyên lý mạch điện 1 | Principles of Electrical Engineering I | 3 | 3 | 0 | Phòng TN. CNTT |
| 5 | IT074IU | Linh kiện điện tử | Electronics Devices | 3 | 3 | 0 | |
| 6 | IT076IU | Công nghệ Phần mềm | Software Engineering | 4 | 3 | 1 | Phòng TN. CNTT |
| 7 | IT090IU | Phân tích và thiết kế hướng đối tượng | Object- Oriented Analysis and Design | 4 | 3 | 1 | Phòng TN. CNTT |
| 8 | IT092IU | Nguyên lý của Ngôn ngữ lập trình | Principles of Programming Languages | 4 | 3 | 1 | Phòng TN. CNTT |
| 9 | IT098IU | Thực hành các nguyên lý mạch điện 1 | Principles of Electrical Engineering I Laboratory | 1 | 0 | 1 | Phòng TN. CNTT |
| 10 | IT101IU | Thực hành linh kiện điện tử | Electronics Devices Laboratory | 1 | 0 | 1 | Phòng TN. CNTT |

| STT | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng thí — nghiệm | |
|-----|---------|---|---|--------------|--------------|--------------|-----------------------|--|
| 511 | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | (TN) | |
| 11 | IT103IU | Xử lý tín hiệu số | Digital Signal Processing | 4 | 3 | 1 | Phòng TN. CNTT | |
| 12 | IT105IU | Thiết kế hệ thống số | Digital System Design | 3 | 3 | 0 | | |
| 13 | IT106IU | Thực hành thiết kế hệ thống số | Digital System Design Laboratory | 1 | 0 | 1 | Phòng TN. CNTT | |
| 14 | IT110IU | Khái niệm thiết kế VLSI | Concepts in VLSI Design | 3 | 3 | 0 | Phòng TN. CNTT | |
| 15 | IT126IU | Thực hành khái niệm thiết kế VLSI | Concepts in VLSI Design Laboratory | 1 | | 1 | Phòng TN. CNTT | |
| 16 | IT114IU | Kiến trúc phần mềm | Software Architecture | 4 | 3 | 1 | Phòng TN. CNTT | |
| 17 | IT115IU | Hệ thống nhúng | Embedded Systems | 3 | 3 | 0 | Phòng TN. CNTT | |
| 18 | IT127IU | Thực hành hệ thống nhúng | Embedded Systems Laboratory | 1 | 0 | 1 | | |
| 19 | IT128IU | Hệ thống vi xử lý | Micro- processing Systems | 3 | 3 | 0 | | |
| 20 | IT129IU | Thực hành hệ thống vi xử lý | Micro- processing Systems Laboratory | 1 | 0 | 1 | Phòng TN. CNTT | |

| STT | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng thí |
|-----|---------|---|---|--------------|--------------|--------------|----------------------|
| 511 | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | nghiệm (TN) |
| 21 | IT130IU | Xử lý ảnh Kỹ thuật số | Digital Image Processing | 4 | 3 | 1 | Phòng TN. CNTT |
| 22 | IT160IU | Khai thác dữ liệu | Data Mining | 4 | 3 | 1 | Phòng TN.CNTT |
| 23 | IT133IU | Phát triển ứng dụng di động | Mobile Application Development | 4 | 3 | 1 | Phòng TN. CNTT |
| 24 | IT138IU | Trực quan hóa dữ liệu | Data Science and Data Visualization | 4 | 3 | 1 | Phòng TN.CNTT |
| 25 | IT140IU | Khái niệm cơ bản về bảo mật dữ liệu | Fundamental Concepts of Data Security | 4 | 3 | 1 | Phòng TN.CNTT |
| 26 | IT144IU | Phân Tích Quy Trình Nghiệp Vụ | Business Process Analysis | 4 | 3 | 1 | Phòng TN.CNTT |
| 27 | IT145IU | Hệ Thống Hỗ Trợ Quyết Định | Decision Support Systems | 4 | 3 | 1 | Phòng TN.CNTT |
| 28 | IT164IU | Điện Toán Đám Mây | Cloud Computing | 4 | 3 | 1 | Phòng TN.CNTT |
| 29 | IT150IU | Chuỗi khối | Blockchain | 4 | 3 | 1 | Phòng TN. CNTT |
| 30 | IT156IU | Phát triển và vận hành liên tục | Development & Operation (DevOps) | 4 | 3 | 1 | Phòng TN. CNTT |
| 31 | IT157IU | Học sâu | Deep Learning | 4 | 3 | 1 | Phòng TN. CNTT |

| STT | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng thí nghiệm |
|-----|---------|--------------------------------------|--|--------------|--------------|--------------|----------------------|
| 511 | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | (TN) |
| 32 | IT158IU | Thiết kế và đánh giá giao diện | UI Design and Evaluation | 4 | 3 | 1 | Phòng TN. CNTT |
| 33 | IT166IU | Kiểm tra chất lượng phần mềm | Software Quality Verification and Validation | 4 | 3 | 1 | Phòng TN. CNTT |
| 34 | IT167IU | Phát triển ứng dụng game | Game Application Development | 4 | 3 | 1 | Phòng TN. CNTT |
| 35 | PE008IU | Tư Duy Phản Biện | Critical Thinking | 3 | 3 | 0 | Phòng TN.CNTT |
| 36 | IT131IU | Mô hình Toán cho Tin học | Theoretical Models in Computing | 4 | 3 | 1 | Phòng TN. CNTT |
| 37 | | Tự chọn tự do | Free elective | 4 | 3 | 1 | |

9.2. Chuyên ngành Kỹ thuật Máy tính

| | | Tên môn học (| MH) | Loại MH | | Tín ch | í | Phòng thí |
|------------|---------------|------------------------|----------------------------|------------------------------|--------------|----------------------------------|---|----------------|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý hành/ thuyết Thí nghiệm | | nghiệm (TN) |
| Ι | Kiến thức | giáo dục đại cư | ong | | 45 | 44 | 1 | |
| <i>I.1</i> | Các môn l | ý luận chính trị | | | 11 | 11 | 0 | |
| 1 | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | |

| | | Tên môn học (| MH) | Loại MH | | Tín ch | í | Phòng thí | |
|------------|---------------|--|--|------------------------------|--------------|--------------|--------------------------------|----------------|--|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | nghiệm (TN) | |
| 2 | PE016IU | Kinh tế chính trị Mác-Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | |
| 3 | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | |
| 4 | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | |
| 5 | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | |
| <i>I.2</i> | Khoa học . | xã hội - Nhân và | ĭn - Nghệ thuật | | 3 | 3 | 0 | | |
| 6 | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | |
| <i>I.3</i> | Ngoại ngũ | | | | 8 | 8 | 0 | | |
| 7 | EN008IU | Tiếng Anh chuyên ngành 1 (kỹ năng nghe) | Academic English 1 (listening skill) | Bắt buộc | 2 | 2 | 0 | | |
| 8 | EN007IU | Tiếng Anh chuyên ngành 1 (kỹ năng viết) | Academic English 1 (writing skill) | Bắt buộc | 2 | 2 | 0 | | |
| 9 | EN012IU | Tiếng Anh chuyên ngành 2 (kỹ năng nói) | Academic English 2 (speaking skill) | Bắt buộc | 2 | 2 | 0 | | |

| | | Tên môn học | (MH) | Loại MH | | Tín ch | í | Phòng |
|-----|-------------------------------|---|--|------------------------------|--------------|--------------|--------------------------------|------------------------|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | thí nghiệm (TN) |
| 10 | EN011IU | Tiếng Anh chuyên ngành 2 (kỹ năng viết) | Academic English 2 (writing skill) | Bắt buộc | 2 | 2 | 0 | |
| I.4 | Toán - Kh | oa học tự nhiên | - Môi trường | | 23 | 22 | 1 | |
| 11 | MA001I U | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | |
| 12 | MA003I U | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | |
| 13 | MA026I U | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | |
| 14 | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | |
| 15 | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | |
| 16 | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | |
| 17 | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | |
| 18 | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý |
| II | Khối kiến thức cơ sở ngành | | | | 35 | 27 | 8 | |
| 19 | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | |

| | | Tên môn học (| MH) | Loại - MH | | Tín ch | í | Phòng |
|-----------|------------------------|--|---|------------------------------|--------------|--------------|--------------------------------|-----------------------|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | thí nghiệm (TN) |
| 20 | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 21 | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | |
| 22 | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT |
| 23 | IT069IU | Lập trình hướng đối tượng | Object- Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 24 | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 25 | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 26 | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 27 | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 28 | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| III | Kiến thức chuyên ngành | | | | 44 | 33 | 11 | |
| III. 1 | Kiến thức | Kiến thức bắt buộc | | | 36 | 27 | 9 | |

| | | Tên môn học (| MH) | Loại MH | | Tín ch | í | Phòng |
|-----|---------------|---|--|------------------------------|--------------|--------------|--------------------------------|-----------------------|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | thí nghiệm (TN) |
| 29 | IT068IU | Các nguyên lý mạch điện 1 | Principles of Electrical Engineering I | Bắt buộc | 3 | 3 | 0 | |
| 30 | IT098IU | Thực hành các nguyên lý mạch điện 1 | Principles of Electrical Engineering I Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT |
| 31 | IT074IU | Linh kiện điện tử | Electronics Devices | Bắt buộc | 3 | 3 | 0 | |
| 32 | IT101IU | Thực hành linh kiện điện tử | Electronics Devices Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT |
| 33 | IT105IU | Thiết kế hệ thống số | Digital System Design | Bắt buộc | 3 | 3 | 0 | |
| 34 | IT106IU | Thực hành thiết kế hệ thống số | Digital System Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT |
| 35 | IT115IU | Hệ thống nhúng | Embedded Systems | Bắt buộc | 3 | 3 | 0 | |
| 36 | IT127IU | Thực hành hệ thống nhúng | Embedded Systems Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT |
| 37 | IT128IU | Hệ thống vi xử lý | Micro- processing Systems | Bắt buộc | 3 | 3 | 0 | |
| 38 | IT129IU | Thực hành hệ thống vi xử lý | Micro- processing Systems Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT |

| | | Tên môn học (| MH) | Loại MH | | Tín ch | i | Phòng |
|-----------|---------------|---|---|------------------------------|--------------|--------------|--------------------------------|-----------------------|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | thí nghiệm (TN) |
| 39 | IT110IU | Khái niệm thiết kế VLSI | Concepts in VLSI Design | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT |
| 40 | IT126IU | Thực hành khái niệm thiết kế VLSI | Concepts in VLSI Design Laboratory | Bắt buộc | 1 | | 1 | Phòng TN. CNTT |
| 41 | IT103IU | Xử lý tín hiệu số | Digital Signal Processing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 42 | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT |
| 43 | IT159IU | Trí thông minh nhân tạo | Artificial Intelligence | Bắt Buộc | 4 | 3 | 1 | |
| III. 2 | | ngành tự chọn (tín chỉ trong nh | | | 8 | 6 | 2 | |
| 44 | | Tự chọn 1 | Elective 1 | Tự chọn | 4 | 3 | 1 | |
| 45 | | Tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | |
| IV | Kiến thức | bổ trợ | | | 6 | 6 | 0 | |
| 47 | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt Buộc | 3 | 3 | 0 | |
| 46 | IT120IU | Khởi nghiệp | Entrepreneurs hip | Bắt buộc | 3 | 3 | 0 | |
| V | Thực tập, | khóa luận/luận | văn tốt nghiệp | | 20 | 0 | 20 | |

| | | Tên môn học (| MH) | Loại MH | | Tín ch | ĺ | Phòng |
|-----|---------------|--------------------------------------|----------------------------|------------------------------|--------------|--------------|--------------------------------|-----------------------|
| Stt | Mã môn học | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | thí nghiệm (TN) |
| 47 | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | |
| 48 | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | |
| 49 | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | |
| | Tổng số (t | Γổng số (tín chỉ) | | | 150 | 110 | 40 | |

CÁC MÔN TỰ CHỌN CỦA KỸ THUẬT MÁY TÍNH

| | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng |
|-----|---------|---|---|--------------|--------------|--------------|-------------------|
| STT | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | Thí nghiệm |
| 1 | IT163IU | Tối ưu hóa và ứng dụng | Optimization and Applications | 4 | 3 | 1 | Phòng TN.CNTT |
| 2 | IT024IU | Đồ hoạ Máy tính | Computer Graphics | 4 | 3 | 1 | Phòng TN. CNTT |
| 3 | IT056IU | Quản lý dự án CNTT | IT Project Management | 4 | 3 | 1 | Phòng TN. CNTT |
| 4 | IT076IU | Công nghệ Phần mềm | Software Engineering | 4 | 3 | 1 | Phòng TN. CNTT |
| 5 | IT090IU | Phân tích và thiết kế hướng đối tượng | Object-Oriented Analysis and Design | 4 | 3 | 1 | Phòng TN. CNTT |
| 6 | IT092IU | Nguyên lý của Ngôn ngữ lập trình | Principles of Programming Languages | 4 | 3 | 1 | Phòng TN. CNTT |

| C/D/D | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng |
|-------|---------|---|---|--------------|--------------|--------------|-------------------|
| STT | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | Thí nghiệm |
| 7 | IT093IU | Phát triển ứng dụng Web | Web Application Development | 4 | 3 | 1 | Phòng TN.CNTT |
| 8 | IT094IU | Quản lý hệ thống thông tin | Information System Management | 4 | 3 | 1 | Phòng TN. CNTT |
| 9 | IT096IU | Lập trình Mạng | Net-Centric Programming | 4 | 3 | 1 | Phòng TN. CNTT |
| 10 | IT114IU | Kiến trúc phần mềm | Software Architecture | 4 | 3 | 1 | Phòng TN. CNTT |
| 11 | IT117IU | Bảo mật hệ thống và mạng | System and Network Security | 4 | 3 | 1 | Phòng TN. CNTT |
| 12 | IT125IU | Quản trị hệ thống mạng | System and Network Administration | 4 | 3 | 1 | Phòng TN. CNTT |
| 13 | IT160IU | Khai thác dữ liệu | Data Mining | 4 | 3 | 1 | Phòng TN.CNTT |
| 14 | IT133IU | Phát triển ứng dụng di động | Mobile Application Development | 4 | 3 | 1 | Phòng TN. CNTT |
| 15 | IT138IU | Trực quan hóa dữ liệu | Data Science and Visualization | 4 | 3 | 1 | Phòng TN. CNTT |
| 16 | IT139IU | Tính toán phân tán | Scalable and Distributed Computing | 4 | 3 | 1 | Phòng TN. CNTT |
| 17 | IT140IU | Khái niệm cơ bản về bảo mật dữ liệu | Fundamental Concepts of Data Security | 4 | 3 | 1 | Phòng TN.CNTT |

| COO | Mã môn | Tên môn | học (MH) | | Tín chỉ | | Phòng |
|-----|---------|---------------------------------------|--|--------------|--------------|--------------|-------------------|
| STT | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | Thí nghiệm |
| 18 | IT144IU | Phân Tích Quy Trình Nghiệp Vụ | Business Process Analysis | 4 | 3 | 1 | Phòng TN.CNTT |
| 19 | IT145IU | Hệ Thống Hỗ Trợ Quyết Định | Decision Support Systems | 4 | 3 | 1 | Phòng TN.CNTT |
| 20 | IT147IU | Điện Toán Đám Mây Di Động | Mobile Cloud Computing | 4 | 3 | 1 | Phòng TN.CNTT |
| 21 | IT150IU | Chuỗi khối | Blockchain | 4 | 3 | 1 | Phòng TN. CNTT |
| 22 | IT156IU | Phát triển và vận hành liên tục | Development & Operation (DevOps) | 4 | 3 | 1 | Phòng TN. CNTT |
| 23 | IT157IU | Học sâu | Deep Learning | 4 | 3 | 1 | Phòng TN. CNTT |
| 24 | IT158IU | Thiết kế và đánh giá giao diện | UI Design and Evaluation | 4 | 3 | 1 | Phòng TN. CNTT |
| 25 | IT131IU | Mô hình Toán cho Tin học | Theoretical Models in Computing | 4 | 3 | 1 | Phòng TN. CNTT |
| 26 | IT165IU | Công nghệ và Triển khai bảo mật | Security Technology and Implementation | 4 | 3 | 1 | Phòng TN. CNTT |
| 27 | IT166IU | Kiểm tra chất lượng phần mềm | Software Quality Verification and Validation | 4 | 3 | 1 | Phòng TN. CNTT |
| 28 | IT167IU | Phát triển ứng dụng game | Game Application Development | 4 | 3 | 1 | Phòng TN. CNTT |

| OTT | Mã môn | Tên môn | | Tín chỉ | Phòng | | |
|-----|---------|---------------------|-------------------|--------------|--------------|--------------|------------------|
| STT | học | Tiếng Việt | Tiếng Anh | Tổng cộng | Lý thuyết | Thực hành | Thí nghiệm |
| 29 | PE008IU | Tư Duy Phản Biện | Critical Thinking | 3 | 3 | 0 | Phòng TN.CNTT |
| 30 | | Tự chọn tự do | Free elective | 4 | 3 | 1 | |

10. Dự kiến kế hoạch giảng dạy (phân bổ các môn học theo từng học kỳ)

Tùy vào trình độ tiếng Anh của người học đạt trình độ AE1, IE2, IE1 và IE0, kế hoạch giảng dạy các môn học được cụ thể tương ứng được trình bày trong các Bảng 6, Bảng 7, Bảng 8 và Bảng 9.

10.1. Trình độ AE1 chuyên ngành Kỹ Thuật Mạng

Bảng 6. Kế hoạch giảng dạy đối với người học đạt trình độ AE1 chuyên ngành Kỹ Thuật Mạng

| | | Tên môn | học (MH) | | | Tín ch | ĺ | | |
|-----------------------|----------------------|--|---|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|--|
| Học kỳ | Мã МН | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| I (18 tín chỉ) | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| Cili) | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | P.TN | Không |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | | Tổng | | | 18 | 14 | 4 | | |
| II (17 tín chỉ) | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |

| | | Tên môn | học (MH) | | | Tín ch | i | | |
|--------|----------------------|--|--|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|--|
| Học kỳ | Мã МН | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn TQ EN008IU + EN007IU Academic English 1 (listening + writing skills) |
| | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | | Tổng | | | 17 | 15 | 2 | | |
| | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn | học (MH) | | | Tín ch | i | | |
|-----------------------|---------|-------------------------------------|---|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| III (20 tín chỉ) | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn TQ MA001IU Calculus 1 |
| | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE016IU | Kinh tế chính trị Mác-Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | | Tổng | | | 20 | 18 | 2 | | |
| IV (17 tín chỉ) | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn | học (MH) | | | Tín ch | Î | | | |
|--------|---------|--|--|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|--|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) | |
| | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming | |
| | IT093IU | Phát triển ứng dụng Web | Web Application Development | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT079IU (3,1) Principles of Database Management và IT069IU (3,1) Object- Oriented Programming | |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không | |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU Triết học Mác- Lênin, Kinh tế chính trị Mác-Lênin | |
| | | Tổng | | | 17 | 14 | 3 | | | |

| | | Tên môn | học (MH) | | | Tín ch | í | | |
|--------------|---------|---------------------------|---------------------------------|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture, IT013IU Algorithms and Data Structures |
| | IT096IU | Lập trình mạng | Net-Centric Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| V (19 tín | IT125IU | Quản trị hệ thống mạng | System & Network Administration | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| chỉ) | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | | Tổng | | | 19 | 12 | 7 | | |

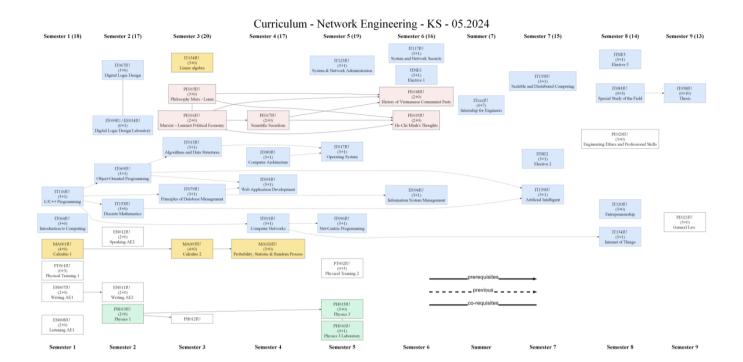
| | | Tên môn | học (MH) | | | Tín ch | i | | |
|------------------------|---------|-----------------------------------|---|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| | | Môn tự chọn 1 | Elective 1 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | |
| | IT094IU | Quản lý Hệ thống thông tin | Information System Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| VI (16 tín chỉ) | IT117IU | Bảo mật hệ thống và mạng | System and Network Security | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| ŕ | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE017IU Scientific Socialism |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU, PE017IU |
| | | Tổng | | | 16 | 13 | 3 | | |
| Hè năm 3 | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| | | Tổng | | | 7 | 0 | 7 | | |
| VII (15 tín chỉ) | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn | học (MH) | | | Tín ch | i | | |
|-----------------|---------|-----------------------------------|--|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object- Oriented Programming |
| | IT139IU | Tính toán phân tán | Scalable and Distributed Computing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |
| | | Tổng | | | 15 | 12 | 3 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |
| VIII | | Môn tự chọn 3 | Elective 3 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| (14 tín chỉ) | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn | học (MH) | | | Tín ch | i | | |
|-------------|---------|---------------------|-------------|-----------------------------------|--------------|--------------|--------------------------------|----------------------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | Loại MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng Thí nghiệm (P.TN) | Môn tiên quyết (TQ)/ học trước (HT)/ song hành (SH) |
| | | Tổng | | | 14 | 9 | 5 | | |
| IX (13 | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn TQ IT083IU Special Study of the Field |
| tín chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | | Tổng | | | 13 | 3 | 10 | | |
| | | TỔNG CỘNG | | | | 110 | 46 | | |

Ghi chú: Tổng số tín chỉ 156 bao gồm cả 06 tín chỉ giáo dục thể chất.

Hình sau đây thể hiện mối quan hệ giữa các môn học trong chương trình Kỹ sư Kỹ thuật Mạng.



10.2. Trình độ AE1 chuyên ngành Kỹ Thuật Máy Tính

Bảng 7. Kế hoạch giảng dạy đối với người học đạt trình độ AE1 chuyên ngành Kỹ Thuật Máy Tính

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | Chi chú / Môn tiên |
|-----------|----------------------|--|---|------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| I (18 tín | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| chí) | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | Tổng | | | | 18 | 14 | 4 | | |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
|---------------|---------|--------------------------------|---------------------------------------|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | |
| | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| II (17 tín | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| chỉ) | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | |
|-------------|----------------------|--|--|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn HT EN008IU + EN007IU Academic English 1 (listening + writing skills) |
| | Tổng | | | | 17 | 15 | 2 | | |
| III (20 | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |
| tín chỉ) | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn HT MA001IU Calculus 1 |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | |
|-----------|---------|-----------------------------------|---|---------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| | IT068IU | Nguyên lý mạch điện l | Principle of Electrical Engineering I | Bắt buộc | 3 | 3 | 0 | | Môn SH Principle of Electrical Engineering I Laboratory |
| | IT098IU | Thực hành nguyên lý mạch điện 1 | Principle of Electrical Engineering I Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Principle of Electrical Engineering I |
| | PE015IU | Triết học Mác- Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE016IU | Kinh tế chính trị Mác-Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | Tổng | | | | 20 | 18 | 2 | | |

| Học kỳ | Мã МН | Tên môn học (MH) | | Loại MH | Tín chỉ | | | | |
|-----------------------|---------|--------------------------------|-------------------------------------|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| IV (17 tín chỉ) | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT074IU | Linh kiện điện tử | Electronic Devices | Bắt buộc | 3 | 3 | 0 | | Môn HT IT068IU Principle of Electrical Engineering I; Môn SH IT074IU Electronic Devices |
| | IT101IU | Thực hành linh kiện điện tử | Electronic Devices Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH IT074IU Electronic Devices |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | |
|----------------------|---------|--|---|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU Triết học Mác- Lênin, Kinh tế chính trị Mác-Lênin |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | Tổng | | | | 14 | 3 | | |
| V. (10 | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture; IT013IU Algorithms and Data Structures |
| V (19 tín chỉ) | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | |
|-----------|---------|--------------------------------|---|---------------------------|--------------|--------------|--------------------------------|-----------------------------|--|
| Học kỳ | Мã МН | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT128IU | Hệ thống vi xử lý | Micro-processing Systems | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Micro-processing Systems Laboratory |
| | IT129IU | Thực hành hệ thống vi xử lý | Micro-processing Systems Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Micro- processing Systems |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | | | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 | |
| | Tổng | | | | 19 | 12 | 7 | | |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | |
|------------|---------|-----------------------------------|-----------------------------------|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | | Môn tự chọn 1 | Elective 1 | | 4 | 3 | 1 | | Không |
| | IT105IU | Thiết kế hệ thống số | Digital System Design | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Digital System Design Laboratory |
| VI (16 tín | IT106IU | Thực hành thiết kế hệ thống số | Digital System Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Digital System Design |
| chỉ) | IT115IU | Hệ thống nhúng | Embedded Systems | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT128IU Micro- processing Systems; Môn SH Embedded Systems Laboratory |
| | IT127IU | Thực hành hệ thống nhúng | Embedded Systems Laboratory | Bắt buộc | 1 | 0 | 1 | | Môn SH Embedded Systems |

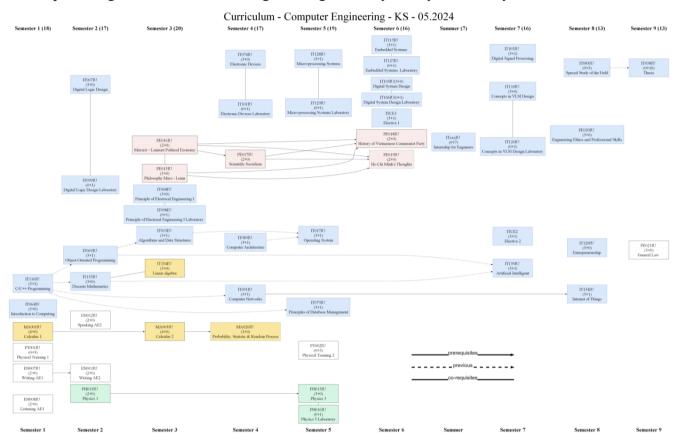
| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | |
|-----------------|---------|-----------------------------------|---|---------------------------|----|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU |
| | Tổng | | | | 16 | 13 | 3 | | |
| Hè | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| năm 3 | Tổng | | | | 7 | 0 | 7 | | |
| VII | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| (16 tín chỉ) | IT110IU | Khái niệm thiết kế VLSI | Concepts in VLSI Design | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT067IU Digital Logic Design; Môn SH IT126IU Concepts in VLSI Design Laboratory |

| | | Tên môn học (MH) | | Loại | | Tín c | hỉ | | |
|-------------------------|---------|--------------------------------------|--|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT126IU | Thực hành khái niệm thiết kế VLSI | Concepts in VLSI Design Laboratory | Bắt buộc | 1 | | 1 | Phòng TN. CNTT | Môn SH IT110IU Concepts in VLSI Design |
| | IT103IU | Xử lý tín hiệu số | Digital Signal Processing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object- Oriented Programming |
| | Tổng | | | | 16 | 12 | 4 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |
| VIII (13 tín chỉ) | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín c | hỉ | | Chi chú / Môn tiên |
|-----------------|-----------|-----------------------------------|--|---------------------------|-----|--------------|--------------------------------|-------------|--|
| Học kỳ | Мã МН | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chủ / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 9 | 4 | | |
| IX | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn HT IT083IU Special Study of the Field |
| (13 tín chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 3 | 10 | | |
| | TỔNG CỘNG | | | | 156 | 110 | 46 | | |

Ghi chú: Tổng số tín chỉ 156 bao gồm cả 06 tín chỉ giáo dục thể chất.

Hình sau đây thể hiện mối quan hệ giữa các môn học trong chương trình $K \tilde{y}$ sư $K \tilde{y}$ thuật Máy tính.



10.3. Trình độ IE2 chuyên ngành Kỹ Thuật Mạng

Bảng 8. Kế hoạch giảng dạy đối với người học đạt trình độ IE2 chuyên ngành Kỹ Thuật Mạng

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|-------------|----------------------|--|---|------------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| I (17 | ENTP02 | Tiếng Anh tăng cường 2 | Intensive English 2 | Bắt buộc | 17 | 17 | 0 | | |
| chỉ) | Tổng | | | | 17 | 17 | 0 | | Không tính vào TC |
| | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| II (18 | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| tín chỉ) | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chá /Môn 4iôn |
|--------------------|----------------------|--|--|------------------------------------|--------------|--------------|--------------------------------|-------------|--|
| Học kỳ | Мã МН | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | Tổng | | | | 18 | 14 | 4 | | |
| Ш | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| (17 tín chỉ) | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn TQ EN008IU + EN007IU Academic English 1 (listening + writing skills) |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|-----------|---------|------------------------------|------------------------------------|------------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | Tổng | | | | 17 | 15 | 2 | | |
| IV (20 | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|-------------|---------|-------------------------------------|--------------------------------------|------------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| tín chỉ) | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn TQ MA001IU Calculus 1 |
| | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|----------------------|---------|---------------------------------|---|------------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE016IU | Kinh tế chính trị Mác- Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | Tổng | | | | 20 | 18 | 2 | | |
| | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| V (17 tín chỉ) | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|-----------|---------|---|---|------------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT093IU | Phát triển ứng dụng Web | Web Application Development | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT079IU (3,1) Principles of Database Management và IT069IU (3,1) Object-Oriented Programming |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU Triết học Mác-Lênin, Kinh tế chính trị Mác-Lênin |
| | Tổng | | | | 17 | 14 | 3 | | |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi alid / Man 4:0n |
|-------------|---------|---------------------------|---------------------------------|------------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture, IT013IU Algorithms and Data Structures |
| VI (19 | IT096IU | Lập trình mạng | Net-Centric Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| tín chỉ) | IT125IU | Quản trị hệ thống mạng | System & Network Administration | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|---------------------------|---------|--------------------------------|----------------------------------|------------------------------------|--------------|--------------|--------------------------------|------------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | Tổng | | | | 19 | 12 | 7 | | |
| Hè năm | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| 3 | Tổng | _ | | | 7 | 0 | 7 | | |
| | | Môn tự chọn 1 | Elective 1 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | |
| VII (16 tín chỉ) | IT094IU | Quản lý Hệ thống thông tin | Information System Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| CIII) | IT117IU | Bảo mật hệ thống và mạng | System and Network Security | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|----------------------------|---------|-----------------------------------|---------------------------------------|------------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE017IU Scientific Socialism |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU, PE017IU |
| | Tổng | | | | 16 | 13 | 3 | | |
| | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| VIII (15 tín chỉ) | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object-Oriented Programming |
| | IT139IU | Tính toán phân tán | Scalable and Distributed Computing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | |
|--------------------------|---------|-----------------------------------|--|------------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 15 | 12 | 3 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |
| | | Môn tự chọn 3 | Elective 3 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| IX (14 tín chỉ) | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 14 | 9 | 5 | | |

| | | Tên môn học (MH) | | Loại | | Tín chỉ | | | Chi chú / Môn tiên |
|-------------|----------|---------------------|-------------|------------------------------------|--------------|--------------|--------------------------------|-------------|---|
| ky | Мã МН | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| X (13 | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn TQ IT083IU Special Study of the Field |
| tín chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 3 | 10 | | |
| | TỔNG CỘI | NG | | | 156 | 110 | 46 | | |

10.4. Trình độ IE2 chuyên ngành Kỹ Thuật Máy Tính

Bảng 9. Kế hoạch giảng dạy đối với người học đạt trình độ IE2 chuyên ngành Kỹ Thuật Máy Tính

| | | Tên môn học (MH) | | Loại MH (bắt | | Tín chỉ | | | Chi chú / Môn |
|-------------|----------------------|--|---|----------------------|--------------|--------------|-----------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| I (17 | ENTP02 | Tiếng Anh tăng cường 2 | Intensive English 2 | Bắt buộc | 17 | 17 | 0 | | |
| tín chỉ) | Tổng | | | | 17 | 17 | 0 | | Không tính vào TC |
| | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| II (18 tín | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| chỉ) | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|------------|---------|-----------------------------|------------------------------------|------------------------------|--------------|--------------|-----------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | Tổng | | | | 18 | 14 | 4 | | |
| III | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| (17 tín | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| chí) | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-------------|----------------------|--|--|------------------------------|--------------|--------------|-----------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn HT EN008IU + EN007IU Academic English 1 (listening + writing skills) |
| | Tổng | | | | 17 | 15 | 2 | | |
| IV (20 | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |
| tín chỉ) | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn HT MA001IU Calculus 1 |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-----------|---------|-----------------------------------|--|------------------------------|--------------|--------------|-----------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| | IT068IU | Nguyên lý mạch điện l | Principle of Electrical Engineering I | Bắt buộc | 3 | 3 | 0 | | Môn SH Principle of Electrical Engineering I Laboratory |
| | IT098IU | Thực hành nguyên lý mạch điện 1 | Principle of Electrical Engineering I Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Principle of Electrical Engineering I |
| | PE015IU | Triết học Mác- Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE016IU | Kinh tế chính trị Mác-Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | Tổng | | ı | | 20 | 18 | 2 | | |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-----------|---------|--------------------------------|----------------------------------|------------------------------|--------------|--------------|-----------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| V (17 tín | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| chỉ) | IT074IU | Linh kiện điện tử | Electronic Devices | Bắt buộc | 3 | 3 | 0 | | Môn HT IT068IU Principle of Electrical Engineering I; Môn SH IT074IU Electronic Devices |
| | IT101IU | Thực hành linh kiện điện tử | Electronic Devices Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH IT074IU Electronic Devices |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-----------------------|---------|--|---|------------------------------|--------------|--------------|-----------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU Triết học Mác-Lênin, Kinh tế chính trị Mác- Lênin |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 17 | 14 | 3 | | |
| VI (19 tín chỉ) | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture; IT013IU Algorithms and Data Structures |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn tiên quyết |
|-----------|---------|-------------------------------------|---|------------------------------|--------------|--------------|-----------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | IT128IU | Hệ thống vi xử lý | Micro-processing Systems | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Micro-processing Systems Laboratory |
| | IT129IU | Thực hành hệ thống vi xử lý | Micro-processing Systems Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Micro- processing Systems |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn tiên quyết |
|---------------------------|---------|--------------------------------|--------------------------|------------------------------|--------------|--------------|-----------------------------|------------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | Tổng | Tổng | | | 19 | 12 | 7 | | |
| Hè | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| năm 3 | Tổng | | | | 7 | 0 | 7 | | |
| | | Môn tự chọn 1 | Elective 1 | | 4 | 3 | 1 | | Không |
| VII (16 tín chỉ) | IT105IU | Thiết kế hệ thống số | Digital System Design | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Digital System Design Laboratory |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn tiên quyết | |
|-----------|---------|-----------------------------------|---|------------------------------|--------------|--------------|-----------------------------|----------------------|--|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) | |
| | IT106IU | Thực hành thiết kế hệ thống số | Digital System Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Digital System Design | |
| | IT115IU | Hệ thống nhúng | Embedded Systems | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT128IU Micro-processing Systems; Môn SH Embedded Systems Laboratory | |
| | IT127IU | Thực hành hệ thống nhúng | Embedded Systems Laboratory | Bắt buộc | 1 | 0 | 1 | | Môn SH Embedded Systems | |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU | |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU | |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|--------------------|---------|--|---------------------------------------|------------------------------|--------------|--------------|-----------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | Tổng | <u>, </u> | | | 16 | 13 | 3 | | |
| | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| VII | IT110IU | Khái niệm thiết kế VLSI | Concepts in VLSI Design | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT067IU Digital Logic Design; Môn SH IT126IU Concepts in VLSI Design Laboratory |
| (16 tín chỉ) | IT126IU | Thực hành khái niệm thiết kế VLSI | Concepts in VLSI Design Laboratory | Bắt buộc | 1 | | 1 | Phòng TN. CNTT | Môn SH IT110IU Concepts in VLSI Design |
| | IT103IU | Xử lý tín hiệu số | Digital Signal Processing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object- Oriented Programming |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-------------|-----------|-----------------------------------|--|------------------------------|--------------|--------------|-----------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | Tổng | | | | 16 | 12 | 4 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |
| VIII (13 | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| tín chỉ) | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |
| CIII) | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | • | | | 13 | 9 | 4 | | |
| IX (13 | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn HT IT083IU Special Study of the Field |
| tín chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 3 | 10 | | |
| | TỔNG CỘNG | | | | 156 | 110 | 46 | | |

10.5. Trình độ IE1 chuyên ngành Kỹ Thuật Mạng

Bảng 10. Kế hoạch giảng dạy đối với người học đạt trình độ IE1 chuyên ngành Kỹ Thuật Mạng

| | | Tên môn học (MH) | | Loại | Tín chỉ | i | | | Chi chú / Môn |
|----------------------|----------------------|---|---|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| T (2.4 | ENTP01 | Tiếng Anh tăng cường 1 | Intensive English 1 | Bắt buộc | 17 | 17 | 0 | | |
| I (34 tín chỉ) | ENTP02 | Tiếng Anh tăng cường 2 | Intensive English 2 | Bắt buộc | 17 | 17 | 0 | | |
| | Tổng | | | 34 | 34 | 0 | | Không tính vào TC | |
| | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| (10 | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| II (18 tín | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| chỉ) | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | Tổng | | | 18 | 14 | 4 | | | |

| | | Tên môn học (MH) | | Loại | Tín chỉ | | | | Chi chú / Môn |
|------------------------|----------------------|--|--|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| III (17 tín chỉ) | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn TQ EN008IU + EN007IU Academic English 1 (listening + writing skills) |
| - | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |

| | | Tên môn học (MH) | | Loại | Tín chỉ | | | | Chi chú / Môn |
|-----------------------|---------|-------------------------------------|---|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | Tổng | | | | 17 | 15 | 2 | | |
| | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |
| IV (20 | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| IV (20 tín chỉ) | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |

| | | Tên môn học (MH) | | Loại | Tín chi | ĺ | | | Chi chú / Môn |
|----------------------|---------|---------------------------------|---|---------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn TQ MA001IU Calculus 1 |
| | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE016IU | Kinh tế chính trị Mác- Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | Tổng | 1 | - | | 20 | 18 | 2 | | |
| | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| V (17 tín chỉ) | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |

| | | Tên môn học (MH) | | Loại | Tín chỉ | | | | Chi chú / Môn |
|-----------------------|---------|--|---|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT093IU | Phát triển ứng dụng Web | Web Application Development | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT079IU (3,1) Principles of Database Management và IT069IU (3,1) Object-Oriented Programming |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU Triết học Mác-Lênin, Kinh tế chính trị Mác- Lênin |
| | Tổng | | | | 17 | 14 | 3 | | |
| VI (19 tín chỉ) | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture, IT013IU Algorithms and Data Structures |

| | | Tên môn học (MH) | | Loại | Tín chi | i | | | Chi chú / Môn |
|------------------------|---------|--------------------------------|------------------------------------|---------------------------------|--------------|--------------|--------------------------------|------------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT096IU | Lập trình mạng | Net-Centric Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | IT125IU | Quản trị hệ thống mạng | System & Network Administration | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | Tổng | | | | 19 | 12 | 7 | | |
| Hè | I174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| năm 3 | Tổng | | | | 7 | 0 | 7 | | |
| VII (16 tín chỉ) | | Môn tự chọn 1 | Elective 1 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | |

| | | Tên môn học (MH) | | Loại | Tín chi | í | | | Chi chú / Môn |
|-------------------------|---------|-----------------------------------|---|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT094IU | Quản lý Hệ thống thông tin | Information System Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| | IT117IU | Bảo mật hệ thống và mạng | System and Network Security | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE017IU Scientific Socialism |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU, PE017IU |
| | Tổng | | | | 16 | 13 | 3 | | |
| | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| VIII (15 tín chỉ) | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object-Oriented Programming |
| | IT139IU | Tính toán phân tán | Scalable and Distributed Computing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại | Tín chi | ĺ | | | Chi chú / Môn |
|-------------|---------|-----------------------------------|--|---------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 15 | 12 | 3 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |
| IX (14 | | Môn tự chọn 3 | Elective 3 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| tín chỉ) | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 14 | 9 | 5 | | |
| X (13 tín | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn TQ IT083IU Special Study of the Field |
| chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | Tổng | Tổng | | | 13 | 3 | 10 | | |
| | TỔNG CỘ | NG | | | 156 | 110 | 46 | | |

10.6. Trình độ IE1 chuyên ngành Kỹ Thuật Máy Tính

Bảng 11. Kế hoạch giảng dạy đối với người học đạt trình độ IE1 chuyên ngành Kỹ Thuật Máy Tính

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|---------------|----------------------|---|---|---------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Мã МН | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| T (24 | ENTP01 | Tiếng Anh tăng cường 1 | Intensive English 1 | Bắt buộc | 17 | 17 | 0 | | |
| I (34 tín | ENTP02 | Tiếng Anh tăng cường 2 | Intensive English 2 | Bắt buộc | 17 | 17 | 0 | | |
| chỉ) | Tổng | | 34 | 34 | 0 | | Không tính vào TC | | |
| | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| II (18 tín | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| chỉ) | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-------------------|---------|---------------------|-------------------------|---------------------------|--------------|--------------|--------------------------------|-------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | Tổng | | | | 18 | 14 | 4 | | |
| III (17 tín | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| chỉ) | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-----------|----------------------|--|--|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn HT EN008IU + EN007IU Academic English 1 (listening + writing skills) |
| | Tổng | | | | 17 | 15 | 2 | | |
| IV (20 | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-------------|---------|------------------------------------|---|---------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| tín chỉ) | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn HT MA001IU Calculus 1 |
| | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| | IT068IU | Nguyên lý mạch điện 1 | Principle of Electrical Engineering I | Bắt buộc | 3 | 3 | 0 | | Môn SH Principle of Electrical Engineering I Laboratory |
| | IT098IU | Thực hành nguyên lý mạch điện 1 | Principle of Electrical Engineering I Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Principle of Electrical Engineering I |
| | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE016IU | Kinh tế chính trị Mác- Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|----------------------|---------|-------------------|--------------------------|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | Tổng | | | | 20 | 18 | 2 | | |
| | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| V (17 tín chỉ) | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT074IU | Linh kiện điện tử | Electronic Devices | Bắt buộc | 3 | 3 | 0 | | Môn HT IT068IU Principle of Electrical Engineering I; Môn SH IT074IU Electronic Devices |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|--------------------------|---------|---|---|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT101IU | Thực hành linh kiện điện tử | Electronic Devices Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH IT074IU Electronic Devices |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU Triết học Mác-Lênin, Kinh tế chính trị Mác-Lênin |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | , | , | | 17 | 14 | 3 | | |
| VI (19 tín chỉ) | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture; IT013IU Algorithms and Data Structures |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-----------|---------|-------------------------------------|---|---------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | IT128IU | Hệ thống vi xử lý | Micro-processing Systems | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Micro-processing Systems Laboratory |
| | IT129IU | Thực hành hệ thống vi xử lý | Micro-processing Systems Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Micro- processing Systems |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|---------------------------|---------|-----------------------------------|-------------------------------------|---------------------------|--------------|--------------|--------------------------------|------------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | Tổng | | | | 19 | 12 | 7 | | |
| Hè năm | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | ITxxxIU | 7 | 0 | 7 | | Không |
| 3 | Tổng | | | | 7 | 0 | 7 | | |
| | | Môn tự chọn 1 | Elective 1 | | 4 | 3 | 1 | | Không |
| VII (16 tín chỉ) | IT105IU | Thiết kế hệ thống số | Digital System Design | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Digital System Design Laboratory |
| , | IT106IU | Thực hành thiết kế hệ thống số | Digital System Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Digital System Design |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|------------|---------|-----------------------------------|---|---------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT115IU | Hệ thống nhúng | Embedded Systems | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT128IU Micro-processing Systems; Môn SH Embedded Systems Laboratory |
| | IT127IU | Thực hành hệ thống nhúng | Embedded Systems Laboratory | Bắt buộc | 1 | 0 | 1 | | Môn SH Embedded Systems |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU |
| | Tổng | | | | 16 | 13 | 3 | | |
| VII (16 | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-------------|---------|-----------------------------------|---------------------------------------|---------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| tín chỉ) | IT110IU | Khái niệm thiết kế VLSI | Concepts in VLSI Design | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT067IU Digital Logic Design; Môn SH IT126IU Concepts in VLSI Design Laboratory |
| | IT126IU | Thực hành khái niệm thiết kế VLSI | Concepts in VLSI Design Laboratory | Bắt buộc | 1 | | 1 | Phòng TN. CNTT | Môn SH IT110IU Concepts in VLSI Design |
| | IT103IU | Xử lý tín hiệu số | Digital Signal Processing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object- Oriented Programming |
| | Tổng | | | | 16 | 12 | 4 | | |
| VIII (13 | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín chỉ | | | Chi chú / Môn |
|-------------|----------|--------------------------------|--|---------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| tín chỉ) | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 9 | 4 | | |
| IX (13 | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn HT IT083IU Special Study of the Field |
| tín chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 3 | 10 | | |
| | TỔNG CỘI | NG | | | 156 | 110 | 46 | | |

10.7. Trình độ IE0 chuyên ngành Kỹ Thuật Mạng

Bảng 12. Kế hoạch giảng dạy đối với người học đạt trình độ IE0 chuyên ngành Kỹ Thuật Mạng

| Học | Mã MH | Tên môn học (| MH) | Loại MH | | Tín ch | าใ | Phòng | Chi chú / Môn |
|--------------------|----------------------|---|--|------------------------|--------------|--------------|--------------------------------|----------------------|--|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| I (34 tín | ENTP00 | Tiếng Anh tăng cường 0 | Intensive English 0 | Bắt buộc | 17 | 17 | 0 | | |
| chỉ) | ENTP01 | Tiếng Anh tăng cường 1 | Intensive English 1 | Bắt buộc | 17 | 17 | 0 | | |
| | | Tổng | | | 34 | 34 | 0 | | Không tính vào TC |
| II (17 tín | ENTP02 | Tiếng Anh tăng cường 2 | Intensive English 2 | Bắt buộc | 17 | 17 | 0 | | |
| chỉ) | | Tổng | | | 17 | 17 | 0 | | Không tính vào TC |
| III | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| (18 tín chỉ) | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |
| | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| Học | Mã MH | Tên môn học (| (MH) | Loại MH | | Tín cl | าใ | Phòng | Chi chú / Môn |
|------|------------|----------------------|----------------------|-----------|------|--------|--------|--------------|----------------------------------|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc | Tổng | Lý | Thực | TN | tiên quyết |
| | | | | /tự chọn) | cộng | thuyết | | | (TQ)/Môn học |
| | | | | | | | Thí | | trước (HT)/Môn |
| | DE004444 | | 71 1 1 | 74.1 | | | nghiệm | | song hành (SH) |
| | PT001IU | Giáo dục thể chất 1 | Physical | Bắt buộc | 3 | 0 | 3 | | Không |
| | | πλ | Training 1 | | 10 | 1.4 | 4 | | |
| | | Tổng | 1 | - / | 18 | 14 | 4 | | |
| IV | IT153IU | Toán rời rạc | Discrete | Bắt buộc | 3 | 3 | 0 | | Môn học học trước |
| (17 | | | Mathematics | | | | | | IT116IU (3,1) |
| tín | | | | | | | | | C/C++ |
| chỉ) | | | | | | | | | Programming hoặc |
| | | | | | | | | | IT149IU (3,1) Fundamentals of |
| | | | | | | | | | Programming |
| | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| | | <u> </u> | | • | | | | | |
| | EN012IU + | Tiếng Anh chuyên | Academic | Bắt buộc | 4 | 4 | 0 | | Môn TQ EN008IU |
| | EN011IU | ngành 2 (nói + viết) | English 2 | | | | | | + EN007IU |
| | | | (speaking + | | | | | | Academic English |
| | | | writing skills) | | | | | | 1 (listening + |
| | ITTO CTILL | 771 : Á. 1 Á 1 · · Á | D: : 11 | D 5, 1 A | 2 | 2 | 0 | | writing skills) |
| | IT067IU | Thiết kế logic số | Digital Logic | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU |
| | | | Design | | | | | | / EE054IU Digital |
| | | | | | | | | | Logic Design |
| | IT099IU | Thực hành Thiết kế | Digital Logic | Bắt buộc | 1 | 0 | 1 | Dhàna | Laboratory Môn SH IT067IU |
| | 1109910 | | Digital Logic | Bai buộc | 1 | | 1 | Phòng TN. | |
| | | logic số | Design Laboratory | | | | | ĐTVT | Digital Logic |
| | | | Laboratory | | | 1 | | ויוע | Design |

| Học | Mã MH | Tên môn học (| (MH) | Loại MH | | Tín cl | าใ | Phòng | Chi chú / Môn |
|--------------|---------|-------------------------------------|---|------------------------|--------------|--------------|--------------------------------|----------------------|--|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT069IU | Lập trình hướng đối tượng | Object- Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | | Tổng | | | 17 | 15 | 2 | | |
| V (20 tín | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |
| chỉ) | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn TQ MA001IU Calculus 1 |
| | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |

| Học | Mã MH | Tên môn học (l | | Loại MH | | Tín cl | าเ๋ | Phòng | Chi chú / Môn |
|------------------|---------|---------------------------------|---|------------------------|--------------|--------------|--------------------------------|----------------------|---|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE016IU | Kinh tế chính trị Mác- Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | | Tổng | | | 20 | 18 | 2 | | |
| VI (17 tín | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| chỉ) | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | IT093IU | Phát triển ứng dụng Web | Web Application Development | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT079IU (3,1) Principles of Database Management và IT069IU (3,1) Object-Oriented Programming |

| Học | Mã MH | Tên môn học (| | Loại MH | | Tín cl | าใ | Phòng | Chi chú / Môn |
|---------------------------|---------|---|---|------------------------|--------------|--------------|--------------------------------|----------------------|---|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU Triết học Mác-Lênin, Kinh tế chính trị Mác- Lênin |
| | | Tổng | | | 17 | 14 | 3 | | |
| VII (19 tín chỉ) | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture, IT013IU Algorithms and Data Structures |
| | IT096IU | Lập trình mạng | Net-Centric Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | IT125IU | Quản trị hệ thống mạng | System & Network Administratio n | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |

| Học | Mã MH | Tên môn học (| MH) | Loại MH | | Tín cl | hỉ | Phòng | Chi chú / Môn |
|--------------------|---------|-----------------------------------|--|------------------------|--------------|--------------|--------------------------------|------------------------|--|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | | Tổng | | | 19 | 12 | 7 | | |
| VIII (16 tín | | Môn tự chọn 1 | Elective 1 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | |
| chỉ) | IT094IU | Quản lý Hệ thống thông tin | Information System Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| | IT117IU | Bảo mật hệ thống và mạng | System and Network Security | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE017IU Scientific Socialism |

| Học | Mã MH | Tên môn học (| MH) | Loại MH | | Tín cl | าเ้ | Phòng | Chi chú / Môn |
|--------------------------|---------|--------------------------------|------------------------------------|------------------------|--------------|--------------|--------------------------------|----------------------|--|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn TQ PE015IU, PE016IU, PE017IU |
| | | Tổng | | | 16 | 13 | 3 | | |
| Hè năm | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| 4 | | Tổng | | | 7 | 0 | 7 | | |
| IX (15 tín chỉ) | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object-Oriented Programming |
| | IT139IU | Tính toán phân tán | Scalable and Distributed Computing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT120IU | Khởi nghiệp | Entrepreneurs hip | Bắt buộc | 3 | 3 | 0 | | Không |
| | | Tổng | | | 15 | 12 | 3 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |

| Học | Mã MH | Tên môn học (| | Loại MH | | Tín cl | าใ | Phòng | Chi chú / Môn |
|----------------------|---------|-----------------------------------|--|------------------------|--------------|--------------|--------------------------------|----------------------|--|
| kỳ | | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| X (14 tín chỉ) | | Môn tự chọn 3 | Elective 3 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | | Tổng | | | 14 | 9 | 5 | | |
| XI (13 tín | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn TQ IT083IU Special Study of the Field |
| chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | | Tổng | 1 | | 13 | 3 | 10 | | |
| | | TỔNG CỘNG | | | 156 | 110 | 46 | _ | |

10.8. Trình độ IE0 chuyên ngành Kỹ Thuật Máy tính

Bảng 13. Kế hoạch giảng dạy đối với người học đạt trình độ IE0 chuyên ngành Kỹ Thuật Máy tính

| | | Tên môn học (MH) | | Loại | | Tín ch | í | | Chi chú / Môn |
|---------------|----------------------|--|---|------------------------------------|--------------|--------------|--------------------------------|-------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| 1 (24 | ENTP00 | Tiếng Anh tăng cường 0 | Intensive English 0 | Bắt buộc | 17 | 17 | 0 | | |
| I (34 tín | ENTP01 | Tiếng Anh tăng cường 1 | Intensive English 1 | Bắt buộc | 17 | 17 | 0 | | |
| chỉ) | Tổng | | | | 34 | 34 | 0 | | Không tính vào TC |
| II (17 tín | ENTP02 | Tiếng Anh tăng cường 2 | Intensive English 2 | Bắt buộc | 17 | 17 | 0 | | |
| chỉ) | Tổng | | | | 17 | 17 | 0 | | Không tính vào TC |
| 111 | MA001IU | Toán 1 | Calculus 1 | Bắt buộc | 4 | 4 | 0 | | Không |
| (18) tín | EN008IU + EN007IU | Tiếng Anh chuyên ngành 1 (nghe + viết) | Academic English 1 (listening + writing skills) | Bắt buộc | 4 | 4 | 0 | | Không |
| chỉ) | IT064IU | Nhập môn Tin học | Introduction to Computing | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn học (MH) | _ | Loại MH | | Tín ch | i | | Chi chú / Môn |
|-----------|---------|---------------------|-------------------------|------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT116IU | Lập trình C/C++ | C/C++ Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | PT001IU | Giáo dục thể chất 1 | Physical Training 1 | Bắt buộc | 3 | 0 | 3 | | Không |
| | Tổng | | | | 18 | 14 | 4 | | |
| IV (17 | IT153IU | Toán rời rạc | Discrete Mathematics | Bắt buộc | 3 | 3 | 0 | | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| chỉ) | PH013IU | Vật lý 1 | Physics 1 | Bắt buộc | 2 | 2 | 0 | | Không |
| | IT067IU | Thiết kế logic số | Digital Logic Design | Bắt buộc | 3 | 3 | 0 | | Môn SH IT099IU / EE054IU Digital Logic Design Laboratory |

| | | Tên môn học (MH) | | Loại | | Tín ch | ĺ | | Chi chú / Môn |
|-----------|----------------------|--|--|------------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT099IU | Thực hành Thiết kế logic số | Digital Logic Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. ĐTVT | Môn SH IT067IU Digital Logic Design |
| | IT069IU | Lập trình hướng đối tượng | Object-Oriented Programming | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học HT IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| | EN012IU + EN011IU | Tiếng Anh chuyên ngành 2 (nói + viết) | Academic English 2 (speaking + writing skills) | Bắt buộc | 4 | 4 | 0 | | Môn HT EN008IU + EN007IU Academic English 1 (listening + writing skills) |
| | Tổng | | | | 17 | 15 | 2 | | |
| | IT154IU | Đại số tuyến tính | Linear algebra | Bắt buộc | 3 | 3 | 0 | | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín ch | i | | Chi chú / Môn |
|-------------|---------|------------------------------------|--|------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | MA003IU | Toán 2 | Calculus 2 | Bắt buộc | 4 | 4 | 0 | | Môn HT MA001IU Calculus 1 |
| | IT013IU | Cấu trúc dữ liệu và giải thuật | Algorithms and Data Structures | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT069IU Object-Oriented Programming |
| V (20 | IT068IU | Nguyên lý mạch điện 1 | Principle of Electrical Engineering I | Bắt buộc | 3 | 3 | 0 | | Môn SH Principle of Electrical Engineering I Laboratory |
| tín chỉ) | IT098IU | Thực hành nguyên lý mạch điện 1 | Principle of Electrical Engineering I Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Principle of Electrical Engineering I |
| | PE015IU | Triết học Mác-Lênin | Philosophy Marx - Lenin | Bắt buộc | 3 | 3 | 0 | | Không |
| | PE016IU | Kinh tế chính trị Mác- Lênin | Marxist – Leninist Political Economy | Bắt buộc | 2 | 2 | 0 | | Môn SH PE015IU Philosophy Marx - Lenin |
| | Tổng | | | | 20 | 18 | 2 | | |

| | | Tên môn học (MH) | | Loại MH | | Tín ch | i | | Chi chú / Môn |
|-----------------|---------|-----------------------------|----------------------------------|------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| VI (17 tín chỉ) | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT091IU | Mạng máy tính | Computer Networks | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) Fundamentals of Programming |
| , | IT089IU | Cấu trúc máy tính | Computer Architecture | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT074IU | Linh kiện điện tử | Electronic Devices | Bắt buộc | 3 | 3 | 0 | | Môn HT IT068IU Principle of Electrical Engineering I; Môn SH IT074IU Electronic Devices |
| | IT101IU | Thực hành linh kiện điện tử | Electronic Devices Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH IT074IU Electronic Devices |

| | | Tên môn học (MH) | | Loại MH | | Tín ch | ĺ | | Chi chú / Môn |
|--------|---------|--|---|------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| P M T | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PE017IU | Chủ nghĩa xã hội khoa học | Scientific Socialism | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU Triết học Mác-Lênin, Kinh tế chính trị Mác-Lênin |
| | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | Probability, Statistic & Random Process | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 17 | 14 | 3 | | |
| | IT017IU | Hệ điều hành | Operating System | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT089IU Computer Architecture; IT013IU Algorithms and Data Structures |
| tín | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | Principles of Database Management | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT116IU (3,1) C/C++ Programming hoặc IT149IU (3,1) |

| | | Tên môn học (MH) | | Loại MH | | Tín ch | í | | Chi chú / Môn |
|-----------|---------|--------------------------------|--|------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | | | | | | | | | Fundamentals of Programming |
| | IT128IU | Hệ thống vi xử lý | Micro-processing Systems | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Micro-processing Systems Laboratory |
| | IT129IU | Thực hành hệ thống vi xử lý | Micro-processing Systems Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Micro- processing Systems |
| | PT002IU | Giáo dục thể chất 2 | Physical Training 2 | Bắt buộc | 3 | 0 | 3 | | Không |
| | PH015IU | Vật lý 3 | Physics 3 | Bắt buộc | 3 | 3 | 0 | | Môn TQ Physics 1; Môn SH Physics 3 Laboratory |

| | | Tên môn học (MH) | | Loại MH | | Tín ch | i | | Chi chú / Môn |
|------------------|---------|-----------------------------------|----------------------------------|------------------------------|--------------|--------------|--------------------------------|------------------------|--|
| PH Tổ VIII (16 | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | PH016IU | Thực hành Vật lý 3 | Physics 3 Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. Vật lý | Môn SH PH015IU Physics 3 |
| | Tổng | | | | 19 | 12 | 7 | | |
| | | Môn tự chọn 1 | Elective 1 | | 4 | 3 | 1 | | Không |
| VIII | IT105IU | Thiết kế hệ thống số | Digital System Design | Bắt buộc | 3 | 3 | 0 | | Môn HT IT067IU Digital Logic Design; Môn SH Digital System Design Laboratory |
| (16 tín | IT106IU | Thực hành thiết kế hệ thống số | Digital System Design Laboratory | Bắt buộc | 1 | 0 | 1 | Phòng TN. CNTT | Môn SH Digital System Design |
| | IT115IU | Hệ thống nhúng | Embedded Systems | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT128IU Micro-processing Systems; Môn SH Embedded Systems Laboratory |

| | | Tên môn học (MH) | | Loại | | Tín ch | i | | Chi chú / Môn |
|-----------------------|---------|-----------------------------------|---|------------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| IT1 PE | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT127IU | Thực hành hệ thống nhúng | Embedded Systems Laboratory | Bắt buộc | 1 | 0 | 1 | | Môn SH Embedded Systems |
| | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | History of Vietnamese Communist Party | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU |
| | PE019IU | Tư tưởng Hồ Chí Minh | Ho Chi Minh's Thoughts | Bắt buộc | 2 | 2 | 0 | | Môn HT PE015IU, PE016IU, PE017IU |
| | Tổng | | | | 16 | 13 | 3 | | |
| Hè | IT174IU | Thực tập công nghiệp cho kỹ sư | Internship for engineers | Bắt buộc | 7 | 0 | 7 | | Không |
| năm 4 | Tổng | | | | 7 | 0 | 7 | | |
| IX (16 tín chỉ) | | Môn tự chọn 2 | Elective 2 | Tự chọn | 4 | 3 | 1 | Phòng TN. CNTT | Không |

| | | Tên môn học (MH) | | Loại MH | | Tín ch | i | | Chi chú / Môn |
|-----------|---------|--------------------------------------|---------------------------------------|------------------------------|--------------|--------------|--------------------------------|----------------------|--|
| Học kỳ | Mã MH | Tiếng Việt | Tiếng Anh | (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT110IU | Khái niệm thiết kế VLSI | Concepts in VLSI Design | Bắt buộc | 3 | 3 | 0 | Phòng TN. CNTT | Môn HT IT067IU Digital Logic Design; Môn SH IT126IU Concepts in VLSI Design Laboratory |
| | IT126IU | Thực hành khái niệm thiết kế VLSI | Concepts in VLSI Design Laboratory | Bắt buộc | 1 | | 1 | Phòng TN. CNTT | Môn SH IT110IU Concepts in VLSI Design |
| | IT103IU | Xử lý tín hiệu số | Digital Signal Processing | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Không |
| | IT159IU | Trí thông minh nhân tạo | Artificial intelligence | Bắt buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn học học trước IT069IU (3,1) Object- Oriented Programming |
| | Tổng | | | | 16 | 12 | 4 | | |
| | IT083IU | Thực tập tốt nghiệp | Special Study of the Field | Bắt buộc | 3 | 0 | 3 | | Không |

| | | Tên môn học (MH) | | Loại | | Tín ch | ĺ | | Chi chú / Môn |
|--|----------|--------------------------------|--|------------------------------------|--------------|--------------|--------------------------------|----------------------|---|
| X (13 17 17 17 17 17 17 17 | Mã MH | Tiếng Việt | Tiếng Anh | MH (bắt buộc /tự chọn) | Tổng cộng | Lý thuyết | Thực hành/ Thí nghiệm | Phòng TN | Chi chú / Môn tiên quyết (TQ)/Môn học trước (HT)/Môn song hành (SH) |
| | IT134IU | Internet vạn vật | Internet of Things | Bắt Buộc | 4 | 3 | 1 | Phòng TN. CNTT | Môn HT IT091I Computer Networks |
| ` | IT120IU | Khởi nghiệp | Entrepreneurship | Bắt buộc | 3 | 3 | 0 | | Không |
| chỉ) | PE020IU | Đạo đức và kỹ năng nghề nghiệp | Engineering Ethics and Professional Skills | Bắt buộc | 3 | 3 | 0 | | Không |
| | Tổng | | | | 13 | 9 | 4 | | |
| , | IT058IU | Luận văn tốt nghiệp | Thesis | Bắt buộc | 10 | 0 | 10 | | Môn HT IT083IU Special Study of the Field |
| tin chỉ) | PE021IU | Pháp luật đại cương | General Law | Bắt Buộc | 3 | 3 | 0 | | Không |
| | Tổng | rổng | | | 13 | 3 | 10 | | |
| | TỔNG CỘN | J | | | 156 | 110 | 46 | | |

11. Ma trận các môn học và chuẩn đầu ra (kỹ năng)

Mức độ đóng góp của các môn học vào chuẩn đầu ra của CTĐT ngành Công nghệ Thông tin được trình bày như Bảng 14.

Bảng 14. Đóng góp của các môn học vào CĐR của CTĐT chuyên ngành Kỹ thuật Mạng

| STT | Mã môn | Tên môn học (MH) | Chuẩn | đầu ra | (ABET) | | | |
|------------|-------------|---|-------|--------|--------|------|------|------|
| | học | Tiếng Việt | | PLO2 | ` ′ | PLO4 | PLO5 | PLO6 |
| I | Kiến thức g | iáo dục đại cương | 1201 | 1202 | 1200 | 1201 | 1200 | 1200 |
| <i>I.1</i> | Các môn lý | luận chính trị | | | | | | |
| 1 | PE015IU | Triết học Mác-Lênin | | | | XX | | |
| 2 | PE016IU | Kinh tế chính trị Mác-Lênin | | | | xx | | |
| 3 | PE017IU | Chủ nghĩa xã hội khoa học | | | | xx | | |
| 4 | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | | | | X | | |
| 5 | PE019IU | Tư tưởng Hồ Chí Minh | | | | XX | | |
| <i>I.2</i> | Khoa học xi | ã hội - Nhân văn - Nghệ thuật | | | | | | |
| 6 | PE021IU | Pháp luật đại cương | | | | XX | X | |
| <i>I.3</i> | Ngoại ngữ | | | | | | | |
| 7 | EN008IU | Tiếng Anh chuyên ngành 1 (kỹ năng nghe) | | | xxx | | | |
| 8 | EN007IU | Tiếng Anh chuyên ngành 1 (kỹ năng viết) | | | xxx | | | |
| 9 | EN012IU | Tiếng Anh chuyên ngành 2 (kỹ năng nói) | | | XXX | | | |
| 10 | EN011IU | Tiếng Anh chuyên ngành 2 (kỹ năng viết) | | | XXX | | | |
| <i>I.4</i> | Toán - Kho | a học tự nhiên - Môi trường | | | | | | |
| 11 | MA001IU | Toán 1 | XX | | X | | | |
| 12 | MA003IU | Toán 2 | XX | | X | | | |
| 13 | IT154IU | Đại số tuyến tính | XX | | | | | |
| 14 | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | XX | X | | | | |
| 15 | IT153IU | Toán rời rạc | X | X | | | | |
| 16 | PH013IU | Vật lý 1 | X | | | | | |
| 17 | PH015IU | Vật lý 3 | X | | | | | |
| 18 | PH016IU | Thực hành Vật lý 3 | X | | | | | |
| II | Khối kiến t | hức cơ sở ngành | | | | | | |
| 19 | IT064IU | Nhập môn Tin học | X | | | X | X | |

| STT | Mã môn học | Tên môn học (MH) | Chuẩn | đầu ra | (ABET) | | | |
|-----|---------------|-------------------------------------|-------|--------|--------|------|------|------|
| | | Tiếng Việt | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
| 20 | IT116IU | Lập trình C/C++ | X | XXX | | | X | |
| 21 | IT067IU | Thiết kế logic số | X | X | | | | X |
| 22 | IT099IU | Thực hành Thiết kế logic số | X | X | | | | X |
| 23 | IT069IU | Lập trình hướng đối tượng | xx | XXX | | | | X |
| 24 | IT013IU | Cấu trúc dữ liệu và giải thuật | xxx | XX | | | | x |
| 25 | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | xxx | xxx | | | xx | |
| 26 | IT089IU | Kiến trúc máy tính | X | X | | | | X |
| 27 | IT091IU | Mạng máy tính | XX | XXX | | | X | |
| 28 | IT017IU | Hệ điều hành | X | X | | | | |
| III | Kiến thức | chuyên ngành | | | | | 1 | 1 |
| 29 | IT094IU | Quản lý hệ thống thông tin | X | | | | XX | X |
| 30 | IT093IU | Phát triển ứng dụng Web | X | x | | | X | X |
| 31 | IT096IU | Lập trình Mạng | X | XXX | | | | X |
| 32 | IT117IU | Bảo mật hệ thống và mạng | X | X | X | X | | |
| 33 | IT125IU | Quản trị hệ thống mạng | XXX | | X | XXX | | |
| 34 | IT139IU | Tính toán phân tán | x | X | | | | x |
| 35 | IT134IU | Internet van vât | | xxx | | | XX | X |
| 36 | IT159IU | Trí thông minh nhân tạo | x | X | | | | x |
| IV | Kiến thức | tự chọn | | | | | | |
| 37 | | Tự chọn 1 | | | | | | |
| 38 | | Tự chọn 2 | | | | | | |
| 39 | | Tự chọn 3 | | | | | | |
| V | Kiến thức | bổ trợ | | | | | | |
| 40 | IT120IU | Khởi nghiệp | X | | | X | | |
| 41 | PE020IU | Đạo đức và kỹ năng nghề nghiệp | | | | XX | | |
| VI | Nghiên cứ | u, thực tập và luận văn tốt nghi | ệp | | | | | |
| 42 | IT174IU | Thực tập công nghiệp cho kỹ sư | | | | X | | X |
| 43 | IT083IU | Thực tập tốt nghiệp | XXX | XX | | | | X |
| 44 | IT058IU | Luận văn tốt nghiệp | XXX | XXX | | | | X |

Bảng 14. Đóng góp của các môn học vào CĐR của CTĐT chuyên ngành Kỹ thuật Máy tính

| STT | Mã môn học | Tên môn học (MH) | Chuẩn | đầu ra | (ABET) | | | |
|------------|----------------|---|-------|--------|--------|------|------|------|
| | • | Tiếng Việt | | | PLO3 | PLO4 | PLO5 | PLO6 |
| I | Kiến thức giáo | o dục đại cương | | | | | | |
| <i>I.1</i> | Các môn lý lug | | | | | | | |
| 1 | PE015IU | Triết học Mác-Lênin | | | | XX | | |
| 2 | PE016IU | Kinh tế chính trị Mác- Lênin | | | | xx | | |
| 3 | PE017IU | Chủ nghĩa xã hội khoa học | | | | XX | | |
| 4 | PE018IU | Lịch sử Đảng Cộng Sản Việt Nam | | | | X | | |
| 5 | PE019IU | Tư tưởng Hồ Chí Minh | | | | XX | | |
| <i>I.2</i> | Khoa học xã h | ội - Nhân văn - Nghệ thuật | | | | | | |
| 6 | PE021IU | Pháp luật đại cương | | | | XX | X | |
| 1.3 | Ngoại ngữ | | | | | | | |
| 7 | EN008IU | Tiếng Anh chuyên ngành 1 (kỹ năng nghe) | | | XXX | | | |
| 8 | EN007IU | Tiếng Anh chuyên ngành 1 (kỹ năng viết) | | | XXX | | | |
| 9 | EN012IU | Tiếng Anh chuyên ngành 2 (kỹ năng nói) | | | XXX | | | |
| 10 | EN011IU | Tiếng Anh chuyên ngành 2 (kỹ năng viết) | | | XXX | | | |
| <i>I.4</i> | Toán - Khoa h | ọc tự nhiên - Môi trường | | | | | | |
| 11 | MA001IU | Toán 1 | XX | | X | | | |
| 12 | MA003IU | Toán 2 | XX | | X | | | |
| 13 | IT154IU | Đại số tuyến tính | XX | | | | | |
| 14 | MA026IU | Xác suất, thống kê và quá trình ngẫu nhiên | XX | x | | | | |
| 15 | IT153IU | Toán rời rạc | X | X | | | | |
| 16 | PH013IU | Vật lý 1 | X | | | | | |
| 17 | PH015IU | Vật lý 3 | X | | | | | |
| 18 | PH016IU | Thực hành Vật lý 3 | X | | | | | |
| II | Khối kiến thứ | c cơ sở ngành | | | | | | |
| 19 | IT064IU | Nhập môn Tin học | X | | | X | X | |
| 20 | IT116IU | Lập trình C/C++ | X | XXX | | | X | |
| 21 | IT067IU | Thiết kế logic số | X | X | | | | X |
| 22 | IT099IU | Thực hành Thiết kế logic số | Х | X | | | | X |
| 23 | IT069IU | Lập trình hướng đối tượng | XX | XXX | | | | X |

| STT | Mã môn học | Tên môn học (MH) | Chuẩn | đầu ra | (ABET) | | XX X X X X X X X X X X X X X X X X X X | |
|-----|----------------|-------------------------------------|-------|--------|--------|----------|--|------|
| | • | Tiếng Việt | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
| 24 | IT013IU | Cấu trúc dữ liệu và giải thuật | xxx | xx | | | | х |
| 25 | IT079IU | Nguyên lý Quản trị Cơ sở dữ liệu | XXX | XXX | | | xx | |
| 26 | IT089IU | Kiến trúc máy tính | X | X | | | | X |
| 27 | IT091IU | Mạng máy tính | XX | XXX | | | X | |
| 28 | IT017IU | Hệ điều hành | X | X | | | | |
| III | Kiến thức chu | yên ngành | | | | | | |
| 29 | IT068IU | Các nguyên lý mạch điện 1 | X | X | | | | X |
| 30 | IT098IU | Thực hành các nguyên lý mạch điện 1 | X | X | | | | X |
| 31 | IT074IU | Linh kiện điện tử | X | X | | | | X |
| 32 | IT101IU | Thực hành linh kiện điện tử | X | X | | | | X |
| 33 | IT105IU | Thiết kế hệ thống số | X | X | | | | X |
| 34 | IT106IU | Thực hành thiết kế hệ thống số | X | X | | | | X |
| 35 | IT128IU | Hệ thống vi xử lý | X | X | X | | | X |
| 36 | IT129IU | Thực hành hệ thống vi xử lý | х | х | х | | | Х |
| 37 | IT110IU | Khái niệm thiết kế VLSI | X | X | X | | | Х |
| 38 | IT126IU | Thực hành khái niệm thiết kế VLSI | х | х | Х | | | х |
| 39 | IT115IU | Hệ thống nhúng | | X | | | | Х |
| 40 | IT127IU | Thực hành hệ thống nhúng | | X | | | | Х |
| 41 | IT103IU | Xử lý tín hiệu số | X | X | | | | Х |
| 42 | IT134IU | Internet vạn vật | | XXX | | | XX | Х |
| 43 | IT159IU | Trí thông minh nhân tạo | X | X | | | | X |
| IV | Kiến thức tự | chọn | | • | | <u>'</u> | • | |
| 44 | | Tự chọn 1 | | | | | | |
| 45 | | Tự chọn 2 | | | | | | |
| V | Kiến thức bổ | trợ | | | | | | |
| 46 | IT120IU | Khởi nghiệp | X | | | X | | |
| 47 | PE020IU | Đạo đức và kỹ năng nghề nghiệp | | | | xx | | |
| VI | Nghiên cứu, tl | hực tập và luận văn tốt nghiệ | p | | | | | |
| 48 | IT174IU | Thực tập công nghiệp cho kỹ sư | | | | X | | X |
| 49 | IT083IU | Thực tập tốt nghiệp | XXX | XX | | | | X |
| 50 | IT058IU | Luận văn tốt nghiệp | XXX | XXX | | | | X |

- 12. Mô tả vắn tắt nội dung và khối lượng các môn học (số thứ tự của môn học tương ứng với số thứ tự của môn học trong nội dung chương trình đào tạo)
 - 12.1 PE015IU Triết học Mác-Lênin (Philosophy Marx Lenin)

Số tín chỉ : 3 (3LT + 0TH)

Môn học tiên quyết: không

Mô tả môn học:

Môn học trang bị cho sinh viên những kiến thức cơ bản về triết học Mác-Lênin.

12.2 **PE016IU - Kinh tế chính trị Mác-Lênin (Marxist – Leninist Political Economy)**

Số tín chỉ : 2 (2LT + 0TH)

Môn học song hành: Triết học Mác-Lênin

Mô tả môn học:

Nội dung chương trình gồm 6 chương: Trong đó chương 1 bàn về đối tượng, phương pháp nghiên cứu và chức năng của Kinh tế chính trị Mác-Lênin. Từ chương 2 đến chương 6 trình bày nội dung cốt lõi của Kinh tế chính trị Mác-Lênin theo mục tiêu của môn học. Cụ thể các vấn đề như: Hàng hóa, thị trường và vai trò của các chủ thể trong nền kinh tế thị trường; Sản xuất giá trị thặng dư trong nền kinh tế thị trường; Cạnh tranh và độc quyền trong nền kinh tế thị trường; Kinh tế thị trường định hướng xã hội chủ nghĩa và các quan hệ lợi ích kinh tế ở Việt Nam; Công nghiệp hóa, hiện đại hóa và hội nhập kinh tế quốc tế ở Việt Nam.

12.3 **PE017IU - Chủ nghĩa xã hội khoa học (Scientific Socialism)**

Số tín chỉ : 2 (2LT + 0TH)

Môn học trước: Triết học Mác-Lênin, Kinh tế chính trị Mác-Lênin

Mô tả môn học:

Môn học trang bị cho sinh viên những kiến thức cơ bản về chủ nghĩa xã hội khoa học.

12.4 **PE018IU - Lịch sử Đảng Cộng Sản Việt Nam (History of Vietnamese Communist Party)**

Số tín chỉ : 2 (2LT + 0TH)

Môn học trước: Triết học Mác-Lênin, Kinh tế chính trị Mác-Lênin, Chủ nghĩa xã hội khoa học.

Mô tả môn học:

Môn học trang bị cho sinh viên những kiến thức cơ bản về lịch sử Đảng Cộng Sản Việt Nam.

12.5 **PE019IU - Tư tưởng Hồ Chí Minh (Ho Chi Minh's Thoughts)**

Số tín chỉ: 2 (2LT + 0TH)

Môn học trước: Triết học Mác-Lênin, Kinh tế chính trị Mác-Lênin, Chủ nghĩa xã hội khoa học.

Mô tả môn học:

Môn học trang bị cho sinh viên những kiến thức cơ bản về: đối tượng, phương pháp nghiên cứu và ý nghĩa học tập môn tư tưởng Hồ Chí Minh; về cơ sở, quá trình hình thành và phát triển tư tưởng Hồ Chí Minh; về độc lập dân tộc và đoàn kết quốc tế; về văn hóa, đạo đức, con người.

12.6 **MA001IU - Toán 1 (Calculus 1)**

Số tín chỉ : 4 (4LT + 0TH)

Môn học tiên quyết: Không

Mô tả môn học:

Nội dung chính: Hàm số, Giới hạn, Tính liên tục, Đạo hàm, Đạo hàm cho các hàm cơ bản, Qui tắc tính đạo hàm, Ứng dụng của đạo hàm, Quy tắc L'hospital, Tối ưu, Phương pháp Newton, Tích phân, Tích phân xác định, Các định lý cơ bản của giải tích, kỹ thuật tính tích phân.

12.7 **MA003IU - Toán 2 (Calculus 2)**

Số tín chỉ : 4 (4LT + 0TH)

Môn học tiên quyết: Toán 1

Mô tả môn học:

Dãy và chuỗi; Kiểm tra sự hội tụ; Chuỗi mủ; Chuỗi Taylor và Maclaurin; Hệ tọa độ Cartesian; Đường thẳng, Mặt và Mặt phẳng; Đạo hàm và tích phân của hàm Vécto; Chiều dài đường cong; Mặt phẳng tham số; Mặt tiếp xúc; Vécto Gradient; Cực trị; Nhân tử Lagrange; Tích phân bội: tích phân hai lớp, tích phân ba lớp, những kỹ thuật tính tích phân; Trường Vécto, tích phân đường, tích phân mặt.

Số tín chỉ : 4 (3LT + 1TH)

Môn học tiên quyết: Toán 1, Toán 2

Mô tả môn học: Phương trình vi phân cấp một, phương trình vi phân cấp hai, hệ số không xác định, phương sai của tham số, phương trình vi phân tuyến tính cấp cao, nghiệm chuỗi của phương trình vi phân tuyến tính cấp hai với hệ số không là hằng, hệ phương trình tuyến tính cấp một, cơ bản về phương trình đạo hàm riêng và phương pháp tách biến, phương pháp số.

12.8 **MA026IU** - Xác suất, thống kê và quá trình ngẫu nhiên (Probability, Statistic & Random Process)

Số tín chỉ : 3 (3LT + 0TH)

Môn học tiên quyết: Toán 1, Toán 2

Mô tả môn học: Môn học trình bày lý thuyết xác suất theo quan điểm độ đo. Nội dung chính bao gồm kiến thức về các biến cố (độc lập, có điều kiện,...), các biến ngẫu nhiên, phân phối, kỳ vọng, phương sai và các định lý giới hạn quan trọng trong xác suất (định lý giới hạn trung tâm, luật số lớn, ...).

12.9 **PH013IU - Vật lý 1 (Physics 1)**

Số tín chỉ : 2 (2LT + 0TH)

Môn học tiên quyết: Không

Mô tả môn học:

Khảo sát động học, động lực học, năng lượng học của chuyển động của chất điểm và của vật rắn. Khảo sát động lực học lưu chất, tính chất của khí lí tưởng, và các nguyên lí nhiệt động lực học.

12.10 PH015IU & PH016IU - Vật lý 3 (Physics 3 + Physics 3 Laboratory)

Số tín chỉ : 4 (3LT + 1TH)

Môn học tiên quyết: Vật lý 1

Mô tả môn học:

Môn học cung cấp cho sinh viên những kiến thức cơ bản về điên và từ.

12.11 PE020IU - Đạo đức và kỹ năng nghề nghiệp (Engineering Ethics and Professional Skills)

Số tín chỉ: 3 (3LT + 0TH) Môn học tiên quyết: không

Mô tả môn học: Môn học thiết kế để giới thiệu cho sinh viên kỹ thuật về khái niệm, lý thuyết và thực hành về đạo đức kỹ thuật. Môn học giúp sinh viên khám phá ra mối quan hệ giữa đạo đức và kỹ thuật cũng như việc áp dụng lý thuyết đạo đức cổ điển và ra quyết định cho các vấn đề kỹ thuật trong quá trình học thuật cũng như trong nghề nghiệp. Học tập và hiểu đạo đức nghề nghiệp cũng là một phần trong sự phát triển của sinh viên với tư cách là một kỹ sư. Sinh viên phải có khả năng mở rộng hiểu biết và tư duy cởi mở. Điều quan trọng là sinh viên phải học cách chia sẻ ý tưởng kể cả khi có sự bất đồng, do đó hoạt động thực hành nhóm sẽ được chú trọng trong môn học này.

12.12 EN007IU & EN008IU - Tiếng anh chuyên ngành 1 (Academic English 1)

Số tín chỉ: 4 (4LT + 0TH)

Môn học tiên quyết: không

Mô tả môn học:

Môn học nhằm nâng cao kỹ năng viết trình độ tiền nâng cao (pre-advanced). Chương trình tập trung vào việc xây dựng bài luận dựa trên các kỹ năng viết như: làm dàn bài, viết câu luận đề, kết nối và sắp xếp trình tự các đọan, dung từ và cụm từ nối để tạo sự mạch lạc cho bài văn. Các thể loại bao gồm: miêu tả người, đồ vật, qui trình, trình bày ý kiến, so sánh và đối chiếu, nguyên nhân – kết quả, vấn đề - giải pháp, nghị luận. Những kỹ năng nghe tiếng Anh học thuật, ghi chú, và thảo luận sẽ giúp sinh viên làm quen với những khó khăn trong việc học tiếng Anh ở đại học. Sinh viên sẽ học các kỹ năng cần thiết cho sinh viên đại học quốc tế, bao gồm: nghe bài giảng chủ động, ghi chú hiệu quả, tham gia thảo luận tự tin. Cùng với các kỹ năng nghe, sinh viên cũng sẽ trau giồi thêm vốn từ vựng học thuật.

12.13 EN011IU & EN012IU - Tiếng anh chuyên ngành 2 (Academic English 2)

Số tín chỉ : 4 (4LT + 0TH)

Môn học tiên quyết: Tiếng anh chuyên ngành 1

Mô tả môn học:

Khóa học nhằm cung cấp một cách tổng quát cấu trúc của một bài viết báo cáo nghiên cứu, từng bước giúp sinh viên hoàn tất một bài viết cụ thể trong lĩnh vực của mình. Nội dung của khóa học bao gồm: các thành phần của bài báo cáo, kỹ năng chọn và giới hạn đề tài, viết câu luận đề, làm dàn bài, tìm và dẫn chứng tài liệu, ghi chú, viết mở bài, nội dung chính và kết luận, viết và sửa chữa bản nháp. Sinh viên sẽ thực hành trên các đề tài liên quan đến môn học của mình. Môn học cung cấp cho sinh viên các chiến lược thiết thực sử dụng trong việc thuyết trình. Ngòai ra sinh viên được giúp đỡ hình thành kỹ năng lắng nghe, nhận xét và nêu ý kiến phản hồi đối với các bài thuyết trình khác trong lớp.

12.14 IT064IU - Nhập môn Tin học (Introduction to computing)

Số tín chỉ: 3 (3 LT+0TH)

Môn học tiên quyết: Không

Mô tả môn học:

Môn học giới thiệu những khái niệm cơ bản, những mô hình và xu hướng trong ngành công nghiệp Công nghệ thông tin. Ngoài ra, sinh viên được giới thiệu về các chuyên ngành, về cơ cấu các môn học trong mỗi chuyên ngành, ý nghĩa của các môn học, các nghề nghiệp liên quan đến mỗi chuyên ngành, định hướng nghề nghiệp cho sinh viên.

12.15 IT116IU - Lập trình C/C++ (C/C++ Programming)

Số tín chỉ: 4 (3 LT+1TH)

Môn học tiên quyết: Không

Mô tả môn học:

Môn học giúp phát triển những giải thuật và giới thiệu những nguyên tắc trong lập trình dùng C và C++. Các chủ đề bao gồm: giới thiệu máy tính và điện toán, phát triển chương trình, cú pháp ngôn ngữ lập trình C/C++ và các phương pháp số căn bản cho kỹ sư. Môi trường Unix và một số tiện ích cũng được giới thiệu trong môn học này.

12.16 IT153IU - Toán rời rạc (Discrete Mathematics)

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Toán 1, Toán 2, Lập trình C/C++

Mô tả môn học: Môn học giúp sinh viên phát triển khả năng tư duy, suy nghĩ và diễn giải dựa trên toán học, logic, ứng dụng khả năng này để phân tích, xử lý và giải quyết các đối tượng rời rạc trong thực tế. Đây là khóa học hướng ứng dụng dựa trên việc nghiên cứu các sự kiện xảy ra là nhỏ hay rời rạc phân đoạn trong khoa học, kinh tế, công nghiệp.... Sinh viên sẽ được giới thiệu các công cụ toán học về toán rời rạc như: lý thuyết tổ hợp; lý thuyết quan hệ (quan hệ tương đương, quan hệ sắp xếp); bài toán đếm (giới thiệu về bài toán và phần mở rộng về hệ thức truy hồi); bài toán tồn tại; bài toán liệt kê; lý thuyết đại số Boole; lý thuyết đồ thị và cây. Các ứng dụng thực tế sẽ được giới thiệu trong suốt khóa học.

12.17 IT067IU & IT099IU - Thiết kế logic số và thực hành (Digital Logic Design + Digital Logic Design Laboratory)

Số tín chỉ: 4 (3 LT+1TH)

Môn học tiên quyết: không

Môn học tương đương: EE053IU & EE054IU

Mô tả môn học:

Môn học cung cấp cho sinh viên các kiến thức về số nhị phân, đại số Boolean, bìa Karnaugh, mạch tổ hợp, mạch tổ hợp MSI, logis tuần tự, thiết kế máy trạng thái đồng bộ, mạch MSI tuần tự.

12.18 IT069IU - Lập trình hướng đối tượng (Object Oriented Programming)

Số tín chỉ: 4 (3 LT+1TH)

Môn học học trước: Lập trình C/C++ hoặc Lập trình cơ bản

Mô tả môn học:

Lập trình và các cấu trúc dữ liệu cơ bản dùng ngôn ngữ Java. Các cấu trúc điều khiển cơ bản như vòng lặp, mảng, đệ qui và con trỏ. Thiết kế hướng đối tương: lớp, thừa kế, overload và đa hình. Cấu trúc dữ liệu trừu tượng: danh sách, danh sách liên kết, chồng và hàng. Giới thiệu về phân tích giải thuật, dùng ký hiệu O, các phương pháp tìm kiếm và sắp xếp.

12.19 IT013IU - Cấu trúc dữ liệu và giải thuật (Algorithms and Data Strutures)

Số tín chỉ: 4 (3 LT+1TH)

Môn học trước: Lập trình hướng đối tượng

Mô tả môn học:

Tìm hiểu những đặc điểm quan trọng của cấu trúc dữ liệu và giải thuật. Cách sử dụng những cấu trúc này để hỗ trợ thiết kế giải thuật. Giới thiệu về các kỹ thuật tìm kiếm, sắp xếp và băm.

12.20 **IT079IU - Nguyên lý Quản trị Cơ sở dữ liệu (Principle of Database Management).**

Số tín chỉ: 4 (3 LT+1TH)

Môn học trước: Lập trình C/C++ hoặc Lập trình cơ bản

Mô tả môn học:

Môn học nhằm cung cấp cho người học kiến thức tổng quan về: kiến trúc Cơ sở dữ liệu (CSDL), phương pháp quản trị CSDL; các mô hình dữ liệu phân cấp, mô hình dữ liệu mạng và mô hình dữ liệu quan hệ; phương pháp thiết kế mô hình thực thể kết hợp và mô hình cơ sở dữ liệu quan hệ; các phụ thuộc hàm cho dữ liệu và cách chuẩn hóa dữ liệu, các ràng buộc toàn vẹn dữ liệu và bảo mật dữ liệu; các cơ chế quản lý giao tác cho hệ quản trị CSDL đa người dùng; ngoài ra môn học còn giới thiệu một số hệ quản trị CSDL thông dụng như SQL Server và một số hệ quản trị CSDL thương mại khác.

12.21 IT089IU - Cấu trúc máy tính (Computer Architecture)

Số tín chỉ: 4 (3 LT+1TH)

Môn học học trước: Thiết kế logic số

Mô tả môn học: Lịch sử và các nguyên lý của cấu trúc máy tính, cấu tạo máy tính, hợp ngữ và mã máy tính, số học của máy tính, thiết kế ALU, hiệu năng của máy tính, đường dẫn dữ liệu và điều khiển, pipelining, cấu trúc phân tầng của bộ nhớ, thiết bị xuất nhập, và các bộ xử lý di động cũng như đa lõi.

12.22 IT091IU - Mạng Máy Tính (Computer Networks)

Số tín chỉ: 4 (3 LT+1TH)

Môn học học trước: Lập trình C/C++

Môn học trước: Lập trình hướng đối tượng

Mô tả môn học: Giới thiệu về mạng, cấu trúc OSI, chuyển mạch gói, mạng nội bộ, Ethernet, mạng không dây, và các giao thức mạng.

12.23 IT096IU - Lập trình mạng (Net-Centric Programming)

Số tín chỉ: 4 (3LT+1TH)

Môn học học trước: Mạng máy tính, Lập trình C/C++

Mô tả môn học: Môn học cung cấp các kiến thức cơ sở và nâng cao về các kỹ thuật lập trình mạng TCP/IP và UDP. Giúp sinh viên có khả năng xây dựng định dạng dữ liệu để thiết kế các giao thức truyền dữ liệu trên mạng. Hướng dẫn sinh viên lập trình được các ứng dụng có kết nối mạng Client/Server độc lập sử dụng ở mức socket và một số giao thức mạng cấp ứng dụng phổ biến như HTTP, FTP, DNS, Email... Môn học cũng cung cấp cho sinh viên các kỹ năng phát triển phần mềm trên các công cụ và môi trường trực quan như PyCharm, Visual Studio...

12.24 IT094IU - Quản lý Hệ thống thông tin (Information System Management)

Số tín chỉ: 4 (3 LT+1TH)

Môn học trước: Nguyên lý Quản Trị Cơ sở dữ liệu

Mô tả môn học: Môn học hướng tới việc mô tả cách mà một hệ thống thông tin được sử dụng bởi các doanh nghiệp và sự ảnh hưởng của nó đến hoạt động của doanh nghiệp. Cùng với việc trình bày và tìm hiểu về công nghệ trong hệ thống thông tin, các vấn đề cơ bản là làm cách nào để các công nghệ được dùng giải quyết các vấn đề của doanh nghiệp và các cơ hội khai thác chúng. Nội dung cụ thể gồm các vấn đề liên quan đến tổ chức, quản lý, mạng doanh nghiệp; hạ tầng công nghệ thông tin doanh nghiệp; các hệ thống hỗ trợ quản lý và tổ chức cho doanh nghiệp số; xây dựng và quản lý hệ thống thông tin

12.25 IT017IU - Hệ điều hành (Operating System)

Số tín chỉ: 4 (3 LT+1TH)

Môn học học trước: Cấu trúc dữ liệu và giải thuật, Kiến trúc máy tính, Lập trình C/C++

Mô tả môn học: Môn học trang bị cho sinh viên khả năng định nghĩa và giải thích các nguyên lý của hệ điều hành. Hiểu về kiến trúc của một hệ điều hành. Khả năng lập trình để giao tiếp với các chức năng và dịch vụ hệ thống

12.26 IT093IU - Phát triển ứng dụng Web (Web Application Development)

Số tín chỉ: 4 (3 LT+1TH)

Môn học học trước: Lập trình hướng đối tượng, Nguyên lý Quản Trị Cơ sở dữ liệu

Mô tả môn học: Sử dụng các kiến thức và kỹ năng để phát triển ứng dụng Web dựa trên các tiện ích, công nghệ và môi trường phát triển của Java như HTML, Java Server Page, Java Bean, MVC Model. Ngoài ra còn mở rộng thêm các kiến thức liên quan đến kiến trúc của Java như Ajax và Struts. Môn học này làm nền tảng để sinh viên thực hiện các đề án môn học cũng như luận văn tốt nghiệp theo hướng Web.

12.27 IT117IU - Bảo mật hệ thống và mạng (System and Network Security)

Số tín chỉ: 4 (3LT+1TH)

Môn học học trước: Mạng máy tính

Mô tả môn học: Môn học này giới thiệu cho sinh viên các hệ thống mật mã (mã hóa đối xứng và khóa công khai), lý thuyết thông tin cơ bản, xác thực và ủy quyền, bảo mật cơ sở dữ liệu, phần mềm độc hại, tấn công từ chối dịch vụ, hệ thống phát hiện và ngăn chặn xâm nhập, tường lửa, tấn công tràn bộ đệm và bảo mật phần mềm, các tiêu chuẩn giao thức và bảo mật Internet, ứng dụng xác thực Internet và bảo mật không dây.

12.28 IT134IU - Internet van vật (Internet of Things)

Số tín chỉ: 4 (3LT+1TH)

Môn học học trước: Mạng máy tính

Mô tả môn học:

Môn học giải thích về kiến trúc, thành phần của mạng Internet vạn vật. Sinh viên sẽ được học về các kỹ thuật truyền thông khác nhau, từ tầm gần đến tầm xa như là Bluetooth, Zigbee, Wifi, LoRa, NB-IoT,... Ngoài ra, các kỹ thuật lưu trữ, tổ chức và phân tích dữ liệu còn được học trong môn học này. Sau đó, sinh viên sẽ được học các khái niệm, nguyên lý cơ bản và cấu tạo cơ bản của các hệ thống IoT cho các ứng dụng công nghiệp như y tế, sản xuất, nông nghiệp, v.v..

12.29 IT074IU – Linh kiện điện tử (Electronics Devices)

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Nguyên lý mạch điện 1

Môn học song hành: Thực hành linh kiện điện tử

Môn tương đương: EE090IU

Mô tả môn học: Môn học này cung cấp cho sinh viên kiến thức cơ bản về các thiết bị bán dẫn và mạch vi điện tử, đặc tính của kết nối P-N, điốt Zener và mạch điốt tương tự. Lý thuyết hoạt động của MOSFET và BJT, phân cực và phân tích transistor ở trung tần.

12.30 IT101IU – Thực hành linh kiện điện tử (Electronics Devices Laboratory)

Số tín chỉ: 1 (0LT + 1TH)

Môn học học trước: Nguyên lý mạch điện 2

Môn học song hành: Linh kiện điện tử

Môn tương đương: EE091IU

Mô tả môn học: Môn học được thiết kế để cung cấp sinh viên kiến thức về các mạch điện tử sử dụng các linh kiện bán dẫn bao gồm: Diod, MOSFE và BJT nhấn mạnh yếu tố thực nghiệm kết hợp mô phỏng máy tính.

12.31 IT068IU – Nguyên lý mạch điện 1 (Principles of Electrical Engineering I)

Số tín chỉ: 3 (3LT + 0TH) Môn học học trước: Toán 1

Môn học song hành: Thực hành nguyên lý mạch điện 1

Môn tương đương: EE051IU

Mô tả môn học: Môn học được thiết kế để cung cấp sinh viên các kiến thức về các thành phần mạch điện; nguồn độc lập; nguồn phụ thuộc; phân tích mạch một chiều và xoay chiều trạng thái ổn định; lý thuyết mạng điện; khuếch đại thuật toán; tính toán công suất.

12.32 IT098IU – Thực hành Nguyên lý mạch điện 1 (Principles of Electrical Engineering I Laboratory)

Số tín chỉ: 1 (OLT + 1TH) Môn học học trước: Toán 1

Môn học song hành: Nguyên lý mạch điện 1

Môn tương đương: EE052IU

Mô tả môn học: Môn học được thiết kế để cung cấp sinh viên các kiến thức về các bài thực hành thí nghiệm về sử dụng thiết bị thí nghiệm: máy đo điện áp, dòng điện, trở kháng, tần số, dạng sóng. Nguyên lí cơ bản về thiết kế và mô hình hóa mạch điện.

12.33 IT105IU – Thiết kế hệ thống số (Digital System Design)

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Thiết kế logic số

Môn học song hành: Thực hành thiết kế hệ thống số

Môn tương đương: EE063IU

Mô tả môn học: Môn học này giới thiệu phương pháp và kỹ thuật để thiết kế hệ thống kỹ thuật số. Các chủ đề bao gồm các khái niệm cơ bản, phân tích và thiết kế hệ thống với các ngôn ngữ mô tả phần cứng (HDL). Khóa học cung cấp cái nhìn sâu sắc về thiết kế các mạch tuần tự không đồng bộ và các hệ thống đồng bộ phức tạp. Quá trình thiết kế được giới thiệu bởi các khái niệm, tài liệu và mô phỏng.

12.34 IT106IU – Thực hành thiết kế hệ thống số (Digital System Design Laboratory)

Số tín chỉ: 1 (0LT + 1TH)

Môn học học trước: Thiết kế logic số

Môn học song hành: Thiết kế hệ thống số

Môn tương đương: EE117IU

Mô tả môn học: Môn học này này giúp sinh viên hiểu rõ hơn về các kỹ thuật để thiết kế hệ thống kỹ thuật số. Môn học bao gồm các chủ đề phần mềm và phần cứng: Giới thiệu về phần mềm Maxplus II, Bộ đếm, Giới thiệu về VHDL trong Maxplus II, Đồng hồ kỹ thuật số.

12.35 **IT128IU** – **Hệ thống vi xử lý (Micro-processing Systems)**

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Thiết kế logic số

Môn học song hành: Thực hành hệ thống vi xử lý

Môn tương đương: EE083IU

Mô tả môn học: Môn học trang bị cho sinh viên những kiến thức cơ bản về: lập trình bằng ngôn ngữ máy và hợp ngữ, kiến trúc và tập lệnh của các hệ vi xử lý, các ứng dụng về thiết kế dùng bộ vi xử lý

12.36 IT129IU – Thực hành hệ thống vi xử lý (Micro-processing Systems Laboratory)

Số tín chỉ: 1 (0LT + 1TH)

Môn học học trước: Thiết kế logic số

Môn học song hành: Hệ thống vi xử lý

Môn tương đương: EE084IU

Mô tả môn học: Sinh viên sẽ thực hành với các chủ đề sau: ngôn ngữ máy và hợp ngữ, kiến trúc và bộ hướng dẫn; ngăn xếp, chương trình con, I / O và ngắt; nguyên tắc giao thoa ngoại vi; thiết kế với bộ vi xử lý, và các ứng dụng của hệ thống vi xử lý cho một số vấn đề thực tế.

12.37 IT115IU – Hệ thống nhúng (Embedded Systems)

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Thiết kế logic số, Hệ thống vi xử lý

Môn học song hành: Thực hành Hệ thống nhúng

Môn tương đương: EE104IU

Mô tả môn học: Môn học cung cấp cho sinh viên kiến thức về thiết kế các Hệ thống nhúng, cả từ góc độ phần cứng và phần mềm. Trọng tâm chính là xử lý thời gian thực cho các hệ thống xử lý tín hiệu và truyền thông. Các dự án lập trình bằng ngôn ngữ cấp cao như C / C ++ sẽ là một thành phần thiết yếu của khóa học, cũng như thiết kế phần cứng với các công cụ thiết kế hiện đại.

12.38 IT127IU – Thực hành Hệ thống nhúng (Embedded Systems Laboratory)

Số tín chỉ: 1 (0LT + 1TH)

Môn học học trước: Thiết kế logic số, Hệ thống vi xử lý

Môn học song hành: Hệ thống nhúng

Môn tương đương: EE118IU

Mô tả môn học: Môn học được thiết kế để cung cấp sinh viên các kiến thức về thực hành thí nghiệm thiết kế các Hệ thống nhúng cả về phần cứng và phần mềm. Bao gồm các giao tiếp ngoại vi, các giao thức bus, giao tiếp bộ nhớ ngoài, hệ điều hành Hệ thống nhúng, bộ lập lịch và xử lý ngắt thời gian thực, kết nối mạng hệ thống nhúng.

12.39 IT110IU – Khái niệm thiết kế VLSI (Concepts in VLSI Design)

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Thiết kế logic số, Điện tử kỹ thuật số **Môn học song hành:** Thực hành Khái niệm thiết kế VLSI

Môn tương đương: EE066IU

Mô tả môn học: Môn học này cung cấp một giới thiệu về thiết kế chip VLSI kỹ thuật số dựa trên công nghệ CMOS và bao gồm logic xung nhịp động, phân tích thời gian MOSFET và quy tắc thiết kế bố trí. Môn học phát triển việc sử dụng các công cụ phần mềm thiết kế hỗ trợ máy tính cũng như hiểu biết về kiểm tra mạch cơ bản.

12.40 IT126IU – Thực hành Khái niệm thiết kế VLSI (Concepts in VLSI Design Laboratory)

Số tín chỉ: 1 (0LT + 1TH)

Môn học học trước: Thiết kế logic số, Điện tử kỹ thuật số

Môn học song hành: Khái niệm thiết kế VLSI

Môn tương đương: EE121IU

Mô tả môn học: Môn học này cung cấp giới thiệu về thiết kế chip VLSI kỹ thuật số dựa trên việc sử dụng các công cụ Khái niệm thiết kế VLSI để thiết kế chip vi xử lý MIPS. Môn học này sử dụng phương pháp học tập, nhấn mạnh vào kinh nghiệm thiết kế thực tế và mô phỏng máy tính.

12.41 **IT103IU – Xử lý tín hiệu số (Digital Signal Processing)**

Số tín chỉ: 3 (3LT + 0TH)

Môn học học trước: Tín hiệu và hệ thống

Môn học song hành: Thực hành xử lý tín hiệu số

Môn tương đương: EE092IU

Mô tả môn học: Môn học này giới thiệu về các nguyên tắc cơ bản, phương pháp và ứng dụng xử lý tín hiệu số, nhấn mạnh các khía cạnh thuật toán, tính toán và lập trình của nó. Nội dung cụ thể bao gồm: chuyển đổi từ analog sang kỹ thuật số, các khái niệm về hệ thống tuyến tính thời gian rời rạc, lọc, phân tích quang phổ của tín hiệu thời gian rời rạc và thiết kế bộ lọc.

12.42 IT125IU - Quản trị hệ thống mạng (System and Network Administration)

Số tín chỉ: 4 (3LT+1TH)

Môn học học trước: Mạng máy tính

Mô tả môn học: Môn học này giới thiệu các công nghệ mạng mới, bao gồm các cấu trúc liên kết mạng, các khái niệm triển khai giao thức và kỹ thuật quản lý. Giải thích các yếu tố và công nghệ khác nhau được sử dụng trong mạng doanh nghiệp và cách chúng liên quan với nhau. Tập trung vào các khái niệm và nguyên tắc cơ bản. Cung cấp một nền tảng kỹ thuật vững chắc để điều hướng quản lý mạng một cách thành công và áp dụng các khái niệm trên cho các tình huống cụ thể.

12.43 IT120IU - Khởi nghiệp (Entrepreneurship)

Số tín chỉ: 3 (3LT)

Môn học học trước: không

Mô tả môn học: Môn học cung cấp kiến thức về khởi tạo doanh nghiệp, tư duy sáng tạo để đưa ra sản phẩm, dịch vụ mới có liên quan đến công nghệ. Vai trò của doanh nghiệp trẻ trong nền kinh tế và cách quản lý doanh nghiệp để khơi nguồn ý tưởng sáng tạo trong nhóm làm việc. Xây dựng và biến ý tưởng kinh doanh thành hiện thực.

12.44 ITxxxIU - Thực tập Công nghiệp cho kỹ sư (Internship for Engineers)

Số tín chỉ: 7 (0 LT+7TH)

Điều kiện tiên quyết: sinh viên năm 3 trở lên

Mô tả môn học: Môn học nhằm tạo điều kiện cho sinh viên có cơ hội tiếp xúc với môi trường thực tế, nhằm để giải quyết những vấn đề thực tiễn trong sản xuất, cuộc sống hàng ngày. Nội dung chủ yếu bao gồm: xây dựng và quản trị hệ thống thông tin bằng web hoặc ứng dụng; tin học hóa các công tác văn phòng, công việc hang ngày; thiết kế, cài đặt vận hành mạng máy tính cho các doanh nghiệp, tổ chức. Tìm hiểu và ứng dụng các công nghệ mới.

12.45 IT083IU- Thực tập tốt nghiệp (Special Study of the Field)

Số tín chỉ: 3 (0 LT+3TH)

Điều kiện tiên quyết: đủ số tín chỉ theo quy định

Mô tả môn học: Môn học nhằm hướng dẫn sinh viên đến việc tìm hiểu phương pháp giải quyết một vấn đề tổng hợp thực tế. Nội dung hướng dẫn chủ yếu bao gồm: phương pháp tiếp cận vấn đề, các bước trong quá trình tìm hiểu vấn đề, các phương pháp tìm hiểu những giải pháp, các bước hoạch định, đề xuất giải pháp cho vấn đề

12.46 **IT058IU - Luận văn tốt nghiệp (Thesis)**

Số tín chỉ: 10 (0LT+10TH)

Điều kiện tiên quyết: Thực tập tốt nghiệp

Mô tả môn học: Đây là các đề tài có tính thực tiễn hoặc có tính khoa học cao, được thiết kế để bảo đảm sinh viên nắm và vận dụng được những kiến thức đã học trong chương trình. Sinh viên sẽ làm việc theo nhóm để thu thập yêu cầu, thiết kế, cài đặt và cung cấp giải pháp cho các vấn đề thực tế. Sinh viên có thể sử dụng mô hình thích hợp, phải tự quản lý

chính đề án đố, theo các kỹ thuật quản lý đề án đã học. Kết quả của luận văn có thể là sản phẩm theo yêu cầu và các tài liệu liên quan.

12.47 IT139IU - Tính toán phân tán (Scalable and Distributed Computing)

Mã MH: IT139IU **Số tín chỉ:** 4 (3,1)

Môn học trước: Không

Mô tả vắn tắt nội dung: Khóa học này trình bày lý thuyết, thiết kế, hiện thực, và phân tích các hệ thống phân bố. Thông qua các bài giảng lớp học, phòng thí nghiệm, dự án và bài tập, sinh viên có thể học các nguyên tắc cơ bản của hệ thống phân bố, mô hình hệ thống, gọi thủ tục từ xa, các đối tượng phân bố, hỗ trợ hệ điều hành, bảo mật trong các hệ thống phân bố, các hệ thống tập tin phân bố, đồng thời, giao dịch và đồng bộ hóa, sao chép. Khóa học cũng bao gồm các chủ đề nâng cao liên quan đến công nghệ xử lý dữ liệu phân bố và đám mây: phân vùng dữ liệu, sơ đồ lưu trữ, xử lý luồng, và các thuật toán song song. Các giờ thực hành của khóa học cho phép khai thác Internet và các dịch vụ điện toán đám mây hiện đại chạy trên nhiều trung tâm dữ liệu được phân bố theo địa lý: Google, Yahoo, Facebook, iTunes, Amazon, eBay, Bing, v.v ...

12.48 IT154IU - Đại số tuyến tính (Linear algebra)

Mã MH: IT154IU **Số tín chỉ:** 3 (3,0)

Môn học trước: Toán 1

Mô tả vắn tắt nội dung: Đại số tuyến tính cung cấp một khuôn khổ toán học để tổ chức thông tin và sau đó sử dụng thông tin đó để giải quyết các vấn đề, đặc biệt là các vấn đề phân tích dữ liệu. Đại số tuyến tính rất cần thiết để hiểu và tạo ra các thuật toán học máy, đặc biệt là mạng thần kinh và các mô hình học sâu.

Khóa học này sẽ cung cấp cho sinh viên kiến thức đại số tuyến tính cần thiết cho học máy và mô hình mạng thần kinh. Học sinh sẽ tìm hiểu tổng quan về ma trận cơ bản và đại số vector như được áp dụng cho các hệ thống tuyến tính. Sau đó, họ sẽ học cách thao tác ma trận để có được kiến thức hữu ích từ dữ liệu, định lượng mức độ học tập và tối ưu hóa tốc độ học tập trong không gian vector và chuyển đổi tuyến tính để khám phá dữ liệu. Các bài học và bài tập thực hành sẽ trang bị cho sinh viên nền tảng toán học cần thiết để xây dựng và đào tạo các mạng thần kinh đơn giản trong các ứng dụng khai thác dữ liệu.

12.49 **PE021IU - Pháp luật đại cương**

Mã MH: PE021IU

Số tín chỉ: 3 (3,0)

Môn học trước: Không Mô tả vắn tắt nội dung:

12.50 IT159IU - Trí thông minh nhân tạo (Artificial intelligence)

Số tín chỉ : 4 (3LT + 1TH)

Môn học trước: Đại số tuyến tính, Lập trình hướng đối tượng

Mô tả môn học: Môn học nhằm cung cấp một cách tiếp cận kỹ thuật vào các khái niệm cơ bản trong lĩnh vực trí tuệ nhân tạo. Nội dung cụ thể bao gồm: lịch sử trí tuệ nhân tạo, các tác tử, các phương pháp tìm kiếm (tìm kiếm trên không gian trạng thái, tìm kiếm có thông tin và tìm kiếm không có thông tin, tìm kiếm thỏa mãn ràng buộc hoặc tìm kiếm cho trò chơi), biểu diễn tri thức (biểu diễn tri thức cụ thể bằng logic, hệ thống lập luận bằng logic), hoạch định, và ngôn ngữ Lisp. Môn học này thích hợp cho sinh viên nào muốn có một kiến thức cơ bản vững chắc về trí tuệ nhân tạo hoặc chuẩn bị cho những phát triển sâu hơn trong lĩnh vực Trí tuệ nhân tạo.

12.51 IT155IU – Tối ưu hóa và ứng dụng (Optimization and Applications, môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: Lập trình C/C++, Lập trình hướng đối tượng

Mô tả môn học: Tối ưu hóa, đặc biệt là tối ưu hóa lồi, được ứng dụng trong nhiều lĩnh vực như khoa học dữ liệu, khoa học máy tính, kinh tế, kỹ thuật, hậu cần, v.v.. Môn học giới thiệu các mô hình tối ưu hóa của nhiều ứng dụng khác nhau trong học máy, phân bổ nguồn lực, v.v.. Lý thuyết nền tảng của các thuật toán lặp giải các bài toán như gradient descent, mini-batch stochastic gradient descent, subgradient method, proximal gradient descent, v.v. được giảng dạy. Môn học cũng bao gồm lập trình tuyến tính (LP). Một số ứng dụng LP như luồng tối đa – cắt tối thiểu, vận chuyển, đường đi ngắn nhất,... được đề cập.

12.52 IT024IU - Đồ hoạ máy tính (Computer Graphics, môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: Lập trình C/C++, Lập trình hướng đối tượng Mô tả môn học:

Triển khai các giải thuật và ngôn ngữ cho việc tương tác trong đồ hoạ máy tính. Các khái niệm về hệ trục toạ độ trong không gian 2 chiều, 3 chiều, không gian véc tơ đường cong, bề mặt được sinh ra từ việc thiết kế, bố trí xây dựng các đối tượng đồ hoạ. Ngoài ra còn phát triển các mô hình kết hợp camera để tao ảnh và xử lý ảnh.

12.53 IT056IU - Quản trị Dự án Công nghệ thông tin (IT Project Management, môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: Lập trình hướng đối tượng

Mô tả môn học:

Soạn đề cương kế hoạch dự án. Phỏng vấn và chuẩn bị yêu cầu khách hàng. Ước tính chi phí, thời gian, nhân lực để hoàn tất dự án. Quản lý công đoạn thiết kế và lập trìng hệ thống. Kiểm soát chất lượng: thử nghiệm phần mềm, kiểm soát yêu cầu khách hàng.

12.54 IT076IU - Công nghệ phần mềm (Software Engineering)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: Lập trình hướng đối tượng

Mô tả môn học:

Môn học giới thiệu quy trình công nghệ phần mềm. Khảo sát hoạt động doanh nghiệp. Thảo luận với khách hàng về yêu cầu. Chọn công nghệ thiết kế. Phân tích hệ thống theo hướng đối tượng. Thiết kế và lập trình dự án.

12.55 IT090IU- Phân tích và thiết kế hướng đối tượng (Object Oriented Analysis and Design)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: Lập trình hướng đối tượng

Mô tả môn học:

Mô hình hóa hệ thống. Các khái niệm về phân tích và thiết kế hệ thống. Chu kỳ phát triển sản phẩm. Quy trình hợp nhất và những công đoạn thực hiện như: lấy yêu cầu, phân tích, thiết kế, hiện thực và kiểm thử. Nội dung nâng cao bao gồm cơ sở dữ liệu hướng đối tượng, mẫu thiết kế, lập trình Extreme.

12.56 **IT092IU - Nguyên lý Ngôn ngữ lập trình (Principle of Programming Languages)**

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Môn học nhằm làm cho người học quen thuộc với một số khái niệm cơ bản của các ngôn ngữ lập trình, từ đó nâng cao khả năng tiếp thu các ngôn ngữ lập trình khác. Các kiểu ngôn ngữ lập trình khác nhau (chẳng hạn như ngôn ngữ lập trình luận lý, ngôn ngữ lập trình chức năng, ngôn ngữ lập trình thủ tục, ngôn ngữ lập trình hướng đối tượng) cũng được so sánh và các phương pháp cài đặt cũng được tìm hiểu và thảo luận.

12.57 IT114IU – Kiến trúc phần mềm (Software Architecture, môn tư chon)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: không.

Mô tả môn học:

Cung cấp cho sinh viên sự hiểu biết thấu đáo về các phương pháp và kỹ thuật khác nhau trong phân tích, thiết kế và triển khai hệ thống thông tin bằng cách sử dung UML.

12.58 IT160IU – Khai thác Dữ liệu (Data Mining, môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: Lập trình hướng đối tượng

Mô tả môn học:

Môn học này giới thiệu cho sinh viên các nguyên lý, thuật toán khai phá dữ liệu, yêu cầu của một quá trình khai phá dữ liệu. Học sinh sẽ nghiên cứu các khái niệm và thuật toán khai thác dữ liệu để giải quyết các vấn đề khám phá tri thức. Học sinh có thể phát triển các kỹ năng sử dụng phần mềm khai thác dữ liệu gần đây để giải quyết các vấn đề thực tế và tích lũy kinh nghiệm thực hiện nghiên cứu và học tập độc lập.

12.59 **IT133IU - Phát triển ứng dụng di động (Mobile Application Development, môn tự chọn)**

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: Phân tích và thiết kế hướng đối tượng

Mô tả môn học:

Khóa học này được thiết kế nhằm giới thiệu và làm quen với sinh viên về lập trình trên môi trường di động: Nền tảng Android sẽ được sử dụng trong suốt khóa học. Khóa học bắt đầu với phần giới thiệu về các thành phần, khái niệm, cấu trúc cơ bản của ứng dụng Android sau đó tiếp tục với các thành phần giao diện người dùng phổ biến, lưu trữ liên tục,

cơ sở dữ liệu cho thiết bị di động, v.v. Giới thiệu về hầu hết các công cụ và công cụ phổ biến kỹ thuật viết ứng dụng Android cũng được kèm theo bằng tay về kinh nghiệm dưới dạng dự án lập trình bài tập trong phòng thí nghiệm.

12.60 **IT138IU – Trực quan hóa dữ liệu (Data Science and Visualization, môn tự chọn)**

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Mục tiêu của khóa học này là giới thiệu cho sinh viên các nguyên tắc, phương pháp và kỹ thuật chính để phân tích dữ liệu trực quan một cách hiệu quả. Khóa học bắt đầu với mục tiêu và nguyên tắc chính của trực quan hóa dữ liệu. Khóa học tiếp tục với các khía cạnh khác nhau của trực quan hóa bao gồm các kỹ thuật và phương pháp trình bày các loại dữ liệu khác nhau cũng như thảo luận và phân tích trực quan hóa. Xuyên suốt khóa học, học viên sẽ được làm quen với nhiều hệ thống trực quan và công cụ trực quan thông qua các bài tập thực hành.

12.61 Khái niệm cơ bản về bảo mật dữ liệu (Fundamental Concepts of Data Security)

- **Mã MH:** IT140IU

- **Số tín chỉ:** 4 (3,1)

- **Môn học trước:** Không

Mô tả vắn tắt nội dung: Khóa học này giới thiệu cho sinh viên về các nguyên tắc và hệ thống mật mã (đối xứng và mã khóa công khai), và các ứng dụng của chúng trong bảo mật dữ liệu, truyền thông an toàn, chứng thực và ủy quyền. Những nguyên tắc cốt lõi này sẽ được áp dụng cho các khái niệm quản lý rủi ro thông tin, phân tích và xử lý các hệ thống bị xâm nhập. Các đạo đức về tội phạm máy tính, quyền riêng tư và sở hữu trí tuệ được đề cập chi tiết. Cuối cùng, khóa học sẽ bao gồm các tiêu chí và các điều khiển để phân loại thông tin.

12.62 Phân Tích Quy Trình Nghiệp Vụ (Business Process Analysis)

- Mã MH: IT144IU

- Số tín chỉ: 4 (3,1)

- Môn học trước: Không

Mô tả vắn tắt nội dung: Mỗi tổ chức phát triển mạnh việc thực hiện các quy trình kinh doanh hiệu quả để tăng nhân viên và sự hài lòng của khách hàng, tăng cường hiệu suất kinh doanh, giảm chi phí và tăng năng suất. Tất cả các hoạt động bao gồm thay đổi các quy trình quan trọng, sáp nhập hoặc chia tách đơn vị kinh doanh yêu cầu một khung quản lý thống nhất về những thay đổi. Khóa học nhằm cung cấp kiến thức cơ bản về phân tích quá trình kinh doanh, cải tiến và đánh giá. Nhiều phương pháp, kỹ thuật và công cụ phần mềm được sử dụng để phân tích và quản lý cải tiến quá trình kinh doanh cũng được giới thiệu trong khóa học.

12.63 Hệ Thống Hỗ Trợ Quyết Định (Decision Support Systems)

- Mã MH: IT145IU

- Số tín chỉ: 4 (3,1)

- Môn học trước: Lập trình hướng đối tượng

Mô tả vắn tắt nội dung: Hệ thống Hỗ trợ Quyết định (DSS) là một hệ thống dựa trên máy tính tương tác hoặc hệ thống con nhằm giúp các nhà hoạch định chính sách sử dụng công nghệ truyền thông, dữ liệu, tài liệu, kiến thức và / hoặc mô hìn h để xác định và giải quyết các vấn đề, hoàn thành các tác vụ xử lý quyết định, và làm quyết định. DSS mô phỏng các chức năng quyết định nhận thức của con người dựa trên phương pháp luận trí tuệ nhân tạo (bao gồm hệ thống chuyên gia, khai thác dữ liệu, máy học, kết nối, lý luận logic, vv) để thực hiện các chức năng hỗ trợ quyết định. DSS là một thuật ngữ chung cho bất kỳ ứng dụng máy tính nào để trợ giúp một người hoặc nhóm khả năng đưa ra quyết định. Ngoài ra, DSS đề cập đến một lĩnh vực nghiên cứu bao gồm việc thiết kế và nghiên cứu DSS trong bối cảnh sử dụng.

12.64 IT150IU – Chuỗi khối (Blockchain, môn tự chọn)

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Môn học này giới thiệu cho sinh viên nền tảng của công nghệ chuỗi khối và các ứng dụng của nó. Học sinh sẽ nghiên cứu các khái niệm và nguyên tắc blockchain hoạt động như thế nào. Khóa học này bao gồm các chủ đề liên quan đến không gian chuỗi khối. Khóa học bắt đầu với những điều cơ bản về chuỗi khối, mật mã, hiểu biết cơ bản về bitcoin. Sau đó, các ứng dụng của công nghệ blockchain được giới thiệu trong các lĩnh vực tài chính, y tế, chuỗi cung ứng, v.v. Một bức tranh hoàn chỉnh về hệ sinh thái xung quanh công nghệ blockchain và các xu hướng phát triển cũng được thảo luận.

12.65 **IT156IU – Phát triển và vận hành liên tục (Development & Operation, môn tự chọn)**

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Khóa học này là phần giới thiệu về DevOps nhằm giúp sinh viên hiểu các nguyên tắc và thực tiễn của nó. Các khái niệm và thuật ngữ chính sẽ được đề cập bằng các nghiên cứu điển hình, ví dụ và bài tập thực tế trong đời thực. Các công cụ phổ biến và phổ biến để đạt được mô hình DevOps cũng sẽ được giới thiệu.

12.66 IT157IU – Học sâu (Deep Learning, môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: khônG

Mô tả môn học:

Khóa học này giúp sinh viên hiểu được các khả năng, kỹ thức và hậu quả của việc học sâu và chuẩn bị cho sinh viên tham gia phát triển công nghệ AI hàng đầu.

12.67 IT158IU – UI Design and Evaluation (môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Khóa học này cung cấp cho sinh viên các nguyên tắc tương tác cơ bản giữa con người và máy tính.

12.68 IT131IU – Theoretical Models in Computing (môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Khóa học này hướng đến những sinh viên đại học cần có kiến thức làm việc về các phương pháp số. Các chủ đề được đề cập bao gồm giải phương trình phi tuyến và hệ tuyến tính, phương pháp nội suy và bình phương tối thiểu, đánh giá bằng số của đạo hàm, tích phân và nghiệm của phương trình vi phân.

12.69 IT164IU – Điện toán đám mây (Cloud Computing, môn tự chọn)

Số tín chỉ: 4 (3LT + 1TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Khóa học này tập trung vào các kỹ thuật lập trình song song cho điện toán đám mây và các hệ thống phân tán quy mô lớn tạo thành cơ sở hạ tầng đám mây. Các chủ đề bao gồm tổng quan về điện toán đám mây, hệ thống đám mây, xử lý song song trên đám mây, hệ thống lưu trữ phân tán, ảo hóa, bảo mật trong đám mây và hệ điều hành đa lõi. Sinh viên sẽ nghiên cứu các giải pháp tiên tiến nhất cho điện toán đám mây do Google, Amazon, Microsoft, Yahoo, VMWare, v.v. phát triển. Sinh viên cũng sẽ áp dụng những gì học được vào một bài tập lập trình và một dự án được thực hiện trên Amazon Web Services.

12.70 IT165IU – Công nghệ và Triển khai bảo mật (Security Technology and Implementation, môn tự chọn)

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: Computer Network

Mô tả môn học:

Môn học giới thiệu cho sinh viên nguyên lý của an toàn thông tin, hệ thống mật mã hóa

(mã hóa đối xứng và mã hóa công cộng), quản lý rủi ro, an toàn cho kiến trúc và thiết kế, an toàn trong vận hành kinh doanh liên tục, kiểm soát truy cập, bảo vệ màng TCP/IP, tưởng lửa, mạng ảo, IPSec, an toàn trong phát triển phần mềm.

12.71 IT166IU – Kiểm tra chất lượng phần mềm (Software Quality Verification and Validation, môn tự chọn)

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: IT069IU (3,1) Object-Oriented Programming Mô tả môn học:

Giới thiệu về xác minh, xác nhận và thử nghiệm phần mềm. Các chiến lược và kỹ thuật được trình bày để kiểm thử phần mềm cũng như lập kế hoạch kiểm thử phần mềm.

12.72 IT167IU – Phát triển ứng dụng game (Game Application Development, môn tự chọn)

Số tín chỉ: 4 (3LT+1TH)

Điều kiện tiên quyết/Môn học trước: IT069IU (3,1) Object-Oriented Programming Mô tả môn học:

Khóa học này là phần giới thiệu về lý thuyết và thực hành về quá trình thiết kế trò chơi và trải nghiệm vui chơi. Sinh viên được làm quen với các phương pháp, khái niệm, kỹ thuật và tài liệu được sử dụng trong việc thiết kế trò chơi. Chiến lược này hướng đến quy trình, tập trung vào các khía cạnh như: Tạo mẫu nhanh, thử nghiệm trò chơi và lặp lại thiết kế bằng cách sử dụng phương pháp lấy người chơi làm trung tâm.

12.73 **PE008IU** – Tư duy Phản biện (Critical Thinking, môn tự chọn)

Số tín chỉ: 3 (3LT+0TH)

Điều kiện tiên quyết/Môn học trước: không

Mô tả môn học:

Tư duy phê phán nghiên cứu một quá trình không thể thiếu đối với tất cả những người có học thức - quá trình chúng ta phát triển và ủng hộ niềm tin của mình cũng như đánh giá sức mạnh của những lập luận của người khác trong các tình huống thực tế. Nó bao gồm thực hành về lý luận quy nạp và suy diễn, trình bày các lập luận dưới dạng nói và viết và phân tích việc sử dụng ngôn ngữ để tác động đến suy nghĩ. Khóa học cũng áp dụng quy trình suy luận vào các lĩnh vực khác như kinh doanh, khoa học, luật, khoa học xã hội, đạo đức và nghệ thuật.

TRƯỞNG KHOA

KT. HIỆU TRƯỞNG PHÓ HIỆU TRƯỞNG

Nguyễn Văn Sinh

Muh

Đinh Đức Anh Vũ

ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH **TRƯỜNG ĐẠI HỌC QUỐC TẾ**

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM Độc lập – Tự do – Hạnh phúc

Phu luc I

NỘI DUNG ĐIỀU CHỈNH CHƯƠNG TRÌNH ĐÀO TẠO NGÀNH CÔNG NGHỆ THÔNG TIN KHÓA 2024 SO VỚI KHÓA 2023

(Kèm theo Quyết định số: /QĐ-ĐHQT ngày tháng năm 2024 của Hiệu trưởng trường Đại học Quốc tế)

Đối với cả hai chuyên ngành Kỹ thuật mạng và Kỹ thuật máy tính:

- Tăng số tín chỉ môn Thực tập Công Nghiệp từ 03 lên 07 tín chỉ. Đổi tên môn thành Thực tập công nghiệp cho kỹ sư để phân biệt với môn thực tập công nghiệp 03 tín chỉ trước đây.

- Hủy các môn Vật lý 02 (PH014IU, 2 tín chỉ) và Vật lý 04 (PH012IU, 2 tín chỉ).

Việc thay đổi này đã được phê duyệt bởi Hội đồng Khoa học cấp Khoa và Hội đồng Khoa học và Đào tạo cấp Trường. Tổng số tín chỉ của các chương trình không đổi.

ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH **TRƯỜNG ĐẠI HỌC QUỐC TẾ**

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM Độc lập – Tự do – Hạnh phúc

Phụ lục II ĐỀ CƯƠNG CHI TIẾT CÁC MÔN HỌC

(Kèm theo Quyết định số: / QĐ-ĐHQT ngày tháng năm 2024 của Hiệu trưởng trường Đại học Quốc tế)

Quy đổi tín chỉ ECTS cho các môn học trong phụ lục này như sau:

- Đối với nhóm các môn Thực tập, khóa luận/luận văn tốt nghiệp (Internship, Special ststudy of the field, và Thesis):

1 tín chỉ = 1,64 ECTS

- Đối với tất cả các môn khác:

1 tín chỉ lý thuyết = 3,55 ECTS, 1 tín chỉ thực hành =3,55 ECTS

Course Name: Introduction to Computing

Course Code: IT064

1. General information

| Course designation | This course introduces students to a broad knowledge of the computer science and information technology fields. Topics covered will include basic computer concepts, components of computer hardware and operating systems software as well as data and telecommunications systems. Students can use the knowledge they've gained to strengthen their future-oriented job. | | | | |
|---|--|----------------|-------------------------------|---|--|
| Semester(s) in which the course is taught | 1,3 | | | | |
| Person responsible for the course | Dr. Nguyen Trung Ky | | | | |
| Language | English | English | | | |
| Relation to curriculum | Compulsory | | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | | |
| Workload (incl. contact hours, self-study hours) | Total workload: 135 hours. Contact hours: 45 hours (lecture). Private study including examination preparation, specified in hours: 90 hours. | | | | |
| Credit points | Number of credits: 3 Lecture: 3 Laboratory: 0 | | | | |
| Required and recommended prerequisites for joining the course | None | | | | |
| Course objectives | This course is to provide fundamentals and basic concepts of computer science and engineering, basics of Computing such as basic concepts, models, trends in industry. Introduction to majors and curricula, career path of all majors in computing, career orientation, job requirements and career opportunities in industry are also included in this course. | | | | |
| Course learning | | | | ı | |
| outcomes | Colleve | mpetency el | Course learning outcome (CLO) | | |
| | Kn | owledge | CLO1, CLO2. | | |
| | Ski | 11 | CLO3, CLO4. | | |

| | Attitude CLO5. | | | | |
|------------------------------------|--|------------|--------|--|--|
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | Topic | Weigh t | Leve l | | |
| | The Overall Picture | 1 | I | | |
| | Data and Information | 2 | T, U | | |
| | Hardware | 2 | T, U | | |
| | Algorithm and Programming Language | 2 | T, U | | |
| | Operating System | 2 | T, U | | |
| | Networking | 2 | T, U | | |
| | Information System and Application | 2 | T, U | | |
| | Majors and Curriculum, Career Paths and Orientation Careers at a Hardware, Network and Software Company | 1 | I | | |
| | Revision | 1 | | | |
| Examination forms | Multiple-choice questions, short-answer questions | 3 | • | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | points overall to pass this course. [1] Nell Dale and John Lewis, "Computer science: Illuminated", 7th Edition, Jones & Bartlett Learning Publisher, ISBN-13 978- 1284155617, 2019. [2] J. Glenn Brookshear, "Computer Science: An Overview", 12 th Edition, Pearson Publisher, ISBN-13 978-0133760064, 2014. [3] Peter Wentworth, Jeffrey Elkner, "How to Think Like a Computer Scientist: Learning with Python 3 Documentation", 3rd Edition, Allen B. Downey and Chris Meyers, Green Tea Press Publisher, ISBN-13 978-0971677500, 2020. | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| SL | | | |
|----|--|--|--|
| O | | | |

| CL O | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|---|---|---|---|---|---|
| O | | | | | | |
| 1 | X | | | X | | |
| 2 | X | | | X | | |
| 3 | X | | | | | |
| 4 | X | | | | | |
| 5 | | | | | X | |

3. Planned learning activities and teaching methods

| Wee k | Topic | CL O | Assessmen ts | Learning activities | Resource s |
|----------|--|---------|--------------|---------------------------|---------------------------|
| 1 | The Overall Picture | 1 | | Lecture, Discussion | [1]. Chapter 1 |
| 2 | Binary Values and Number System | 1, 2 | Quiz. | Lecture, In-class quiz | [1]. Chapter 2 |
| 3 | Data Representation | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 3 |
| 4 | Gates and Circuits | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 4 |
| 5 | Computing Components | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 5 |
| 6 | Low-level Programming Languages and Pseudocode | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 6 |
| 7 | Midterm | | | | |
| 8 | Problem Solving and Algorithm, Abstract Data Types and Subprograms | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 7,8 |
| 9 | Object-oriented Design and High-level Programming Languages | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 9 |
| 10 | Operating System and File System and Directory | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 10, 11 |
| 11 | Information System, Artificial Intelligence | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 12, 13 |
| 12 | Simulation, Graphics, Gaming, and Other Programming Networks | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 14, 15 |

| 13 | The World Wide Web Computer Security | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 16, 17 |
|----|---|------|------|---------------------------|---------------------------|
| 14 | Majors and Curriculum, Career Paths and Orientation, Careers at Hardware, Network and Software Company | 3, 4 | | Lecture, Discussion | |
| 15 | Revision | | | Review-test | |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO 1 | CLO 2 | CLO 3 | CLO 4 | CLO 5 |
|--------------------------------------|----------|----------|-----------|-----------|----------|
| Quiz (10%) | 25% | 25% | 33.3 % | 33.3 % | 25% |
| Midterm examination (30%) | 25% | 25% | | | 25% |
| Projects/Presentations/ Report (20%) | 25% | 25% | 33.3 % | 33.3 % | 25% |
| Final examination (40%) | 25% | 25% | 33.3 % | 33.3 % | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.↔

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|------|-------|-------------|--|
| Student: HW/Assignme | ent: | | • • • • • • | |
| Date: Evaluator: | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |

| Summary and conclusions appropriate and complete | 5 | |
|--|-----|--|
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holist | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | |
|--------|--|--|--|--|
| Score | Description | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | |
| | are included in response | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | |
| | task are included. | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | |
| | are included. | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | |
| | are missing. | | | |
| 1 | Demonstrates no understanding of the problem. | | | |
| 0 | No response/task not attempted | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone Capstone | Miles | | Benchmark |
|-------------|----------------------|-------------------|----------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | Issue/ problem to | | considered | |
| | be considered | Issue/ problem | critically is | |
| | critically is stated | to be considered | stated but | |
| | clearly and | critically is | description | Issue/ |
| | described | stated, | leaves some | problem to be |
| | comprehensively, | described, and | terms | considered |
| | delivering all | clarified so that | undefined, | critically is |
| | relevant | understanding is | ambiguities | stated without |
| | information | not seriously | unexplored, | clarification |
| Explanation | necessary for full | impeded by | boundaries | or |
| of issues | understanding. | omissions. | undetermined, | description. |

| | | and/ or | |
|--|--------------------------|----------------------------------|----------------------------|
| | | backgrounds | |
| | | unknown. | |
| | | | |
| | | | |
| | | Information is | |
| | | taken from | |
| | | source(s) with | |
| Informati | | n is some | |
| taken from | | interpretation/ | |
| source(s) | | · · | |
| enough | enough | not enough to | Information is |
| interpreta | _ | _ | taken from |
| evaluation | | | source(s) |
| Evidence develop a | 1 | analysis or | without any |
| Selecting comprehe | | synthesis. | interpretation/ |
| and using analysis of | • | Viewpoints of | |
| information synthesis. | • | experts are taken as | Viewpoints of |
| to investigate Viewpoir a point of experts an | _ | | experts are taken as fact, |
| view or questione | _ | with little | without |
| conclusion thoroughl | | | question. |
| conclusion thorough | questioning | g. questioning. | Shows an |
| | | Questions | emerging |
| | | some | awareness of |
| | | assumptions. | present |
| Thorough | nly | Identifies | assumptions |
| (systemat | tically and | several | (sometimes |
| methodic | ally) | relevant | labels |
| analyzes | | contexts when | assertions as |
| others' | Identifies of | | assumptions). |
| assumption | | position. May | Begins to |
| 1 | evaluates assumption | | • |
| the releva | | | contexts |
| Influence of contexts v | | 1 | when |
| context and presenting assumptions position. | g a presenting position. | a than one's own (or vice versa) | |
| Specific p | | (or vice versa) | . position. |
| (perspect | | | |
| | position (perspective) | e, Specific | Specific |
| is imagin | | _ | position |
| | to account s) takes int | _ | (perspective, |
| I | lexities of account the | | thesis/ |
| (perspective an issue. | Limits of complexition | es of hypothesis) | hypothesis) is |
| , position | an issue. O | | stated, but is |
| thesis/hypot (perspect | _ | | simplistic and |
| hesis) thesis/ hy | pothesis) are | of an issue. | obvious. |

| | are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ hypothesis). | acknowledged within position (perspective, thesis/ hypothesis). | | |
|--------------|---|--|---|--|
| Conclusions | Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed | Conclusion is logically tied to a range of information, including opposing viewpoints; related | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related | Conclusion is inconsistently tied to some of the information discussed; related outcomes |
| and related | evaluation and | outcomes | outcomes | (consequence |
| outcomes | ability to place | (consequences | (consequences | s and |
| (implication | evidence and | and | and | implications) |
| s and | perspectives | implications) | implications) | are |
| consequence | discussed in | are identified | are identified | oversimplifie |
| s) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | , <u> </u> | stone | Benchmark |
|-------------|-------------------|-----------------|-----------------|-------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is |
| | content of the | observable | observable | not observable |
| Organizatio | presentation | within the | within the | within the |
| n | cohesive. | presentation. | presentation. | presentation. |

| Language choices are choices are choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. Language choices are mundane and commonplace choices are unclear and partially unclear and support the effectiveness of the the the effectiveness of the effectiveness of the presentation. Language in presentation is appropriate to audience. Language in presentation is appropriate to audience. Delivery techniques (posture, techniques (posture, effective, are mundane and Language choices are mundane and propriate to minimally unclear and minimally effectiveness of effectiveness of the effectiveness of the effectiveness of the presentation. Language in presentation is appropriate to appropriate to audience. Delivery techniques (posture, (posture, (posture, effectiveness of the effectiveness o | on. |
|--|-------|
| choices are imaginative, thoughtful and composite, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. Language Language in Choices are thoughtful and commonplace and partially unclear and support the effectiveness of the the effectiveness of the presentation. The presentation is appropriate to audience. Language in presentation is appropriate to audience. Delivery techniques Choices are and partially unclear and minimally effectiveness of the effectiveness of the the effectiveness of the presentation. Language in Language in presentation is appropriate to audience. Delivery techniques Delivery techniques Delivery techniques | on. |
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| presentation is appropriate to audience. Delivery techniques presentation is appropriate to audience. presentation is appropriate to audience. presentation is appropriate to audience. Delivery techniques presentation is appropriate to audience. Delivery techniques presentation is appropriate to audience. Delivery techniques | |
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| techniques Delivery techniques techniques | |
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| contact, and gesture, eye contact, and contact, and | |
| vocal contact, and vocal vocal | ~ \ |
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| 1 / / | |
| presentation make the presentation understandabi | 111 |
| compelling, and presentation understandable, y of the | امسا |
| speaker appears interesting, and and speaker presentation, a | |
| polished and speaker appears appears speaker appear speaker appear speaker appear uncomfortable. | |
| A variety of Supporting Supporting Supporting | · . |
| types of materials materials Insufficient | |
| supporting (explanations, (explanations, supporting | |
| materials examples, examples, materials | |
| (explanations, illustrations, illustrations, (explanations, | |
| examples, statistics, statistics, examples, | |
| illustrations, analogies, analogies, illustrations, | |
| statistics, quotations from quotations from statistics, | |
| analogies, relevant relevant analogies, | |
| quotations from authorities) authorities) quotations fro | m |
| relevant make make relevant | |
| authorities) appropriate appropriate authorities) | |
| make reference to reference to make reference | e |
| appropriate information or information or to information | |
| reference to analysis that analysis that analysis that | |
| information or generally partially minimally | |
| analysis that supports the supports the supports the | |
| significantly presentation or presentation or presentation or | r |
| supports the establishes the establishes the | |
| Supporting presentation or presenter's presenter's presenter's | |
| Material establishes the credibility/ credibility/ credibility/ | |

| | presenter's credibility/ authority on the topic. | authority on the topic. | authority on the topic. | authority on the topic. |
|---------|--|---|--|--|
| Central | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly | Central message is clear and consistent with the supporting | Central message is basically understandable but is not often repeated and is | Central message can be deduced but is not explicitly stated in the |
| Message | supported.) | material. | not memorable. | presentation. |

Source: Association of American Colleges and Universities

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: C/C++ Programming

Course Code: IT116

1. General information

| Course designation | Learning the basics of program | nming | | | | |
|---|--|-------------------------------|--|--|--|--|
| Semester(s) in which the course is taught | 2 | | | | | |
| Person responsible for the course | MSc. Le Thanh Son | | | | | |
| Language | English | | | | | |
| Relation to curriculum | Compulsory (CS, NE, CE) | Compulsory (CS, NE, CE) | | | | |
| Teaching methods | Lecture | | | | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours: 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | | | | | |
| Required and recommended prerequisites for joining the course | None | | | | | |
| Course objectives | This course concentrates on learning the basics of programming languages which are the foundations for further studies in IT. The course enables students to get familiar with C programming language. The course covers all basic C data structures, control flows, simple data structures as well as other advanced topics which include pointers, bit operators, file processing, dynamic data types. | | | | | |
| Course learning outcomes | CLO 1. Understand programming languages and applications, how applications work CLO 2. Understand basic data structure and control flow of C programming language CLO 3. Able to write applications using C | | | | | |
| | Competency level | Course learning outcome (CLO) | | | | |
| | Knowledge | 1 | | | | |
| | Skill | 2, 3 | | | | |
| | Attitude | | | | | |

| Content | The description of the contents should clearly indicate the weighting | | | | |
|-------------------|---|-------|-------|--|--|
| | of the content and the level. Weight: lecture session (3 hours) | | | | |
| | Teaching levels: I (Introduce); T (Teach); U (Util | ize) | | | |
| | Topic | Weigh | Level | | |
| | | t | | | |
| | Introduction to Computer and Programming Language | 1 | I | | |
| | Introduction to C Programming Language | 1 | I, T | | |
| | C Basic Data Types | 1 | T, U | | |
| | Control Flow: Branching statements | 1 | T, U | | |
| | Control Flow: Iteration | 1 | T, U | | |
| | Functions | 1 | T, U | | |
| | Array | 1 | T, U | | |
| | Pointers | 1 | T, U | | |
| | String | 1 | T, U | | |
| | File Processing | 1 | T, U | | |
| | Dynamic Memory Allocation | 1 | T, U | | |
| | Struct, Union | 1 | T, U | | |
| | Bitwise Operation | 1 | T, U | | |
| | Linked list, Stack, Queue | 1 | T, U | | |
| | Binary tree | 1 | T, U | | |
| Examination forms | Short-answer questions, Programming exercises | | | | |
| Study and | Attendance: A minimum attendance of 80 percen | | • | | |
| examination | the class sessions. Students will be assessed on the basis of their class | | | | |
| requirements | participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| | | | | | |
| Dooding list | | | | | |
| Reading list | 1. Paul Deitel, C How to Program 8th, 2016 | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SLO | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|---|-----|---|---|---|---|
| Т | | | | | | |
| 1 | X | | | | | |
| 2 | | XXX | | | | |
| 3 | | XXX | | | | |

3. Planned learning activities and teaching methods

| Wee k | Topic | CLO | Assessment | Learning activities | Resource s |
|----------|---|------|-----------------------|---|---------------|
| 1 | Introduction to Computer and Programming Language | 1 | Quiz | Lecture | 1 |
| 2 | Introduction to C Programming Language | 1 | Quiz | Lecture | 1 |
| 3 | C Basic Data Types | 1 | Quiz | Lecture | 1 |
| 4 | Control Flow: Branching statements | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 5 | Control Flow: Iteration | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 6 | Functions | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 7 | Array | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 8 | Pointers | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| Midte | rm | | | | |
| 9 | String | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 10 | File Processing | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 11 | Dynamic Memory Allocation | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 12 | Struct, Union | 2, 3 | Quiz, Lab, Final | Lecture, Discussion | 1 |

| | | | | , In-class Exercise | |
|-------|---------------------------|------|---------------------|---|---|
| 13 | Bitwise Operation | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 14 | Linked list, Stack, Queue | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 15 | Binary tree | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| Final | | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Quiz / Assigment (10%) | 50% | 10% | 10% |
| Labs (20%) | 10% | 30% | 30% |
| Midterm examination (30%) | 30% | 30% | 30% |
| Final examination (40%) | 10% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|------|-------|----------|--|--|
| Student: HW/Assignment: | | | | | |
| Date: Evaluator: | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |

| Distinct introduction, body, conclusions | 5 | |
|---|-----|--|
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | |
|--|--|--|--|
| Scor | Description | | |
| e | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | |
| | are included in response | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | |
| | task are included. | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | |
| | included. | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | |
| | missing. | | |
| 1 | Demonstrates no understanding of the problem. | | |
| 0 | No response/task not attempted | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|-------------|----------------------|-------------------|----------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | Issue/ |
| | described | stated, | ambiguities | problem to be |
| | comprehensively, | described, and | unexplored, | considered |
| | delivering all | clarified so that | boundaries | critically is |
| | relevant | understanding is | undetermined, | stated without |
| | information | not seriously | and/ or | clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |

| Questions some assumptions. | Viewpoints of experts are taken as fact, without question. |
|--|---|
| (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. Influence of contexts when presenting a position. Influence of contexts when presenting a presenting a position. Specific position Specific several relevant contexts when position. May be more aware of others' assumptions than one's own presenting a presenting a presenting a position. Specific position Specific | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
| Student's (perspective, thesis/ hypothesis) are acknowledged. (perspective of thesis/ points of view are (perspective, acknowledged of thesis/ hypothesis) (perspective, view are of thesis/ within position of the position of th | Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and |

| | (perspective, thesis/ hypothesis). | | | |
|--------------|---------------------------------------|---------------------------------|-------------------------------|------------------------------|
| | | | Conclusion is | |
| | | Conclusion is logically tied to | logically tied to information | Conclusion is inconsistently |
| | Conclusions and | a range of | (because | tied to some |
| | related outcomes | information, | information is | of the |
| | (consequences and | including | chosen to fit | information |
| | implications) are | opposing | the desired | discussed; |
| | logical and reflect | viewpoints; | conclusion); | related |
| Conclusions | student's informed | related | some related | outcomes |
| and related | evaluation and | outcomes | outcomes | (consequence |
| outcomes | ability to place | (consequences | (consequences | s and |
| (implication | evidence and | and | and | implications) |
| s and | perspectives | implications) | implications) | are |
| consequence | discussed in | are identified | are identified | oversimplifie |
| s) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Milestone | | Benchmark |
|-------------|-------------------|-----------------|-----------------|-------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is |
| | content of the | observable | observable | not observable |
| Organizatio | presentation | within the | within the | within the |
| n | cohesive. | presentation. | presentation. | presentation. |

| I | | | Language | |
|------------------------|---------------------------------|--------------------------|--------------------------|--------------------------|
| | Language | Language | choices are | |
| | choices are | choices are | mundane and | Language |
| | imaginative, | thoughtful and | commonplace | choices are |
| | memorable, and | generally | and partially | unclear and |
| | compelling, and | support the | support the | minimally |
| | enhance the | effectiveness of | effectiveness of | support the |
| | effectiveness of | the | the | effectiveness of |
| | the presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | Delivery | Delivery |
| | techniques | Delivery | techniques | techniques |
| | (posture, | techniques | (posture, | (posture, |
| | gesture, eye | (posture, | gesture, eye | gesture, eye |
| | contact, and | gesture, eye | contact, and | contact, and |
| | vocal | contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandabilit |
| | compelling, and | presentation | understandable, | y of the |
| | speaker appears | interesting, and | and speaker | presentation, and |
| | polished and | speaker appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | |
| | types of | materials | materials | Insufficient |
| | supporting | (explanations, | (explanations, | supporting |
| | materials | examples, | examples, | materials |
| | (explanations, | illustrations, | illustrations, | (explanations, |
| | examples, | statistics, | statistics, | examples, |
| | illustrations, | analogies, | analogies, | illustrations, |
| | statistics, | quotations from | quotations from | statistics, |
| | analogies, | relevant | relevant | analogies, |
| | quotations from | authorities) | authorities) | quotations from |
| | relevant | make | make | relevant |
| | authorities) | appropriate | appropriate | authorities) |
| | make | reference to | reference to | make reference |
| | appropriate | information or | information or | to information or |
| | reference to | analysis that | analysis that | analysis that |
| | information or | generally | partially | minimally |
| | analysis that | supports the | supports the | supports the |
| | significantly | presentation or | presentation or | presentation or |
| Supporting | supports the | establishes the | establishes the | establishes the |
| Supporting Material | presentation or establishes the | presenter's credibility/ | presenter's credibility/ | presenter's credibility/ |
| Material | establishes the | Ciedibility/ | credibility/ | credibility/ |

| | presenter's credibility/ authority on the topic. | authority on the topic. | authority on the topic. | authority on the topic. |
|---------|--|---|--|--|
| Central | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly | Central message is clear and consistent with the supporting | Central message is basically understandable but is not often repeated and is | Central message can be deduced but is not explicitly stated in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Object-Oriented Programming

Course Code: IT069IU

1. General information

| 1. Stuttul mistmut | 1011 | | | | | |
|----------------------|---|---|---|--|--|--|
| Course designation | This subject introduces students to the object-oriented programming from basic notions to professional principles for | | | | | |
| | desi | igning an object-orie | nted software. | | | |
| Semester(s) in | 3 | | | | | |
| which the course is | | | | | | |
| taught | | | | | | |
| Person responsible | Dr. | Tran Thanh Tung | | | | |
| for the course | | | | | | |
| Language | Eng | English | | | | |
| Relation to | Cor | npulsory (all progran | ns) | | | |
| curriculum | | | | | | |
| Teaching methods | Lec | ture, lesson, project, | seminar. | | | |
| Workload (incl. | Tot | al workload: 195 | | | | |
| contact hours, self- | Cor | ntact hours (please sp | ecify whether lecture, exercise, | | | |
| study hours) | | laboratory session, etc.): 45 (lecture) + 30 (laboratory) | | | | |
| | | | examination preparation, specified in | | | |
| | hours: 120 | | | | | |
| Credit points | Number of credits: 4 | | | | | |
| | Lecture: 3 | | | | | |
| | Lab | oratory: 1 | | | | |
| Required and | Pre | requisite course of O | OP: C/C++ Programming | | | |
| recommended | | | | | | |
| prerequisites for | | | | | | |
| joining the course | | | | | | |
| Course objectives | | | iented programming and design. Topics | | | |
| | | | es and basic design principles of object- | | | |
| | | | ich as classes, objects, abstraction, | | | |
| | | | ee, polymorphism, the SOLID design | | | |
| | prin | nciples, and design pa | tterns | | | |
| Course learning | | - | concepts in object-oriented | | | |
| outcomes | _ | | classes, objects, abstraction, | | | |
| | | _ | e, and polymorphism. | | | |
| | | _ | eject-oriented solution in JAVA | | | |
| | programming language. | | | | | |
| | CLO 3. Analyze design principles and design patterns in object- | | | | | |
| | oriented programing | | | | | |
| | | | | | | |
| | | Competency level | Course learning outcome (CLO) | | | |
| | | Knowledge | CLO1 | | | |
| | | Skill | CLO2, CLO3 | | | |
| | | Attitude | | | | |

| Content | The description of the contents should clearly | indicate th | \overline{e} | | | | |
|-------------------|---|---------------|----------------|--|--|--|--|
| | weighting of the content and the level. | | | | | | |
| | Weight: lecture session (3 hours) | | | | | | |
| | Teaching levels: I (Introduce); T (Teach); U (U | Jtilize) | | | | | |
| | Topic | Weight | Level | | | | |
| | Introduction to Java | 3 | I | | | | |
| | Introduction to Object-Oriented | 3 | I, T | | | | |
| | Programming | | | | | | |
| | Classes and Objects | 3 | T | | | | |
| | Inheritance and composition | 3 | T | | | | |
| | Polymorphism | 3 | T | | | | |
| | Design with interfaces and abstract classes 3 T | | | | | | |
| | Building Objects | 3 | T | | | | |
| | Exception handling | 3 | T | | | | |
| | Generic classes and methods 3 T | | | | | | |
| | Introduction to SOLID principles 3 T, | | | | | | |
| | Single responsibility principle | | | | | | |
| | Open/closed principle 1.5 | | | | | | |
| | Lisko substitution principle | 1.5 | T, U | | | | |
| | Interface segregation principle | 1.5 | T, U | | | | |
| | Dependency inversion principle | 1.5 | T, U | | | | |
| | Reusing Designs Through Design Patterns | 6 | T, U | | | | |
| Examination forms | Short-answer questions | | | | | | |
| Study and | Attendance: A minimum attendance of 80 perc | ent is com | pulsory | | | | |
| examination | for the class sessions. Students will be assessed | d on the ba | sis of | | | | |
| requirements | their class participation. Questions and comme | ents are stre | ongly | | | | |
| | encouraged. | | | | | | |
| | Assignments/Examination: Students must have | e more that | n | | | | |
| | 50/100 points overall to pass this course. | | | | | | |
| Reading list | 1. Paul J. Deitel (Author), Harvey Deitel (| | | | | | |
| | How To Program, 11th Edition, Prentice | | | | | | |
| | 2. Matt Weisfeld, The Object-Oriented Th | ought Pro | cess, 3rd | | | | |
| | Edition, Addison-Wesley, 2009 | | | | | | |
| | 3. Erich Gamma, Richard Helm, Ralph Jol | | | | | | |
| | Vlissides, Design Patterns: Elements of | | • | | | | |
| | Oriented Software, Addison-Wesley Pro | | | | | | |
| | 4. Eric Freeman, Bert Bates, Kathy Sierra | | | | | | |
| | Robson, Head First Design Patterns: A | Brain-Frie | ndly | | | | |
| | Guide, O'Reilly Media, 2004 2 Learning Outcomes Matrix | | | | | | |

2. **Learning Outcomes Matrix**The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | XX | | | | | |
| 2 | | XX | | | | X |

3 XXX X X X X X 3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning | Resources |
|------|----------------------------------|-----|-------------------------|----------------------|-----------------|
| | 1 | | | activities | |
| 1 | Introduction to Java | 1 | Quiz | Lecture | [1] |
| 2 | Introduction to Object- | 1 | Quiz | Lecture, | [1,2] |
| | Oriented Programming | | | Discussion | |
| 3 | Classes and Objects | 2 | Quiz, Lab, | Lecture, | [1,2] |
| | | | Midterm | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 4 | Inheritance and | 2 | Quiz, Lab, | Lecture, | [1,2] |
| | composition | | Midterm | Discussion, | |
| | | | | In-class | |
| 5 | Dolymounhiam | 2 | Oviz Lab | exercises | [1 2] |
| 3 | Polymorphism | 2 | Quiz, Lab, Midterm | Lecture, Discussion, | [1,2] |
| | | | Whaterin | In-class | |
| | | | | exercises | |
| 6 | Design with interfaces | 2,3 | Quiz, Lab, | Lecture, | [1,2] |
| | and abstract classes | | Midterm | Discussion, | [-,-] |
| | | | | In-class | |
| | | | | exercises | |
| 7 | Building Objects | 2,3 | Quiz, Lab, | Lecture, | [1,2] |
| | | | Midterm | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 8 | Exception handling | 1,2 | Quiz | Lecture | [1] |
| 9 | Midterm | | | | |
| 10 | Generic classes and | 2,3 | Quiz, Lab, | Lecture, | [1,2] |
| | methods | | Final | Discussion, | |
| | | | | In-class | |
| 11 | Introduction to COLID | 2.2 | Ovia Project | exercises | [1 2 <i>l</i>] |
| 11 | Introduction to SOLID principles | 2,3 | Quiz, Project, Final | Lecture, Discussion, | [1,3,4] |
| | Single responsibility | | Tillal | In-class | |
| | principle | | | exercises | |
| 12 | Open/closed principle | 2,3 | Quiz, Project, | Lecture, | [1,3,4] |
| | Lisko substitution | | Final | Discussion, | L 2- 2-3 |
| | principle | | | In-class | |
| | | | | exercises | |
| 13 | Interface segregation | 2,3 | Quiz, Project, | Lecture, | [1,3,4] |
| | principle | | Final | Discussion, | |
| | Dependency inversion | | | In-class | |
| | principle | | | exercises | |

| 14 | Reusing Designs | 2,3 | Quiz, Project, | Lecture, | [1,3,4] |
|----|------------------|-----|----------------|-------------|---------|
| | Through Design | | Final | Discussion, | |
| | Patterns, part 1 | | | In-class | |
| | | | | exercises | |
| 15 | Reusing Designs | 2,3 | Quiz, Project, | Lecture, | [1,3,4] |
| | Through Design | | Final | Discussion, | |
| | Patterns, part 2 | | | In-class | |
| | | | | exercises | |
| 16 | Final exam | | | | |

4. Assessment plan

| /· Tibbebbilleli | · P | | |
|--------------------------------------|------|------|------|
| Assessment Type | CLO1 | CLO2 | CLO3 |
| Quiz (5%) | 10% | | 20% |
| Labs (10%) | 30% | 30% | |
| Midterm examination (30%) | 50% | 40% | |
| Projects/Presentations/ Report (15%) | 10% | | 30% |
| Final examination (40%) | | 30% | 50% |

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------|----------------|----------|--|--|
| Student: | HW/A | HW/Assignment: | | | |
| Date: | | | | | |
| | Evalu | ator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW

| Score | Description |
|-------|--|
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|----------------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | Information is | Information is | is taken from | |
| | taken from | taken from | source(s) | Information is |
| | source(s) with | source(s) with | with some | taken from |
| | enough | enough | interpretation | source(s) |
| | interpretation/ | interpretation/ | / evaluation, | without any |
| Evidence | evaluation to | evaluation to | but not | interpretation/ |
| Selecting and | develop a | develop a | enough to | evaluation. |
| using | comprehensive | coherent | develop a | Viewpoints of |
| information to | analysis or | analysis or | coherent | experts are |
| investigate a | synthesis. | synthesis. | analysis or | taken as fact, |
| point of view or | Viewpoints of | Viewpoints of | synthesis. | without |
| conclusion | experts are | experts are | Viewpoints | question. |

| | | 1-1 | - C | |
|------------------|--|---|--|--|
| | questioned | subject to | of experts are | |
| | thoroughly. | questioning. | taken as | |
| | | | mostly fact, | |
| | | | with little | |
| | | | questioning. | |
| | Thoroughly (systematically and methodically) analyzes own and others' assumptions | Identifies own | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' | Specific position | Specific |
| | Others' points of view are | points of view are | (perspective, thesis/ | position (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | • | within position | · - | |
| - | within position | _ | acknowledge s different | hypothesis) is |
| (perspective, | (perspective, | (perspective, | | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|---|---|---|---|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and |
| Organization | makes the content of the presentation cohesive. | consistently observable within the presentation. | intermittently observable within the presentation. | transitions) is not observable within the presentation. |
| Organization | Language choices are imaginative, memorable, and compelling, and enhance | Language choices are thoughtful and generally support the effectiveness of the | Language choices are mundane and commonplace and partially support the effectiveness of | Language choices are unclear and minimally support the effectiveness of the presentation. |
| Language | the | presentation. | the | Language in |

| | affactive ass | Languaga | mmagantation | mmagantation is | |
|------------|-----------------|------------------|-----------------|--------------------|--|
| | effectiveness | Language in | presentation. | presentation is | |
| | of the | presentation is | Language in | not appropriate | |
| | presentation. | appropriate to | presentation is | to audience. | |
| | Language in | audience. | appropriate to | | |
| | presentation is | | audience. | | |
| | appropriate to | | | | |
| | audience. | | | | |
| | Delivery | | | | |
| | techniques | Delivery | Delivery | | |
| | (posture, | techniques | techniques | Delivery | |
| | gesture, eye | (posture, | (posture, | techniques | |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, | |
| | vocal | contact, and | contact, and | eye contact, and | |
| | expressiveness) | vocal | vocal | vocal | |
| | make the | expressiveness) | expressiveness) | expressiveness) | |
| | presentation | make the | make the | detract from the | |
| | compelling, | presentation | presentation | understandability | |
| | and speaker | interesting, and | understandable, | of the | |
| | appears | speaker | and speaker | presentation, and | |
| | polished and | appears | appears | speaker appears | |
| Delivery | | | tentative. | uncomfortable. | |
| | A variety of | | | | |
| | types of | | | | |
| | supporting | Supporting | Supporting | | |
| | materials | materials | materials | Insufficient | |
| | (explanations, | (explanations, | (explanations, | supporting | |
| | examples, | examples, | examples, | materials | |
| | illustrations, | illustrations, | illustrations, | (explanations, | |
| | statistics, | statistics, | statistics, | examples, | |
| | analogies, | analogies, | analogies, | illustrations, | |
| | quotations | quotations | quotations | statistics, | |
| | from relevant | from relevant | from relevant | analogies, | |
| | authorities) | authorities) | authorities) | quotations from | |
| | make | make | make | relevant | |
| | appropriate | appropriate | appropriate | authorities) | |
| | reference to | reference to | reference to | make reference | |
| | information or | information or | information or | to information or | |
| | analysis that | analysis that | analysis that | analysis that | |
| | significantly | generally | partially | minimally | |
| | supports the | supports the | supports the | supports the | |
| | presentation or | presentation or | presentation or | presentation or | |
| | establishes the | establishes the | establishes the | establishes the | |
| | presenter's | presenter's | presenter's | presenter's | |
| | credibility/ | credibility/ | credibility/ | credibility/ | |
| Supporting | authority on | authority on | authority on | authority on the | |
| Material | the topic. | the topic. | the topic. | topic. | |
| | me topie. | mic topic. | tare topic. | 1 1 | |

| | Central message is compelling | | | |
|---------|-------------------------------|-----------------|------------------|-------------------|
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Discrete Mathematics

Course Code: IT153

1. General information

| 7. General informat | |
|---|---|
| Course designation | The course provides students the ability to reason and think mathematically and logically; and apply this ability to analyze and solve discrete practical problems in Computer Science and IT. |
| Semester(s) in which the course is taught | 4 |
| Person responsible for the course | Assoc. Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | Compulsory (NE, CE, CS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 135 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits : 3 Lecture: 3 Laboratory: 0 |
| Required and recommended prerequisites for joining the course | C/C++ Programming Calculus 1, 2 |
| Course objectives | This course provides students the based knowledge of discrete mathematics. To develop the ability to reason and think mathematically and logically; and to apply this ability to analyzing and solving discrete practical problems in computer science. This is an application-oriented course based upon the study of events that occur in small, or discrete in computer science, segments in business, industry, government and the digital areas. Students will be introduced to the mathematical tools of logic and set theory, counting, number theory, and graph theory. Practical applications will be introduced throughout the course |
| Course learning outcomes | CLO 1. Understand and apply count/enumerate objects in a systematic way. CLO 2. Understand mathematical reasoning in order to read, comprehend and construct mathematical arguments; Understand to work with discrete structures and practical problems in computer science and IT |

CLO 3. Apply algorithm thinking and modeling; Apply knowledge in computer science for problems solving CLO 4. Have a sense of preparation of good mathematical knowledges to approach and solve problems in computer science and information technology.

| Competency level | Course learning outcome (CLO) |
|-------------------------|-------------------------------|
| Knowledge | CLO1, CLO2 |
| Skill | CLO2, CLO3 |
| Attitude | CLO4 |

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (3 teaching hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weight | Level |
|---|--------|-------|
| Week 1: Course syllabus and introduction; Logic and propositions | 3 | I,T |
| Week 2: Logic and propositions (continue) | 3 | I,T,U |
| Week 3: Propositional Equivalences; predicates and quantifiers | 3 | I,T,U |
| Week 4: Nested Quantifiers and Methods of Proof | 3 | I,T,U |
| Week 5: Induction and recursion | 3 | I,T,U |
| Week 6&7: Number of theory | 3 | I,T,U |
| Week 8: Counting: part 1, 2; midterm review | 3 | I,T,U |
| Week 9: Counting: part 3 | 3 | I,T,U |
| Week 10: Advanced counting | 3 | I,T,U |
| Week 11: Boolean algebras | 3 | I,T,U |
| Week 12: Graph theory | 3 | I,T,U |
| Week 13: Optimal problem solving on graphs | 3 | I,T,U |
| Week 14: Introduction and application of tree | 3 | I,T,U |
| Week 15: Search on tree; review for final exam | 3 | I,T,U |
| Multiple-choice questions, short-answer question | ons | |

Examination forms
Study and
examination
requirements

Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.

| | Assignments/Examination: Students must have more than 50/100 points overall to pass this course. |
|--------------|---|
| Reading list | 1. Kenneth H. Rosen, Discrete Mathematics and Its Applications 8 th edition, 2019. |
| | 2. Oscar Levin, Discrete mathematics An Open Introduction. 3 rd edition, 2019. |
| | 3. Vietnamese book: N.V.Sinh, T.M.Hà, N.T.T.Sang, N.M.Quân, "Nền tảng Toán học trong Công nghệ Thông tin", NXB - Đại học Quốc gia TPHCM, ISBN: 978-604-73-6518-0, 2018. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SL | SLO | | | | | | |
|-----|----|-----|---|---|---|---|--|--|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 1 | X | X | | | | | | |
| 2 | X | X | | | | | | |
| 3 | | X | | | | | | |
| 4 | | | | | | X | | |

3. Planned learning activities and teaching methods

| 3. I taimed real ming activities and teaching methods | | | | | |
|---|--|-------|------------------------------------|---|-----------|
| Week | Topic | CLO | Assessments | Learning activities | Resources |
| 1 | Course syllabus and introduction; Logic and propositions | 1,2 | Questions and answers | Lecture, Discussion, In-class exercises | [1, 2] |
| 2 | Logic and propositions (continue) | 2,3,4 | Quiz, Homework, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2] |
| 3 | Propositional Equivalences; predicates and quantifiers | 2,3,4 | Quiz, Homework, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2] |
| 4 | Nested Quantifiers and Methods of Proof | 2,3,4 | Quiz, Homework, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2] |
| 5 | Induction and recursion | 2,3,4 | Quiz, Homework, Midterm exam | Lecture, Discussion, | [1, 2] |

| 1 | Final examination | | | | |
|----|--|-------|------------------------------------|--|-----------|
| 15 | Search on tree; review for final exam | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 14 | Introduction and application of tree | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 13 | Optimal problem solving on graphs | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 12 | Graph theory | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 11 | Boolean algebras | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 10 | Advanced counting | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2] |
| 9 | Counting: part 3 | 2,3,4 | Quiz, Homework, Final exam | Lecture, Discussion, In-class exercises | [1, 2] |
| | Midterm examination | | | | |
| 8 | Counting: part 1, 2; midterm review | 2,3,4 | Quiz, Homework, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 7 | Number of theory (continue) | 2,3,4 | Quiz, Homework, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2] |
| 6 | Number of theory | 2,3,4 | Quiz, Homework, Midterm exam | exercises Lecture, Discussion, In-class exercises | [1, 2] |
| | | | | In-class | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------------|------|------|------|------|
| Quiz/Homework/Assignment (25%) | 20% | 30% | 30% | 20% |
| Midterm examination (30%) | 25% | 25% | 25% | 25% |
| Final examination (45%) | | 30% | 40% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|----------------|--------|----------|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | ••••• | | | | |
| | Evalı | iator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| C.2. 1 | ionsuc i usi ic | | | | |
|--------|--|--|--|--|--|
| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |

| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
|---|--|
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical thinking vi | Capstone | Milest | | Benchmark |
|---|--|--|---|--|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is | Issue/ problem | Issue/ problem to be considered critically is stated but description leaves some | 1 |
| Explanation of issues | stated clearly and described comprehensivel y, delivering all relevant information necessary for full understanding. | to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions. | terms undefined, ambiguities unexplored, boundaries undetermine d, and/ or backgrounds unknown. | Issue/ problem to be considered critically is stated without clarification or description. |
| Evidence | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent | Information is taken from source(s) without any interpretation/ |
| Selecting and using information to | analysis or synthesis. Viewpoints of | analysis or synthesis. Viewpoints of | analysis or synthesis. | evaluation. Viewpoints of experts are |
| investigate a point of view or conclusion | experts are questioned thoroughly. | experts are subject to questioning. | of experts are taken as mostly fact, | taken as fact, without question. |

| | | | rrith 1:441 a | |
|------------------|-------------------|-------------------|---------------|----------------|
| | | | with little | |
| | | | questioning. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| ussumptions | Specific | position. | versu). | position. |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| Language | the | presentation. | the | Language in |

| | affactive ass | Languaga | mmagantation | mmagantation is |
|------------|-----------------|-----------------------------|-----------------|--------------------|
| | effectiveness | Language in | presentation. | presentation is |
| | of the | presentation is | Language in | not appropriate |
| | presentation. | appropriate to | presentation is | to audience. |
| | Language in | audience. | appropriate to | |
| | presentation is | | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | | quotations | statistics, |
| | from relevant | quotations from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | me topie. | mic topic. | tare topic. | 1 1 |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Digital Logic Design

Course Code: IT067

1. General information

| Course designation | Provide fundamentals of logic design, such as: number presentation and codes, Boolean algebra and basic tools for design with combinational and sequential digital logic. | | | |
|---|--|---|--|--|
| Semester(s) in which the course is taught | 3 | | | |
| Person responsible for the course | As | soc. Prof. Dr. Dinh D | Duc Anh Vu | |
| Language | En | glish | | |
| Relation to curriculum | CS | , IT: Compulsory | | |
| Teaching methods | Le | cture, lesson, project, | seminar. | |
| Workload (incl. contact hours, self-study hours) | Co lab Pri | oratory session, etc.) | pecify whether lecture, exercise, : 45 (lecture) examination preparation, specified in | |
| Credit points | Number of credits : 3 Lecture: 3 Laboratory: 0 | | | |
| Required and recommended prerequisites for joining the course | | | | |
| Course objectives | as: | number presentation ols for design with co | e fundamentals of logic design, such and codes, Boolean algebra and basic mbinational and sequential digital | |
| Course learning outcomes | CLO 1. Explain the presentation of number, codes systems. CLO 2. Demonstrate the operation of arbitrarily basic combinational and sequential circuits. CLO 3. Design basic combinational and sequential circuits. CLO 4. Follow the discussions of instructors and classmates. | | | |
| | | Competency level | Course learning outcome (CLO) | |
| | | Knowledge | CLO1, CLO2, CLO3 | |
| | | Skill | CLO3 | |
| | | Attitude | CLO4 | |
| Content | we | e description of the coighting of the content eight: lecture session | | |

| | Те | eaching levels: I (Introduce); T (Teach); I | U (Utilize) |) | | |
|-------------------|--|--|--------------|------------|--|--|
| | | Topic | Weight | Level | | |
| | | Number systems, arithmetic and codes | 6 | I,T | | |
| | | Boolean algebra and Logic Gates | 9 | I,T | | |
| | | Combinational Circuits | 9 | T,U | | |
| | | Sequential logic and flip-flops | 9 | T,U | | |
| | | Arithmetic logic Circuits | 6 | T,U | | |
| | | Counters, stacks and registers | 6 | I,T | | |
| Examination forms | Multiple-choice questions, short-answer questions | | | | | |
| Study and | At | tendance: A minimum attendance of 80 j | percent is | | | |
| examination | co | mpulsory for the class sessions. Students | s will be as | ssessed on | | |
| requirements | the | the basis of their class participation. Questions and comments | | | | |
| | are | are strongly encouraged. | | | | |
| | As | ssignments/Examination: Students must l | have more | than | | |
| | 50 | 1/100 points overall to pass this course. | | | | |
| Reading list | 1. Ronald J. Tocci, Neal S.Widmer, Digital Systems | | | | | |
| | | Principles and Applications, Prentice Hall Inc (2007) | | | | |
| | | 2. J.F. Wakerly, Digital Design: Princip 2004 | | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | X | | | | | |
| 3 | | X | | | | |
| 4 | X | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|-------|--------------------------------------|------|-----------------|----------------------------------|-------------------------------|
| 1,2 | Number systems, arithmetic and codes | CLO1 | Midterm Exam | Reading Group Presentation | Textbooks |
| 3,4,5 | Boolean algebra and Logic Gates | CLO1 | Midterm Exam | Reading Lecture | Textbooks Lecture notes |
| | Midterm | | | | |

| 6,7,8 | Combinational | CLO2,CLO4 | Quiz | Reading | Textbooks |
|---------|------------------|-----------|------------|----------|-----------|
| | Circuits | | Final Exam | Lecture | Lecture |
| | | | | Discuss | notes |
| 9,10,11 | Sequential logic | CLO2,CLO4 | Exercise | Reading | Textbooks |
| | and flip-flops | | Final Exam | Lecture | Lecture |
| | | | | Discuss | notes |
| | | | | Exercise | |
| 12,13 | Arithmetic logic | CLO3,CLO4 | Exercise | Reading | Textbooks |
| | Circuits | | Final Exam | Lecture | Lecture |
| | | | | Discuss | notes |
| | | | | Exercise | |
| 14,15 | Counters, stacks | CLO3,CLO4 | Exercise | Reading | Textbooks |
| | and registers | | Final Exam | Lecture | Lecture |
| | | | | Discuss | notes |
| | | | | Exercise | |
| | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Midterm examination (30%) | 30% | | | |
| Final examination (40%) | | 20% | 20% | |
| Exercises/ Quiz (30%) | | 10% | 10% | 10% |

Note: %Pass: Target that 90% of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.<u>←</u>

Rubrics (optional)

| | | . 14 | ~~ | \mathbf{m} | α | α | 7 | 101 | ı |
|---|------|------|-----------|--------------|----------|----------|----|-----|---|
| ı | l. (| T | 211 | ing | | | ĸ. | | ı |
| | | | | | | | | | |

| . Grading checklist | | | |
|--|---|----------|----------|
| Grading checklist for W | ritten Repo | orts | |
| Student: | HW/A | Assignme | ent: |
| Date: | • • • • • • | | •• |
| | Evalu | iator: | |
| | • | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes principal content | 10 | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |

| Analysis and discussion demonstrate good subject | 30 | |
|--|-----|--|
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|-------|--|--|--|--|--|--|
| Score | Description | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | | |
| | are included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | | |
| | task are included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | | |
| | are included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | | |
| | are missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem | | Issue/ | |
| | to be considered | | problem to | |
| | critically is | Issue/ problem | be | |
| | stated clearly | to be considered | considered | |
| | and described | critically is | critically is | Issue/ |
| | comprehensivel | stated, | stated but | problem to be |
| | y, delivering all | described, and | description | considered |
| | relevant | clarified so that | leaves some | critically is |
| | information | understanding is | terms | stated without |
| | necessary for | not seriously | undefined, | clarification |
| Explanation of | full | impeded by | ambiguities | or |
| issues | understanding. | omissions. | unexplored, | description. |

| | | | 1 1 . | |
|------------------|-----------------|------------------|----------------|-----------------|
| | | | boundaries | |
| | | | undetermine | |
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | Specific | • |
| | position | position | position | Specific |
| Student's | (perspective, | (perspective, | (perspective, | position |
| position | thesis/ | thesis/hypothesi | thesis/ | (perspective, |
| (perspective, | hypothesis) is | s) takes into | hypothesis) | thesis/ |
| thesis/hypothesi | imaginative, | account the | acknowledge | hypothesis) is |
| s) | taking into | complexities of | s different | stated, but is |
| ~/ | 11110 | - Complements of | 5 GIIIOIOIII | States, Out 15 |

| | account the | an issue. Others' | sides of an | simplistic and |
|---------------|-------------------|-------------------|----------------|----------------|
| | complexities of | points of view | issue. | obvious. |
| | an issue. Limits | are | | |
| | of position | acknowledged | | |
| | (perspective, | within position | | |
| | thesis/ | (perspective, | | |
| | hypothesis) are | thesis/ | | |
| | acknowledged. | hypothesis). | | |
| | Others' points of | | | |
| | view are | | | |
| | synthesized | | | |
| | within position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | | |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | <u> </u> | stone | Benchmark |
|--------------|-----------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | Organizational | Organizational | |
| | pattern | pattern | pattern | Organizational |
| | (specific | (specific | (specific | pattern (specific |
| | introduction | introduction | introduction | introduction and |
| | and conclusion, | and conclusion, | and conclusion, | conclusion, |
| | sequenced | sequenced | sequenced | sequenced |
| | material within | material within | material within | material within |
| | the body, and | the body, and | the body, and | the body, and |
| | transitions) is | transitions) is | transitions) is | transitions) is not |
| Organization | clearly and | clearly and | intermittently | observable |

| | consistently | consistently | observable | within the |
|------------|-----------------|------------------|------------------|--------------------|
| | observable and | observable | within the | presentation. |
| | is skillful and | within the | presentation. | prosontation. |
| | makes the | presentation. | Prosentation. | |
| | content of the | presentation. | | |
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| C | analogies, | from relevant | from relevant | quotations from |
| Supporting | quotations | authorities) | authorities) | relevant |
| Material | from relevant | make | make | authorities) |

| | authorities) | appropriate | appropriate | make reference |
|---------|-----------------|-----------------|------------------|-------------------|
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Digital Logic Design Lab

Course Code: IT099

1. General information

| Course designation | This subject covers the fundamental knowledge of digital logic design laboratory |
|---|--|
| Semester(s) in which the course is taught | 3 |
| Person responsible for the course | Dr. Ly Tu Nga |
| Language | English |
| Relation to curriculum | Compulsory (CS, NE, CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. | Total workload: 60 |
| contact hours, self- | Contact hours (please specify whether lecture, exercise, |
| study hours) | laboratory session, etc.): 30 (laboratory) |
| | Private study including examination preparation, specified in hours: 30 |
| Credit points | Number of credits: 1 |
| Crean points | Lecture: 0 |
| | Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Digital Logic Design |
| Course objectives | This course provides students the fundamentals of digital logic design concepts, a sequence of laboratory experiments to present and illustrate theory of digital logic design involving Logic gates, Combinational logic circuit, MSI combinational logic circuit, Flip Flops and Counters, Counter ICs, and Shift register. Students apply contemporary agile requirements analysis, implementation and testing practices to digital logic design project work in small teams. |
| Course learning outcomes | CLO 1. use laboratory equipment in digital logic design. CLO 2. design, construct, analyze, and troubleshoot simple combinational and sequential circuits. CLO 3. measure and record the experimental data, analyze the results, and prepare a laboratory report for submission. CLO 4. Have an opportunity to exam case studies to understand the professional and ethical responsibility as an engineer. |
| | Competency level Course learning outcome (CLO) |

| | | Knowledge | CLO1 | | | |
|-------------------|---|---|---------------------|--------------|------------|------|
| | | Skill | CLO2,3 | | | - |
| | | | CLO4 | | | |
| | | Attitude | | | | |
| Content | | description of the co | | rly indica | te the | |
| | | ghting of the content | | | | |
| | | ght: lecture session (ching levels: I (Introd | | T (TItiliza) | | |
| | Teac | | iuce), I (Teach), (| | | |
| | | Topic | | Weight | | |
| | | Logic gates and co | mbinational logic | 2 | I,T | |
| | | MSI combinational | l logic | 1 | T,U | |
| | | MSI Combinationa | ıl logic (cont.) | 1 | T,U | |
| | | Flip flops and counters | | 2 | T,U | |
| | | Counter ICs (part I) | | 1 | T,U | |
| | | Counter ICs (part I | I) | 1 | T,U | |
| | | Shift Register | 2 | T,U | | |
| Examination forms | Shor | rt-answer questions | | | | |
| Study and | | ndance: A minimum | | | | • |
| examination | | he class sessions. Stu | | | | |
| requirements | | class participation. | Questions and con | nments are | e strongly | y |
| | | ouraged. | ~ . | | | |
| | | gnments/Examination | | nave more | than 50 | /100 |
| D 11 11 1 | | ts overall to pass this | | | | |
| Reading list | [1] M.M. Mano and M.D. Ciletti, Digital Design 4th, 2007 | | | | | |
| | [2] J.F. Wakerly, Digital Design: Principles & Practices 4th, | | | | | |
| | 2004 | | 71 D' 11 | | | |
| | | R.J Tocci and N.S. W lications 8th, 2001 | /idner, Digital Sys | tems - Pri | nciples a | ınd |
| | 1 1 PP | 1104110115 0111, 2001 | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|----------|----------|----------|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | √ | / | | | | |
| 2 | √ | √ | | | | |
| 3 | | | √ | | | ✓ |
| 4 | | | √ | | | √ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Teaching and Learning activities | Assessments | Resources |
|------|-------------------------------------|----------|--|--------------|-----------|
| 1 | Logic gates and combinational logic | CLO1,3 | -Practice and demo -Class discussion | -Report | [1,2] |
| 2 | MSI combinational logic | CLO2,3 | -Practice and demo -Class discussion | -Report | [1,2] |
| 3 | MSI Combinational logic (cont.) | CLO2,3 | -Practice and demo -Class discussion | -Report | [1,2] |
| 5 | Flip flops and counters | CLO2,3,4 | -Practice and demo -Class discussion | -Report | [1,3] |
| 6 | Counter ICs (part I) | CLO2,3,4 | -Practice and demo -Class discussion | -Report | [1,3] |
| 7 | Counter ICs (part II) | CLO2,3,4 | -Practice and demo -Class discussion | -Report | [1,3] |
| 8 | Shift Register | CLO2,3,4 | -Practice and demo -Class discussion | -Report | [1,3] |
| 9 | Final exam | | Practice | Written exam | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|-------------------------|------|------|------|------|
| Final examination (30%) | 30% | 30% | 30% | 30% |
| Exercises/ Quiz (70%) | 70% | 70% | 70% | 70% |

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

| l. (| Grad | ling | cho | eck | list | ŀ |
|------|------|------|-----|-----|------|---|
| | | | | | | |

| Grading checklist for Written Reports | | | | | |
|---------------------------------------|----------------|--|--|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | | | | | |
| | Evaluator: | | | | |
| | | | | | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| Holi | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|---|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | |
| | missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. **Analytic rubric**

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone 3 2 | | Benchmark |
|-----------------------|------------------|-------------------|---------------|----------------|
| | 4 | | | 1 |
| | Issue/ problem | Issue/ problem | Issue/ | Issue/ |
| | to be considered | to be considered | problem to | problem to be |
| | critically is | critically is | be | considered |
| | stated clearly | stated, | considered | critically is |
| Explanation of | and described | described, and | critically is | stated without |
| issues | comprehensivel | clarified so that | stated but | clarification |

| | v dolinomin11 | ,,,,,d,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | daganinti | 04 |
|------------------|-------------------|--|----------------|---------------------------------------|
| | y, delivering all | understanding is | description | Or description |
| | relevant | not seriously | leaves some | description. |
| | information | impeded by | terms | |
| | necessary for | omissions. | undefined, | |
| | full | | ambiguities | |
| | understanding. | | unexplored, | |
| | | | boundaries | |
| | | | undetermine | |
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | • | · · · · · · · · · · · · · · · · · · · |
| | | | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions and | Identifies own | May be more | assumptions). |
| | carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| - Perolin | F 22111211. | L 22222 | ,• | L 20111011. |

| | a .c. | | | |
|------------------------|-------------------|-------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | | | |
| | complexities of | Specific position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion is | |
| | | | logically tied | |
| | Conclusions and | | to | |
| | related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions and | evaluation and | outcomes | outcomes | (consequence |
| related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) are | implications) | are |
| and | discussed in | identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A variety of | | | | | |
|---|------------------|------------------|------------------|-------------------|--|--|
| | A variety of | | | | | |
| | types of | Commontino | Commontino | | | |
| | supporting | Supporting | Supporting | T | | |
| | materials | materials | materials | Insufficient | | |
| | (explanations, | (explanations, | (explanations, | supporting | | |
| | examples, | examples, | examples, | materials | | |
| | illustrations, | illustrations, | illustrations, | (explanations, | | |
| | statistics, | statistics, | statistics, | examples, | | |
| | analogies, | analogies, | analogies, | illustrations, | | |
| | quotations | quotations | quotations from | statistics, | | |
| | from relevant | from relevant | relevant | analogies, | | |
| | authorities) | authorities) | authorities) | quotations from | | |
| | make | make | make | relevant | | |
| | appropriate | appropriate | appropriate | authorities) make | | |
| | reference to | reference to | reference to | reference to | | |
| | information or | information or | information or | information or | | |
| | analysis that | analysis that | analysis that | analysis that | | |
| | significantly | generally | partially | minimally | | |
| | supports the | supports the | supports the | supports the | | |
| | presentation or | presentation or | presentation or | presentation or | | |
| | establishes the | establishes the | establishes the | establishes the | | |
| | presenter's | presenter's | presenter's | presenter's | | |
| | credibility/ | credibility/ | credibility/ | credibility/ | | |
| Supporting | authority on the | authority on the | authority on the | authority on the | | |
| Material | topic. | topic. | topic. | topic. | | |
| | Central | | | | | |
| | message is | | | | | |
| | compelling | | | | | |
| | (precisely | | Central | | | |
| | stated, | Central | message is | Central message | | |
| | appropriately | message is | basically | can be deduced | | |
| | repeated, | clear and | understandable | but is not | | |
| | memorable, | consistent with | but is not often | explicitly stated | | |
| Central | and strongly | the supporting | repeated and is | in the | | |
| Message | supported.) | material. | not memorable. | presentation. | | |
| Source: Association of American Colleges and Universities | | | | | | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Object-Oriented Programming

Course Code: IT069IU

2. General information

| Course designation | This subject introduces students to the object-oriented programming from basic notions to professional principles for designing an object-oriented software. | | | | |
|---|---|-------------------------|-------------------------------|--|--|
| Semester(s) in which the course is taught | 3 | | | | |
| Person responsible for the course | Dr. | Dr. Tran Thanh Tung | | | |
| Language | Eng | glish | | | |
| Relation to curriculum | Cor | npulsory (all progran | ns) | | |
| Teaching methods | Lec | ture, lesson, project, | seminar. | | |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | | | | |
| Required and recommended prerequisites for joining the course | Prerequisite course of OOP: C/C++ Programming | | | | |
| Course objectives | Introduction to object-oriented programming and design. Topics include core terminologies and basic design principles of object-oriented programming such as classes, objects, abstraction, encapsulation, inheritance, polymorphism, the SOLID design principles, and design patterns | | | | |
| Course learning outcomes | CLO 1. Explain and use concepts in object-oriented programming including classes, objects, abstraction, encapsulation, inheritance, and polymorphism. CLO 2. Implement an object-oriented solution in JAVA programming language. CLO 3. Analyze design principles and design patterns in object-oriented programing | | | | |
| | | Competency level | Course learning outcome (CLO) | | |
| | | Knowledge | CLO1 | | |

| | Skill | CLO2, CLO3 | | |
|------------------------------------|---|-----------------------------|--------|-------|
| | Attitude | | | |
| Content | The description of the co weighting of the content Weight: lecture session (Teaching levels: I (Intro | and the level. (3 hours) | | e |
| | Topic | duce), I (Icacii), O (| Weight | Level |
| | Introduction to Java | | 3 | I |
| | Introduction to Object-Programming | 3 | I, T | |
| | Classes and Objects | | 3 | T |
| | Inheritance and compos | sition | 3 | T |
| | Polymorphism | | 3 | T |
| | Design with interfaces | and abstract classes | 3 | T |
| | Building Objects | | 3 | T |
| | Exception handling | | 3 | T |
| | Generic classes and me | thods | 3 | T |
| | Introduction to SOLID | principles | 3 | T, U |
| | Single responsibility pr | rinciple | | |
| | Open/closed principle | | 1.5 | T, U |
| | Lisko substitution princ | ciple | 1.5 | T, U |
| | Interface segregation pr | rinciple | 1.5 | T, U |
| | Dependency inversion | principle | 1.5 | T, U |
| | Reusing Designs Throu | igh Design Patterns | 6 | T, U |
| Examination forms | Short-answer questions | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | |
| Reading list | Paul J. Deitel (Author), Harvey Deitel (Author), Java How To Program, 11th Edition, Prentice Hall, 2017 Matt Weisfeld, The Object-Oriented Thought Process, 3rd Edition, Addison-Wesley, 2009 Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley Professional, 1994 Eric Freeman, Bert Bates, Kathy Sierra and Elisabeth Robson, Head First Design Patterns: A Brain-Friendly Guide, O'Reilly Media, 2004 | | | |

3. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|-----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | XX | | | | | |
| 2 | | XX | | | | X |
| 3 | | XXX | | | | X |

4. Planned learning activities and teaching methods

| | | 1 | ctivities and teac | _ | <u> </u> |
|------|---|-----|-----------------------|---|-----------|
| Week | Topic | CLO | Assessments | Learning activities | Resources |
| 1 | Introduction to Java | 1 | Quiz | Lecture | [1] |
| 2 | Introduction to Object- Oriented Programming | 1 | Quiz | Lecture, Discussion | [1,2] |
| 3 | Classes and Objects | 2 | Quiz, Lab, Midterm | Lecture, Discussion, In-class exercises | [1,2] |
| 4 | Inheritance and composition | 2 | Quiz, Lab, Midterm | Lecture, Discussion, In-class exercises | [1,2] |
| 5 | Polymorphism | 2 | Quiz, Lab, Midterm | Lecture, Discussion, In-class exercises | [1,2] |
| 6 | Design with interfaces and abstract classes | 2,3 | Quiz, Lab, Midterm | Lecture, Discussion, In-class exercises | [1,2] |
| 7 | Building Objects | 2,3 | Quiz, Lab, Midterm | Lecture, Discussion, In-class exercises | [1,2] |
| 8 | Exception handling | 1,2 | Quiz | Lecture | [1] |
| 9 | Midterm | | | | |
| 10 | Generic classes and methods | 2,3 | Quiz, Lab, Final | Lecture, Discussion, In-class exercises | [1,2] |

| 11 | Introduction to SOLID principles Single responsibility principle | 2,3 | Quiz, Project, Final | Lecture, Discussion, In-class exercises | [1,3,4] |
|----|--|-----|-------------------------|--|---------|
| 12 | Open/closed principle Lisko substitution principle | 2,3 | Quiz, Project, Final | Lecture, Discussion, In-class exercises | [1,3,4] |
| 13 | Interface segregation principle Dependency inversion principle | 2,3 | Quiz, Project, Final | Lecture, Discussion, In-class exercises | [1,3,4] |
| 14 | Reusing Designs Through Design Patterns, part 1 | 2,3 | Quiz, Project, Final | Lecture, Discussion, In-class exercises | [1,3,4] |
| 15 | Reusing Designs Through Design Patterns, part 2 | 2,3 | Quiz, Project, Final | Lecture, Discussion, In-class exercises | [1,3,4] |
| 16 | Final exam | | | | |

5. **Assessment plan**

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Quiz (5%) | 10% | | 20% |
| Labs (10%) | 30% | 30% | |
| Midterm examination (30%) | 50% | 40% | |
| Projects/Presentations/ Report (15%) | 10% | | 30% |
| Final examination (40%) | | 30% | 50% |

Rubrics (optional) Grading checklist

| 0 | | | | | | |
|--|-------|----------|----------|--|--|--|
| Grading checklist for Written Reports | | | | | | |
| Student: | HW/A | Assignme | ent: | | | |
| Date: | | | | | | |
| | Evalu | ator: | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |

| Summary and conclusions appropriate and complete | 5 | |
|--|-----|--|
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.4. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.5. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical thinking va | Capstone | Milest | | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | Issue/ problem | | be | |
| | to be considered | | considered | |
| | critically is | Issue/ problem | critically is | |
| | stated clearly | to be considered | stated but | |
| | and described | critically is | description | Issue/ |
| | comprehensivel | stated, | leaves some | problem to be |
| | y, delivering all | described, and | terms | considered |
| | relevant | clarified so that | undefined, | critically is |
| | information | understanding is | ambiguities | stated without |
| | necessary for | not seriously | unexplored, | clarification |
| Explanation of | full | impeded by | boundaries | or |
| issues | understanding. | omissions. | undetermine | description. |

| | 1 | | 1 | |
|------------------|-----------------|------------------|----------------|-----------------|
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | | |
| | | | | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using und | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | | question. |
| Conclusion | morouginy. | questioning. | questioning. | question. |
| | | | | |
| | | | Questions | |
| | | | some . | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |

| | Specific | | | |
|------------------|-------------------|--|----------------|----------------|
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| , | 71 | <i>,</i> , , , , , , , , , , , , , , , , , , | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Miles | stone | Benchmark |
|----------|-------|-------|-----------|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |

| | A vomiativ of | | | | |
|---|----------------------|------------------------------|--------------------------------|-------------------|--|
| | A variety of | | | | |
| | types of | Cumpostino | Cummontina | | |
| | supporting materials | Supporting materials | Supporting materials | Insufficient | |
| | | | | | |
| | (explanations, | (explanations, | (explanations, | supporting | |
| | examples, | examples, | examples, | materials | |
| | illustrations, | illustrations, | illustrations, | (explanations, | |
| | statistics, | statistics, | statistics, | examples, | |
| | analogies, | analogies, | analogies, | illustrations, | |
| | quotations | quotations | quotations | statistics, | |
| | from relevant | from relevant | from relevant | analogies, | |
| | authorities) | authorities) | authorities) | quotations from | |
| | make | make | make | relevant | |
| | appropriate | appropriate | appropriate | authorities) | |
| | reference to | reference to | reference to | make reference | |
| | information or | information or | information or | to information or | |
| | analysis that | analysis that | analysis that | analysis that | |
| | significantly | generally | partially | minimally | |
| | supports the | supports the | supports the | supports the | |
| | presentation or | presentation or presentation | | presentation or | |
| | establishes the | establishes the | stablishes the establishes the | | |
| | presenter's | presenter's | presenter's | presenter's | |
| | credibility/ | credibility/ | credibility/ | credibility/ | |
| Supporting | authority on | authority on | authority on | authority on the | |
| Material | the topic. | the topic. | the topic. | topic. | |
| | | | | | |
| | | | | | |
| | Central | | | | |
| | message is | | | | |
| | compelling | | | | |
| | (precisely | | Central | | |
| | stated, | Central | message is | Central message | |
| | appropriately | message is | basically | can be deduced | |
| | repeated, | clear and | understandable | but is not | |
| | memorable, | | | explicitly stated | |
| Central | and strongly | the supporting | repeated and is | in the | |
| Message | supported.) | material. | not memorable. | presentation. | |
| Source: Association of American Colleges and Universities | | | | | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Linear Algebra

Course Code: IT154IU

1. General information

| 1. General illiorina | |
|---|---|
| Course designation | Linear algebra provides a mathematical framework for organizing information and then using that information to solve problems, especially data analytics problems. Linear algebra is essential for understanding and creating machine learning algorithms, especially neural network and deep learning models. |
| Semester(s) in which the course is taught | 2, 3 |
| Person responsible for the course | Mai Hoang Bao An, PhD. |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, demo. |
| Workload (incl. contact hours, self- study hours) | (Estimated) Total workload: 135 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits: 3 Lecture: 3 Laboratory: 0 |
| Required and recommended prerequisites for joining the course | Calculus 2 |
| Course objectives | This course will provide students with the foundations of linear algebra knowledge necessary for machine learning and neural network modelling. Students will learn the overview of basic matrices and vector algebra as applied to linear systems. Then they will learn how to manipulate matrices to derive useful knowledge from data, quantify the degree of learning, and optimizing the speed of learning in vector spaces and linear transformations for data discovery. The hands-on lessons and assignments will equip students with the mathematical background required to build and train simple neural networks in data mining applications. |

Course learning outcomes

CLO 1. Understand concepts of vector space, matrices, tensor, linear system and their application in other fields of study. Get familiar with the fundamental concepts of linear spaces.

CLO 2. Know how to use Python to handle with matrices and linear systems. Get to know and understand the fundamental concepts of abstract vector spaces and their relationships with matrix algebra.

CLO 3. Understand the concepts and applications of linear dependence/independence, spans and linear transformation. Apply principles of matrix algebra to linear transformation. Understand the Isomorphic Vector Spaces and applications. CLO 4. Determine eigenvalues and eigenvectors and solve eigenvalue problems. Introduction to determinant and its properties and applications. The use case of carrying out matrix operations in machine learning.

| Competency level | Course learning outcome (CLO) |
|-------------------------|-------------------------------|
| Knowledge | CLO 1, CLO 2, CLO 3, CLO 4 |
| Skill | CLO 2, CLO 4 |
| Attitude | CLO 1, CLO 2, CLO 3, CLO 4 |

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (3 hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weight | Level |
|--|--------|-------|
| Introduction to python, colab | 1 | I, U |
| What is linear structures | | |
| Fundamentals and geometry of \mathbb{R}^n space | 2 | T, U |
| Matrix algebra: vectors, matrices. | | |
| Linear systems, parametric equations and | | |
| systems of linear equations | | |
| Solving systems of linear equations | 2 | T, U |
| Subspace of \mathbb{R}^n , linear independence, base | | |
| and dimension in \mathbb{R}^n | | |
| Python in linear algebra | | |
| Solving linear system with numpy | 1 | T, U |
| Norm in \mathbb{R}^n with Python | | |
| Abstract vector spaces, base and dimension | 1 | T, U |
| for abstract vector spaces. | | |
| Special kinds of matrices and vectors. | | |
| Span in abstract vector spaces. | 2 | T, U |
| Fundamentals of linear transformations. | | |
| Demo of linear transformations in Python. | | |

| | Linear Transformation in abstract vector | 1 | T, U | |
|-------------------|---|-----------|-------|--|
| | space | | | |
| | Linear Transformation and Inverses | | | |
| | Geometric Transformation of Plane, Image | 1 | I, T, | |
| | and Kernel, Isomorphism and linear map | | U | |
| | Isomorphic Vector Spaces | | | |
| | Introduction to determinant | 1 | I, T | |
| | Determinant expansions. | | | |
| | Properties of determinant. | | | |
| | Elementary Row Operations and the | 2 | I, T, | |
| | Determinant | | U | |
| | Eigenvectors and Eigenvalues, Eigen- | | | |
| | decompositions | | | |
| | Introduction to some application of linear | | | |
| | algebra: PCA, OLS, | | | |
| Examination forms | Short-answer questions, Long-answer questions, programming | | | |
| | questions | | | |
| Study and | Attendance: A minimum attendance of 80 percent is compulsory | | | |
| examination | for the class sessions. Students will be assessed on the basis of | | | |
| requirements | their class participation. Questions and comments are strongly | | | |
| | encouraged. | | | |
| | Assignments/Examination: Students must have more than 50/100 | | | |
| D 1' 1' 4 | points overall to pass this course. | | | |
| Reading list | 1. R.O. Hill, Elementary Linear Algebra and Its applications, | | | |
| | 3rd edition | | | |
| | 2. B. Kolman and David R. Hill, Introductory Linear Algebra: | | | |
| | An Applied First Course (8th edition, 9th edition) | | | |
| | 3. Jim Hefferon, Linear Algebra, 4th edition. | | | |
| | 4. github: Python in linear algebra, matrix co | omputing. | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | | X | | | | |
| 3 | | X | X | | | |
| 4 | | | X | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|------|-------------|------------------------------------|--|
| 1 | Introduction to python, colab What is linear structures Introduction to matrix | 1 | | Lecture, Discussion | [1, 2, 3]. Chapter 1 |
| 2-3 | Fundamentals and geometry of \mathbb{R}^n space Matrix algebra: vectors, matrices. Linear systems, parametric equations and systems of linear equations | 1 | Exercises | Lecture, In-class exercises | [1, 2, 3]. Chapter 2, 3, |
| 4-5 | Solving systems of linear equations Subspace of \mathbb{R}^n , linear independence, base and dimension in \mathbb{R}^n Python in linear algebra | 1, 2 | Exercises | Lecture, In-class exercises | [1, 2, 3]. Chapter 4, 5, 6 [4] Chapter 1,2,3 |
| 6 | Solving linear system with numpy Norm in \mathbb{R}^n with Python | 1, 2 | | Lecture, In-class Discussion | [4]. Chapter 3, 4, 5 |
| 7 | Abstract vector spaces, base and dimension for abstract vector spaces. Special kinds of matrices and vectors. | 1, 2 | Exercises | Lecture, In-class exercises | [1, 2, 3]. Chapter 6, 7, 8 |
| 8 | Midterm | | | | |
| 9-10 | Span in abstract vector spaces. Fundamentals of linear transformations. Demo of linear transformations in Python. | 3, 4 | Exercises | Lecture, In-class exercises | [1, 2, 3]. Chapter 8, 9, 10 [4] Chapter 6, 7 |
| 11 | Linear Transformation in abstract vector space Linear Transformation and Inverses | 3 | Exercises | Lecture, In-class exercises | [1, 2, 3]. Chapter 10, 11, 12 |

| 12 | Geometric Transformation of Plane, Image and Kernel, Isomorphism and linear map Isomorphic Vector Spaces | 3 | Exercises | Lecture, In-class exercises | [1, 2, 3]. Chapter 11, 12, 13 |
|-------|---|------|-----------|-----------------------------------|---|
| 13 | Introduction to determinant Determinant expansions. Properties of determinant | 3, 4 | Quiz | Lecture, In-class Quiz | [1, 2]. Chapter 13. 14, 15 |
| 14-15 | Elementary Row Operations and the Determinant Eigenvectors and Eigenvalues, Eigendecompositions Introduction to some application of linear algebra: PCA, OLS, | 3, 4 | Exercises | Lecture, In-class exercises | [2, 3]. Chapter 14, 15, 16 [4] Chapter 8, 9, 10 |
| 16 | Revision | | | Review-test | |
| 17 | Final exam | | | | |

4.

Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------------------|------|------|------|------|
| Labs (20%) | 25% | 25% | 25% | 25% |
| Midterm examination (30%) | 50% | 50% | | |
| Projects/Presentations/ Report (10%) | | | 50% | 50% |
| Final examination (40%) | | 25% | 25% | 50% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | |
|---------------------------------------|----------------|--|--|--|
| Student: | HW/Assignment: | | | |
| Date: | | | | |

| | Evaluator: | | | | |
|--|------------|-------|----------|--|--|
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes principal content | 10 | | | | |
| Introduction demonstrates thorough knowledge of relevant background and prior work | 15 | | | | |
| Analysis and discussion demonstrate good subject mastery | 30 | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| Holis | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|----------------|------------------|------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem | Issue/ problem | Issue/ | Issue/ |
| | to be considered | to be considered | problem to | problem to be |
| | critically is | critically is | be | considered |
| Explanation of | stated clearly | stated, | considered | critically is |
| issues | and described | described, and | critically is | stated without |

| | | 1 10 1 | | |
|------------------|-------------------|-------------------|----------------|-----------------|
| | comprehensivel | clarified so that | stated but | clarification |
| | y, delivering all | understanding is | description | or |
| | relevant | not seriously | leaves some | description. |
| | information | impeded by | terms | |
| | necessary for | omissions. | undefined, | |
| | full | | ambiguities | |
| | understanding. | | unexplored, | |
| | understanding. | | boundaries | |
| | | | undetermine | |
| | | | | |
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | |
| | | | | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | | | | • |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | T1 | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| assamptions | position. | position. | , 010u). | Position. |

| | 1 | | | T |
|------------------|-----------------------------------|---------------------------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| 3) | hypothesis). | hypothesis). | Conclusion | obvious. |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | | | (because | inconsistently |
| | outcomes | logically tied to | information | tied to some |
| | (consequences | a range of information, | is chosen to | of the |
| | and implications) | · · · · · · · · · · · · · · · · · · · | fit the | information |
| | implications) | including | desired | discussed; |
| | are logical and reflect student's | opposing | | related |
| | | viewpoints; | conclusion); | |
| Conclusions | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Milestone | | Benchmark | |
|----------|-----------|---|-----------|--|
| 4 | 3 | 2 | 1 | |

| | Organizational | | | |
|--------------|-----------------|------------------|------------------|---------------------|
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |

| | A variety of | | | |
|------------|-----------------|--------------------------|------------------|-------------------|
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | _ | _ | _ | materials |
| | examples, | examples, illustrations, | examples, | |
| | illustrations, | ′ | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Algorithms and Data Structure

Course Code: IT013

1. General information

| Course designation | This subject introduces students to basic data structures and | | | | | - | |
|---|--|---|-------------|--------------|-----------|----------|----|
| | algorithm | S | | | | | |
| Semester(s) in which the course is taught | 4,6 | 4,6 | | | | | |
| Person responsible for the course | Dr. Tran | Or. Tran Thanh Tung | | | | | |
| Language | English | English | | | | | |
| Relation to curriculum | Compulso | ory (All progra | ams) | | | | |
| Teaching methods | Lecture, le | esson, project | , seminar. | | | | |
| Workload (incl. contact hours, self-study hours) | Contact he laboratory | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | |
| Credit points | | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | | |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming | | | | | | |
| Course objectives | | on to data strualysis, and in | | _ | ns, inclu | ding the | ir |
| Course learning outcomes | CLO 2. A | nderstand bas nalyze and ev esign algorith lications. | aluate data | a structure: | s and alg | gorithms | |
| | Comp | etency level | Course le | earning or | ıtcome | (CLO) | |
| | Know | ledge | CLO1 | | | | |
| | Skill | | CLO2, C | LO3 | | | |
| | Attitud | le | CLO3 | | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | | |
| | Topic | | | Weight | Level | | |
| | | Review OO | P & Java | 3 | I | | |
| | | Arrays | | 3 | Т | | |

| | | Complexity | 3 | T | |
|-------------------|---|---|-------------|-----------|----------|
| | | Sorting | 3 | T, U | |
| | | Queue, Stack | 3 | Т | |
| | | List | 6 | Т | |
| | | Recursion | 3 | T, U | |
| | | Advanced Sorting | 6 | T | |
| | | Binary Tree | 3 | T | |
| | | Hash Table | 3 | T | |
| | | Graphs | 3 | T | |
| | | Algorithms on graphs | 3 | T, U | |
| Examination forms | Short-ansv | wer questions | | | |
| Study and | | e: A minimum attendan | | | |
| examination | compulso | ry for the class sessions. | Students | will be a | ssessed |
| requirements | on the bas | sis of their class participa | ation. Que | stions an | nd |
| | comments | s are strongly encourage | d. | | |
| | Assignme | nts/Examination: Studen | nts must h | ave more | e than |
| | 50/100 po | ints overall to pass this | course. | | |
| Reading list | 1. Michael T. Goodrich and Roberto Tamassia, Data | | | | |
| | Structures and Algorithms in Java 6th, 2014 | | | | |
| | 2. Cormen, Thomas H., et al. Introduction to algorithms. MIT press, 2009. | | | | |
| | 3. Lafo | ore, Robert. Data structurs publishing, 2017. | res and alg | gorithms | in Java. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|-----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | XX | | | | | |
| 2 | | XXX | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|----------------------|-----|-----------------------|----------------------|-----------|
| 1 | Review OOP & Java | 1 | Quiz | Lecture | |
| 2 | Arrays | 1 | Lab, Quiz, Midterm | Lecture, Discussion, | [1,3] |

| | | | | In class | |
|----|------------------|-----|------------------|-------------|---------|
| | | | | exercises | |
| 3 | Commission | 2 | Quiz | Lecture, | [2] |
| 3 | Complexity | 2 | Quiz | Discussion | [2] |
| 4 | Sorting | 1,2 | Lab, Quiz, | Lecture, | [1,3] |
| • | Sorumg | | Midterm | Discussion, | |
| | | | | In class | |
| | | | | exercises | |
| 5 | Queue, Stack | 2,3 | Lab, Quiz, | Lecture, | [1,3] |
| | | | Midterm | Discussion, | |
| | | | | In class | |
| | | | | exercises | |
| 6 | List part 1 | 1,2 | Lab, Quiz, | Lecture, | [1,3] |
| | | | Midterm | Discussion, | |
| | | | | In class | |
| | | | | exercises | |
| 7 | List part 2 | 2,3 | Lab, Quiz, | Lecture, | |
| | | | Midterm | Discussion | |
| 8 | Recursion | 2,3 | Lab, Quiz, | Lecture, | [1,3] |
| | | | Midterm | Discussion, | |
| | | | | In class | |
| | | | | exercises | |
| 9 | Midterm | | | | |
| 10 | Advanced Sorting | 1,2 | Lab, Quiz, Final | Lecture, | [1,3] |
| | part 1 | | | Discussion, | |
| | | | | In class | |
| | | 2.0 | 7 1 0 1 71 1 | exercises | 54.0.07 |
| 11 | Advanced Sorting | 2,3 | Lab, Quiz, Final | Lecture, | [1,2,3] |
| | part 2 | | | Discussion | |
| 12 | Binary Tree | 1,2 | Lab, Quiz, Final | Lecture, | [1,3] |
| | - | | | Discussion, | |
| | | | | In class | |
| | | | | exercises | |
| 13 | Hash Table | 2,3 | Lab, Quiz, Final | Lecture, | [1,3] |
| | | | | Discussion | |
| 14 | Graphs | 1,2 | Lab, Quiz, Final | Lecture, | [2,3] |
| | | | | Discussion, | |
| | | | | In class | |
| | | | | exercises | |
| 15 | Algorithms on | 2,3 | Lab, Quiz, Final | Lecture, | [2,3] |
| | graphs | | | Discussion | |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | |
|-----------------|------|------|------|--|
|-----------------|------|------|------|--|

| Quiz (5%) | 20% | 5% | |
|--------------------------------------|-----|-----|-----|
| Labs (10%) | | 10% | |
| Midterm examination (30%) | 40% | 30% | 30% |
| Projects/Presentations/ Report (15%) | | 15% | 40% |
| Final examination (40%) | 40% | 40% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| Grading checkingt | | | | | | |
|---------------------------------------|----------------|--|--|--|--|--|
| Grading checklist for Written Reports | | | | | | |
| Student: | HW/Assignment: | | | | | |
| Date: | | | | | | |
| | Evaluator: | | | | | |
| | | | | | | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |

| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
|---|--|
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | _ |
| | | | is taken from | |
| | Information is | Information is | source(s) | |
| | taken from | taken from | with some | |
| | source(s) with | source(s) with | interpretation | |
| | enough | enough | / evaluation, | Information is |
| | interpretation/ | interpretation/ | but not | taken from |
| | evaluation to | evaluation to | enough to | source(s) |
| | develop a | develop a | develop a | without any |
| Evidence | comprehensive | coherent | coherent | interpretation/ |
| Selecting and | analysis or | analysis or | analysis or | evaluation. |
| using | synthesis. | synthesis. | synthesis. | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | Viewpoints | experts are |
| investigate a | experts are | experts are | of experts are | taken as fact, |
| point of view or | questioned | subject to | taken as | without |
| conclusion | thoroughly. | questioning. | mostly fact, | question. |

| | | | rrith 1:441 a | |
|------------------|-------------------|-------------------|---------------|----------------|
| | | | with little | |
| | | | questioning. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| ussumptions | Specific | position. | versu). | position. |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| Language | the | presentation. | the | Language in |

| | offootiveness | Language | nnagantation | mmagamtation is |
|--------------|-----------------|------------------|-----------------|--------------------|
| | effectiveness | Language in | presentation. | presentation is |
| | of the | presentation is | Language in | not appropriate |
| | presentation. | appropriate to | presentation is | to audience. |
| | Language in | audience. | appropriate to | |
| | presentation is | | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| 1/14/01/14/1 | are topic. | The topic. | are topic. | topic. |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Principles of Database Management

Course Code: IU079

1. General information

| 1. General informat | ION | | | | |
|--------------------------|---|---|--|--|--|
| Course designation | This course focuses on the design and implementation of | | | | |
| | database management systems | | | | |
| Semester(s) in | 4 | | | | |
| which the course is | | | | | |
| taught | | | | | |
| Person responsible | Assoc. Prof. Dr. Nguyer | Thi Thuy Loan | | | |
| for the course | | | | | |
| Language | English | | | | |
| Relation to | Compulsory (NE, CS,DS | S) | | | |
| curriculum | | | | | |
| Teaching methods | Lecture, lesson, project, | seminar. | | | |
| Workload (incl. | Total workload: 195 | | | | |
| contact hours, self- | | ecify whether lecture, exercise, | | | |
| study hours) | | 45 (lecture) + 30 (laboratory) | | | |
| | | examination preparation, specified in | | | |
| | hours: 120 | | | | |
| Credit points | Number of credits: 4 | | | | |
| | Lecture: 3 | | | | |
| Do aviand and | Laboratory: 1 | - ~) | | | |
| Required and recommended | IT116IU (C Programmii | ıg) | | | |
| prerequisites for | | | | | |
| joining the course | | | | | |
| Course objectives | This subject introduces t | the students to basic database design and | | | |
| Course objectives | 3 | s. Database design techniques, including | | | |
| | | R analysis, are presented. Database | | | |
| | • | overed in lectures and supported by | | | |
| | practical exercises. | 11 7 | | | |
| Course learning | - | ended) Entity-Relationship (E-R) model | | | |
| outcomes | from specifications. | | | | |
| | CLO 2. Apply data normalization principles to transforming an | | | | |
| | ER model into a database schema. | | | | |
| | CLO 3. Construct efficient SQL queries to retrieve and | | | | |
| | manipulate data as required. | | | | |
| | Competency level Course learning outcome (CLO) | | | | |
| | Knowledge | CLO1 | | | |
| | Skill | CLO2, CLO3 | | | |
| | Attitude | CLO3 | | | |
| | | | | | |

| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
|------------------------------------|--|---|------|--|--|--|
| | Topic Weight Level | | | | | |
| | Introduction to Database Systems | 3 | I | | | |
| | Relational Model and Relational Algebra | 6 | T, U | | | |
| | Structured Query Language | 6 | T, U | | | |
| | (Extended) Entity Relationship Model | 6 | T, U | | | |
| | Relational Database Design | 9 | T, U | | | |
| | Normalization | 6 | T, U | | | |
| | Advanced SQL | 6 | T, U | | | |
| | Review | 3 | I, U | | | |
| Examination forms | Multiple-choice questions, short-answer ques | | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | |
| Reading list | Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concept 7th, 2020 Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi, Modern Database Management 13th, 2019 Ramez Elmasri, Shamkant Navathe, Fundamentals of Database Systems 7th, 2016 | | | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|-----|---|---|----|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | XXX | | | | | |
| 2 | | XXX | | | X | |
| 3 | | XX | | | XX | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|----------------------------------|-----|-------------|---------------------|-----------|
| 1 | Introduction to Database Systems | 1 | Quiz | Lecture | [1,3] |

| 2 | Relational Model and relational Algebra | 2 | Quiz, Midterm, Project | Lecture, Discussion, In- class, exercise | [1,3] |
|----|---|-----|-----------------------------------|--|---------|
| 3 | Structured Query Language | 3 | Quiz, Lab, Project, Midterm | Lecture, Discussion, Inclass, exercise | [1,2,3] |
| 4 | (Extended) Entity Relationship Model | 2 | Quiz, Project, Midterm | Lecture, Discussion, Inclass, exercise | [1,2,3] |
| 5 | Midterm | | | | |
| 6 | Relational Database Design | 2,3 | Project, Final, Quiz, Lab | Lecture, Discussion, Inclass, exercise | [1,2] |
| 7 | Normalization | 2,3 | Quiz, Project, Final | Lecture, Discussion, Inclass, exercise | [2,3] |
| 8 | Advanced SQL | 3 | Quiz, Project, Final | Lecture, Discussion, In- class, exercise | [1,3] |
| 9 | Review | 2,3 | Quiz | Discussion, Inclass, exercise | [1,2,3] |
| 10 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Labs (10%) | | 10% | 20% |
| Midterm examination (25%) | 40% | | 20% |
| Quiz (5%) | 10% | 20% | |
| Projects/Presentations/ Report (20%) | 30% | 20% | 30% |
| Final examination (40%) | 20% | 50% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

1. Grading checklist

| -• | Grading encember | |
|----|-------------------|---------------------|
| | Grading checklist | for Written Reports |
| | Student: | HW/Assignment: |
| | Date: | |

| | Evaluator: | | |
|--|------------|-------|----------|
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| | * AAVAIUME I WOLLE | | | | |
|-------|--|--|--|--|--|
| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|-----------------------|------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem | Issue/ problem | Issue/ | Issue/ |
| | to be considered | to be considered | problem to | problem to be |
| | critically is | critically is | be | considered |
| | stated clearly | stated, | considered | critically is |
| Explanation of | and described | described, and | critically is | stated without |
| issues | comprehensivel | clarified so that | stated but | clarification |

| | v dolivania - all | undanstandina i- | dosomintion | 0.0 |
|------------------|-------------------|------------------|----------------|-------------------|
| | y, delivering all | understanding is | description | Or description |
| | relevant | not seriously | leaves some | description. |
| | information | impeded by | terms | |
| | necessary for | omissions. | undefined, | |
| | full | | ambiguities | |
| | understanding. | | unexplored, | |
| | | | boundaries | |
| | | | undetermine | |
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| | - | _ | taken as | _ |
| information to | Viewpoints of | Viewpoints of | | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | G1 |
| | | | assumptions. | Shows an |
| | TD1 1.1 | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present . |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |

| | a .c. | | | |
|------------------|-------------------|-------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A variety of | | | |
|------------|-----------------|--------------------------|------------------|-------------------|
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | _ | _ | _ | materials |
| | examples, | examples, illustrations, | examples, | |
| | illustrations, | ′ | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Computer Architecture

Course Code: IT089

1. General information

| Course designation | This course introduces the principles of computer organization |
|---|---|
| | and the basic computer architecture. |
| Semester(s) in which the course is taught | 4 |
| Person responsible for the course | Dr. Le Hai Duong |
| Language | English |
| Relation to curriculum | Compulsory (CS, NE, CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Digital Logic Design |
| Course objectives | This course provides students the principles of computer architecture and organization. It covers the subjects on assembly language and machine code, computer arithmetic and ALU design, computer performance, datapath and control, pipelining, memory hierarchy, I/O devices, multi-processor architectures, and mobile and multi-core processors. |
| Course learning outcomes | CLO 1. Understand the principles of computer architecture and the interfaces between its hardware and software components; CLO 2. Understand computer arithmetic (both integer and floating point), datapath, control, pipelining, pipeline hazards and their remedies, computer buses and I/O peripherals, and multiprocessor architecture; |

| | CLO 3. Create assembly programs and their machine code equivalent; CLO 4. Analyze the performance of computer; CLO 5. Analyze computer memory and its organization, especially the interaction between cache and main memory. Competency level Course learning outcome (CLO) Knowledge CLO1, CLO2 Skill CLO3, CLO4, CLO5 Attitude | | | | .O) | |
|------------------------------------|--|--|-------------------------|------------|----------|--|
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
| | His | pic story of computers, red I hardware componer | Weight 1 | Level I | | |
| | As | sembly language inst | ructions | 5 | T, U | |
| | | mputer arithmetic pr | inciples and hardware | 1 | Т | |
| | Co | mputer performance | | 1 | T,U | |
| | Da | tapath and its control | | 2 | T | |
| | Mi | croprocessor pipelini | ing | 2 | T, U | |
| | Me | emory hierarchy | | 1 | T | |
| | I/C | devices and buses | | 1 | T | |
| | Μι | ıltiprocessor | | 1 | T | |
| Examination forms | Mul | tiple-choice question | s, short-answer questic | ons | <u>l</u> | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | |
| Reading list | | | and John L. Hennessy | , Compute | er | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SL | O | | | | |
|-----|----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |

| 2 | X | | | |
|---|---|---|--|---|
| 3 | | X | | X |
| 4 | X | | | |
| 5 | X | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|------|-------------|-------------------------|-----------|
| 1 | History of computers, relations of software and hardware components; | 1 | Quiz, exam | Lecture | [1] |
| 2 | Assembly language instructions | 3 | Quiz, exam | Lecture, lab, exercises | [1] |
| 3 | Computer arithmetic principles and hardware design | 2 | Quiz, exam | Lecture, exercises | [1] |
| 4 | Midterm | | | | |
| 5 | Computer performance | 4 | Quiz, exam | Lecture, exercises | [1] |
| 6 | Datapath and its control | 1, 2 | Quiz, exam | Lecture, exercises | [1] |
| 7 | Microprocessor pipelining | | Quiz, exam | Lecture, exercises | [1] |
| 8 | Memory hierarchy | 5 | Quiz, exam | Lecture, exercises | [1] |
| 9 | I/O devices and buses | 2 | Quiz, exam | Lecture, exercises | [1] |
| 10 | Multiprocessor | 2 | Quiz, exam | Lecture, exercises | [1] |
| 11 | Final exam | | | | |

1. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 |
|---------------------------|------|------|------|------|------|
| Midterm examination (30%) | 70% | 70% | 25% | | |
| Final examination (40%) | | | 50% | 70% | 70% |
| Exercises/ Quiz (30%) | 30% | 30% | 25% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

^{1.} When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual

questions to lecturers after the class, all mean that about 60 minutes should be counted.

1. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------------|----------|-----------------|--|--|
| Student: | HW/A | Assignme | ent: | | |
| Date: | • • • • • • | | •• | | |
| | Evalu | ıator: | | | |
| | | | • • • • • • • • | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

TOTAL SCORE

10

100

Note: this rubric is also used to evaluate questions in an exam.

Quality of Layout and Graphics (10%)

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|------------------|--|---|--|--|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensivel y, delivering all relevant information | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermine | Issue/ problem to be considered critically is stated without |
| Explanation of | necessary for full | not seriously impeded by | d, and/ or backgrounds | clarification or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/ evaluation to develop a | Information is taken from source(s) with enough interpretation/ evaluation to develop a | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent analysis or | Information is taken from source(s) without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |

| | | | 0 | |
|------------------|-------------------|------------------------------|----------------------------|----------------|
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | | others' | • |
| | | assumptions and | | identify some |
| T (9) | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when . |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | | | thesis/ |
| position | within position | acknowledged within position | hypothesis) acknowledge | |
| _ | • | * | s different | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different sides of an | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | Conclusions | Conclusion is | Conclusion | Conclusion is |
| Complete | and related | logically tied to | is logically | inconsistently |
| Conclusions | outcomes | a range of | tied to | tied to some |
| and related | (consequences | information, | information | of the |
| outcomes | and | including | (because | information |
| (implications | implications) | opposing | information | discussed; |
| and | are logical and | viewpoints; | is chosen to | related |
| consequences) | reflect student's | related | fit the | outcomes |

| informed | outcomes | desired | (consequence |
|------------------|----------------|----------------|---------------|
| evaluation and | (consequences | conclusion); | s and |
| ability to place | and | some related | implications) |
| evidence and | implications) | outcomes | are |
| perspectives | are identified | (consequence | oversimplifie |
| discussed in | clearly. | s and | d. |
| priority order. | - | implications) | |
| | | are identified | |
| | | clearly. | |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Miles | | Benchmark |
|--------------|------------------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |

| | D 1' | | | |
|------------------------|-----------------|------------------|------------------|----------------------------------|
| | Delivery | D 11 | D 1' | |
| | techniques | Delivery | Delivery | - · |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | | | | |
| | presenter's | presenter's | presenter's | presenter's |
| Supporting | credibility/ | credibility/ | credibility/ | credibility/ authority on the |
| Supporting Material | authority on | authority on | authority on | - |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | Control | |
| | message is | Control | Central | Control |
| | compelling | Central | message is | Central message |
| | (precisely | message is | basically | can be deduced |
| | stated, | clear and | understandable | but is not |
| Comtaci | appropriately | consistent with | but is not often | explicitly stated |
| Central | repeated, | the supporting | repeated and is | in the |
| Message | memorable, | material. | not memorable. | presentation. |

| and strongly supported.) | | |
|--------------------------|--|--|
| | | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Computer Networks

Course Code: IT091IU

1. General information

| Course designation | This subject covers the finetworks | fundamental knowledge of computer | | | | |
|---|---|-----------------------------------|--|--|--|--|
| Semester(s) in which the course is taught | 3,5 | | | | | |
| Person responsible for the course | Assoc. Prof. Vo Thi Lui | ı Phuong. | | | | |
| Language | English | | | | | |
| Relation to curriculum | Compulsory (CS, NE, C | EE) | | | | |
| Teaching methods | Lecture, lesson, project, | seminar. | | | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | | | | | |
| Required and recommended prerequisites for joining the course | C/C++ Programming or Fundamentals of Programming | | | | | |
| Course objectives | This course covers the fundamental knowledge of computer networks such as OSI, TCP/IP models, network architectures, LAN, WAN, the typical network protocols. The students will also study to design, implement and monitor a small / medium scale network. | | | | | |
| Course learning outcomes | CLO 1. Analyze the components, architecture, and protocols in computer networks; CLO 2. Apply the theory in designing a small/medium computer networks; CLO 3. Show the ability to work in teams; | | | | | |
| | Competency level Course learning outcome (CLO) | | | | | |
| | Knowledge | CLO1 | | | | |
| | Skill | CLO2, CLO3 | | | | |
| | Attitude | CLO2 | | | | |

| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
|------------------------------------|--|-----------|-------|--|--|--|
| | Topic | Weight | Level | | | |
| | Introduction of computer networks | 2 | T, U | | | |
| | Network applications: HTTP, FTP, DNS, SMTP | | | | | |
| | Transport layer: congestion control, TCP, UDP | | | | | |
| | IP addressing, CIDR, VLSM 2 | | | | | |
| | Network layer: routing algorithms, routing protocols | 2 | T, U | | | |
| | Datalink layer and physical layer | 2 | T, U | | | |
| | Wireless and mobile networks | 2 | T | | | |
| | Some advanced topics in contemporary networks | 1 | U | | | |
| Examination forms | Multiple-choice questions, short-answer quest | ions | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly | | | | | |
| requirements | encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | |
| Reading list | 1. J. F. Kurose and K. W. Ross, Computer Top Down Approach 7th, 2014 | Networkin | g: A | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|------------|------------|---|---|----------|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | \ \ | | | | | |
| 2 | | /// | | | | |
| 3 | | | | | √ | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|-----------------------------------|-----|-------------|---------------------|----------------|
| 1-2 | Introduction of computer networks | 1 | Midterm | lecture | Chapter 1, [1] |

| 3-4 | Network applications: HTTP, FTP, DNS, SMTP | 1 | Midterm, Lab | lecture, lab | Chapter 2, [1] |
|-------|--|-----|------------------|--------------|----------------|
| 5-6 | Transport layer: congestion control, TCP, UDP | 1 | Midterm, Lab | lecture, lab | Chapter 3, [1] |
| | Midterm | | | | |
| 7-8 | IP addressing, CIDR, VLSM | 2 | Final, Lab | lecture, lab | Chapter 4, [1] |
| 9-10 | Network layer: routing algorithms, routing protocols | 1,2 | Final, Lab | lecture, lab | Chapter 5, [1] |
| 11-12 | Datalink layer and physical layer | 1,2 | Final, Lab | lecture, lab | Chapter 6, [1] |
| 13-14 | Wireless and mobile networks | 1 | Final | lecture | Chapter 7, [1] |
| 15 | Some advanced topics in contemporary networks | 3 | Group project | group work | Literature |
| 10 | Final exam | | | | |

4.

Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Exercises, quizzes, attendants (10%) | 30% | | 30% |
| Group project (5%) | | 30% | 40% |
| Labs (25%) | | 30% | 30% |
| Midterm examination (30%) | 40% | | |
| Final examination (30%) | 30% | 40% | |

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | | |
|---------------------------------------|----------------|-------|----------|--|--|--|
| Student: | HW/Assignment: | | | | | |
| Date: | | | | | | |
| | Evaluator: | | | | | |
| | •••• | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |

| Abstract clearly identifies purpose and summarizes principal content | 10 | |
|--|-----|--|
| Introduction demonstrates thorough knowledge of relevant background and prior work | 15 | |
| Analysis and discussion demonstrate good subject mastery | 30 | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | Milestone | |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem | Issue/ problem | Issue/ | Issue/ |
| | to be considered | to be considered | problem to | problem to be |
| | critically is | critically is | be | considered |
| | stated clearly | stated, | considered | critically is |
| | and described | described, and | critically is | stated without |
| | comprehensivel | clarified so that | stated but | clarification |
| Explanation of | y, delivering all | understanding is | description | or |
| issues | relevant | not seriously | leaves some | description. |

| | information necessary for full understanding. | impeded by omissions. | terms undefined, ambiguities unexplored, boundaries undetermine d, and/ or backgrounds unknown. | |
|---|---|---|---|---|
| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. Questions | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question. |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |

| | Cracific | | | |
|------------------|-------------------|-------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | ~ | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A required | | | |
|------------|-----------------|-------------------|------------------|-------------------|
| | A variety of | | | |
| | types of | g .: | a .: | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |
| <u> </u> | | Callagae and Univ | | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Web Application Development

Course Code: IT093

1. General information

| Course designation | This subject introduces to students the development of web application. How to design and program a web-app in practice based on the tools, techniques and web frameworks |
|---|---|
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Assoc. Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | Compulsory (NE, CE, CS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming Principles of Database Management |
| Course objectives | This course provides students the fundamentals of web design and web programming. It provide the concepts and models of HTML, Java Server Page, Java Bean, MVC model, Java utilities and development environments, extended Java frameworks, several new frameworks with different programming languages. To develop skills in understanding and evaluating web-based systems, as well as to develop skills in designing and developing web-based applications. |
| Course learning outcomes | CLO 1. Understand web design, web programming concepts and models. CLO 2. Apply to design and develop static/dynamic web application with HTML, Java Server Pages, Java Bean, extended Java and other frameworks based on the MVC model. CLO 3. Apply knowledge and ability to manage and use Java, XML utilities and IDE for developing web applications with DBMS. |

| | CLO 4: work in group, communication, interaction within a team. | on and respons | sible |
|-----------------------|---|----------------|-----------|
| | Competency level Course learning ou | itcome (CLO) |) |
| | Knowledge CLO1 | | |
| | Skill CLO2, CLO3 | | |
| | Attitude CLO4 | | |
| Content | The description of the contents should clearly incented the content and the level. Weight: lecture session (3 teaching hours) Teaching levels: I (Introduce); T (Teach); U (Uti | lize) | |
| | Topic | Weight | |
| | Week 1: Introduction to the course and HTML | 3 | I,T |
| | Week 2: Advanced HTML and CSS | 3 | I,T,U |
| | Week 3: Introduction to J2EE and new frameworks in web application | 3 | I,T |
| | Week 4 : Servlet | 3 | I,T,U |
| | Week 5: Java server page and JDBC | 3 | I,T,U |
| | Week 6: Java Bean and MVC | 3 | I,T,U |
| | Week 7: Web state, session, cookies & midterm review | 3 | I,T,U |
| | Week 8: Java Script, APIs and Libraries | 3 | I,T,U |
| | Week 9&10: Node JS Framework | 3 | I,T,U |
| | Week 11: Graphical models on the webpage, we multimedia and web 360 | eb 3 | I,T,U |
| | Week 12&13: XML & XSLT | 3 | I,T,U |
| | Week 14: Ajax framework | 3 | I,T,U |
| | Week 15: the existing web frameworks & final review | 3 | I,T,U |
| Examination forms | Multiple-choice questions, short-answer question | ns and progran | nming |
| Study and examination | Attendance: A minimum attendance of 80 percer the class sessions. Students will be assessed on the class sessions. | | |
| requirements | participation. Questions and comments are strong Assignments/Examination: Students must have a points overall to pass this course. | | |
| Reading list | 1. Dave Wolf and A.J. Henley. "Java EE Web Primer Building Bullhorn: A Messaging A JavaScript, Bootstrap and Oracle", 2017. | pp with JSP, S | Servlets, |
| | 2. Prem Kumar Karunakaran. "Java Web App Development", second edition, 2020. | olication | |

- **3.** Laura Ubelhor and Christian Hur. "Developing Business Application for the Web With HTML, CSS, JSP, PHP, ASP.NET and JavaScript", 2017.
- **4.** Refer VN book: N.V.Sinh, N.T.T.Sang, T.M.Hà "Xây dựng ứng dụng Web cho Thương mại điện tử trên Netbeans", Nhà xuất bản Xây dựng 2017

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | | X | | | | |
| 3 | | X | | | | X |
| 4 | | | | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-------|----------------------------|---|-----------|
| 1 | Introduction to the course and HTML | 1 | Quiz | Lecture, | [1,2] |
| 2 | Advanced HTML and CSS | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3] |
| 3 | Introduction to J2EE and new frameworks in web application | 1 | Quiz, Midterm | Lecture, Discussion | [1,2] |
| 4 | Servlet | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 5 | Java server page and JDBC | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 6 | Java Bean and MVC | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |

| 7 | Web state, session, cookies & midterm review | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
|----|---|-------|----------------------------|---|-----------|
| 8 | Java Script, APIs and Libraries & midterm review | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 9 | Node JS Framework | 2,3 | Quiz, Lab | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 10 | Node JS Framework (continue) | 2,3 | Quiz, Lab | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 11 | Graphical models on the webpage, web multimedia and web 360 | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 12 | XML & XSLT | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 13 | XML & XSLT (continue) | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 14 | Ajax framework | 2,3 | Quiz, Lab | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 15 | Existing web frameworks & final review | 2,3 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (20%) | | 30% | 40% | 30% |
| Midterm examination (30%) | 40\$ | 60% | | |
| Exercises/Quiz (10%) | 30% | 40% | 30% | |
| Final examination (40%) | | 50% | 50% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------|----------------|----------|--|--|
| Student: | HW/A | HW/Assignment: | | | |
| Date: | | | | | |
| | Evalu | ator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCOPE | 100 | | | | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|-------|--|--|--|--|--|--|
| Score | Description | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | | |
| | are included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | | |
| | task are included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | | |
| | are included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | | |
| | are missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark | |
|--------------|-----------|---|-----------|--|
| 4 | 3 | 2 | 1 | |

| | | | T/ | |
|-----------------------|----------------------------|-------------------|---------------------------|--------------------|
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | _ | described, and | _ | considered |
| | y, delivering all relevant | , | unexplored, boundaries | |
| | | clarified so that | | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using und | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| | _ | • | | |
| conclusion | thoroughly. | questioning. | questioning. | question. Shows an |
| | Th one1-1 | | Questions | |
| | Thoroughly | | some | emerging |
| | (systematically | | assumptions. | awareness of |
| | and | | Identifies | present |
| | methodically) | T1 | several | assumptions |
| | analyzes own | Identifies own | relevant | (sometimes |
| | and others' | and others' | contexts | labels |
| | assumptions | assumptions and | when | assertions as |
| | and carefully | several relevant | presenting a | assumptions). |
| Influence of | evaluates the | contexts when | position. | Begins to |
| context and | relevance of | presenting a | May be more | identify some |
| assumptions | contexts when | position. | aware of | contexts |

| | · · | | .1 1 | 1 |
|------------------|-----------------------------------|------------------------------|------------------------------|-----------------------------|
| | presenting a | | others' | when |
| | position. | | assumptions | presenting a |
| | | | than one's | position. |
| | | | own (or vice | |
| | | | versa). | |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| 3) | hypothesis). | hypothesis). | Conclusion | obvious. |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | | (because | |
| | (consequences | logically tied to | information | inconsistently tied to some |
| | and | a range of information, | is chosen to | of the |
| | | including | fit the | information |
| | implications) | _ | desired | discussed; |
| | are logical and reflect student's | opposing | conclusion); | related |
| | informed | viewpoints; related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | |
| and related | ability to place | | (consequence | (consequence s and |
| outcomes | evidence and | (consequences and | s and | |
| (implications | | | | implications) |
| and | perspectives discussed in | implications) are identified | implications) are identified | are |
| | | | | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|------------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | | Delivery | Delivery | |
| | Delivery | techniques | techniques | Delivery |
| | techniques | (posture, | (posture, | techniques |
| | (posture, | gesture, eye | gesture, eye | (posture, gesture, |
| | gesture, eye | contact, and | contact, and | eye contact, and |
| | contact, and | vocal | vocal | vocal |
| | vocal | expressiveness) | expressiveness) | expressiveness) |
| | expressiveness) | make the | make the | detract from the |
| | make the | presentation | presentation | understandability |
| | presentation | interesting, and | understandable, | of the |
| | compelling, | speaker | and speaker | presentation, and |
| | and speaker | appears | appears | speaker appears |
| Delivery | appears | comfortable. | tentative. | uncomfortable. |

| | polished and | | | |
|------------|-----------------|-----------------|------------------|-------------------|
| | confident. | | | |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central . | G 1 |
| | stated, | Central . | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Operating Systems

Course Code: IT017IU

1. General information

| Course designation | This course covers fundamental concepts of operating systems including scheduling, virtual memory and file systems. |
|---|--|
| Semester(s) in which the course is taught | 5,7 |
| Person responsible for the course | Dr. Le Hai Duong |
| Language | English |
| Relation to curriculum | Compulsory (NE, CE, CS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Algorithms and Data Structure Computer Architecture |
| Course objectives | This course presents the theory, design, implementation, and analysis of computer operating systems. Through classroom lectures, labs, projects and exercises, students learn the fundamentals of concurrency and process management, interprocess communication and synchronization, memory management, job scheduling algorithms, input/output management, file systems, security in operating systems. Course labs use the C/C++ language and include the design and implementation of portions of an operating system. |
| Course learning outcomes | CLO 1. Understand processes and process management CLO 2. Understand synchronization and communication CLO 3. Understand memory management |

| | CLO 4. Given a scheduling algorithm, determine timeline of | | | | | |
|-------------------|--|---------------------------------------|--------------|----------|--|--|
| | actions | 1 (("1) | | | | |
| | CLO 5. Understand inte | <u>-</u> | | va4 a | | |
| | CLO 6. Design and imp | | | | | |
| | Competency level | | | | | |
| | Knowledge | | | | | |
| | Skill | Skill CLO6 | | | | |
| | Attitude | | | | | |
| Content | The description of the co | | ndicate the | 2 | | |
| | weighting of the content | | | | | |
| | Weight: lecture session | | | | | |
| | Teaching levels: I (Intro | oduce); T (Teach); U (U | | 11 | | |
| | Topic | | Weight | Level | | |
| | Introduction, processes | s, process management | 2 | T | | |
| | Threads | Threads | | | | |
| | Inter-process communi | Inter-process communication (IPC) and | | | | |
| | synchronization, deadle | ocks | | | | |
| | Memory management | Memory management | | | | |
| | process scheduling | | 2 | T | | |
| | Input/output and disk r | nanagement | 1 | T | | |
| | File systems | | 2 | T,U | | |
| | Security in operating sy | ystems | 1 | T,U | | |
| | Embedded operating sy | ystems | 1 | T | | |
| | Distributed system issu | ies | 1 | T | | |
| Examination forms | Multiple-choice question | ns, short-answer questic | ons | | | |
| Study and | Attendance: A minimun | • | • | | | |
| examination | for the class sessions. St | | | | | |
| requirements | their class participation. | Questions and commer | its are stro | ngly | | |
| | encouraged. | | | | | |
| | Assignments/Examination | | more than | 1 50/100 | | |
| Panding list | points overall to pass the | | 1.1 ' | | | |
| Reading list | 1. W. Stallin, Operat principles 7th, 201 | ing Systems: Internals a | ınd design | | | |
| | 2. A.S. Tanenbaum, | Modern Operating Syst | ems 3rd, 2 | 2008 | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| SLO |
|-----|
|-----|

| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
|-----|---|---|---|---|---|---|
| 1 | X | | | | | |
| 2 | X | | | | | |
| 3 | X | | | | | |
| 4 | | X | | | | |
| 5 | X | | | | | |
| 6 | | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-----|-------------|-------------------------|-----------|
| 1 | Introduction, processes, process management | 1 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 2 | Threads | 1 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 3 | Inter-process communication (IPC) and synchronization, deadlocks | 2 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 4 | Memory management | 3 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 5 | Midterm | | | | |
| 6 | process scheduling | 4 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 7 | Input/output and disk management | 5 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 8 | File systems | 5 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 9 | Security in operating systems | 6 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 10 | Embedded operating systems | 6 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 11 | Distributed system issues | 6 | Quiz, exam | Lecture, exercises, lab | [1], [2] |
| 12 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 |
|--------------------------------------|------|------|------|------|------|------|
| Midterm examination (30%) | 10% | 10% | 10% | | | |
| Projects/Presentations/ Report (20%) | 3% | 3% | | 4% | | 10% |
| Final examination (40%) | | | 18% | 17% | 15% | |
| Exercises/ Quiz (10%) | 2% | 2% | 2% | 2% | 2% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Writt | en Kepo | orts | |
|--|-------------|----------|-----------------|
| Student: | HW/A | Assignme | ent: |
| Date: | | | •• |
| | Evalu | iator: | |
| | • • • • • • | | • • • • • • • • |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW

| Score | Description |
|-------|--|
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|-----------------------|-------------------|-------------------|----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is | Information is | Information | |
| | taken from | taken from | is taken from | Information is |
| | source(s) with | source(s) with | source(s) | taken from |
| | enough | enough | with some | source(s) |
| | interpretation/ | interpretation/ | interpretation | without any |
| Evidence | evaluation to | evaluation to | / evaluation, | interpretation/ |
| Selecting and | develop a | develop a | but not | evaluation. |
| using | comprehensive | coherent | enough to | Viewpoints of |
| information to | analysis or | analysis or | develop a | experts are |
| investigate a | synthesis. | synthesis. | coherent | taken as fact, |
| point of view or | Viewpoints of | Viewpoints of | analysis or | without |
| conclusion | experts are | experts are | synthesis. | question. |

| | questioned thoroughly. | subject to questioning. | Viewpoints of experts are taken as | |
|---|---|---|---|---|
| | | | mostly fact, with little questioning. | |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are | Specific position (perspective, thesis/hypothesi s) takes into account the complexities of an issue. Others' points of view are | Specific position (perspective, thesis/ | Specific position (perspective, |
| Student's position (perspective, thesis/hypothesis) | synthesized within position (perspective, thesis/ hypothesis). | acknowledged within position (perspective, thesis/hypothesis). | hypothesis) acknowledge s different sides of an issue. | thesis/ hypothesis) is stated, but is simplistic and obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Milestone | | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| Language | the | presentation. | the | Language in |

| | effectiveness | Languagain | nragantation | nragantation is |
|-------------|-----------------|------------------|-----------------|--------------------|
| | of the | Language in | presentation. | presentation is |
| | | presentation is | Language in | not appropriate |
| | presentation. | appropriate to | presentation is | to audience. |
| | Language in | audience. | appropriate to | |
| | presentation is | | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | | Commontable. | tentative. | unconnortable. |
| | A variety of | | | |
| | types of | C | C | |
| | supporting | Supporting | Supporting | T 00' ' |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| 11111111111 | are topic. | are topic. | and topic. | i copie. |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Net-centric Programming

Course Code: IT096IU

1. General information

| 1. General information | T | | |
|---|---|-------------------------|--|
| Course designation | Advanced programming course with focus on developing network application | | |
| Semester(s) in which the course is taught | 6 | | |
| Person responsible for the course | MSc. Le Thanh Son | | |
| Language | English | | |
| Relation to curriculum | Compulsory (NE) Elective (CS) | | |
| Teaching methods | Lecture | | |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | |
| Credit points | Number of credits : 4 Lecture: 2 Laboratory: 1 Mini project: 1 | | |
| Required and recommended prerequisites for joining the course | Computer Networks | | |
| Course objectives | Advanced programming with a focus on developing software for networked systems using UNIX as a reference platform. Topics: Socket Programming using TCP and UDP, Network Application development using popular Internet protocols such as HTTP, FTP Completing the mini project will help students gain a deeper understanding of current trends of Network Applications in the industry. | | |
| Course learning outcomes | CLO 1. Understand the structure of network applications CLO 2. Able to develop network applications using TCP and UDP sockets CLO 3. Understand and implement network applications using popular Internet protocols CLO 4. Team working | | |
| | Competency level | Course learning outcome | |
| | | (CLO) | |
| | Knowledge | 1, 2, 3 | |
| | Skill | 2, 3 | |
| | Attitude | 4 | |

| Content | The description of the contents should cle | arly indicate | e the | | | |
|-----------------------|--|--|-------------|--|--|--|
| | weighting of the content and the level. | | | | | |
| | Weight: lecture session (3 hours) | | | | | |
| | Teaching levels: I (Introduce); T (Teach); | U (Utilize) | | | | |
| | Topic | Weight | Level | | | |
| | Network revisions | 3 | I | | | |
| | TCP Socket Programming | 3 | T, U | | | |
| | UDP Socket Programming | 3 | T, U | | | |
| | Data Serialization | 3 | T, U | | | |
| | Application Protocols | 3 | T, U | | | |
| | HTTP services | 3 | T, U | | | |
| | Working with Databases 3 T, U | | | | | |
| | Working with Cloud services 3 T, U | | | | | |
| | Web Scrapping | Web Scrapping 3 T, U | | | | |
| | Web Socket | 3 | T, U | | | |
| | Network applications in the industry | Network applications in the industry 12 T, U | | | | |
| | Mini Project Presentation | 3 | U | | | |
| Examination forms | Multiple-choice questions, short-answer | questions | | | | |
| Study and examination | Attendance: A minimum attendance of 80 | | | | | |
| requirements | for the class sessions. Students will be ass | | | | | |
| | their class participation. Questions and co | mments are | strongly | | | |
| | encouraged. | . 1 | .1 50/100 | | | |
| | Assignments/Examination: Students must | i nave more | tnan 50/100 | | | |
| Dooding list | points overall to pass this course. | 1 FGD/ | /TD 0 1 1 | | | |
| Reading list | 1. Michael J.Donahoo, Kenneth L.Calvert, TCP/IP Socket in C: A Practical Guide for Programmers 2nd, 2009 | | | | | |
| | 2. W. R. Stevens, B. Fenner, A. M. Rudoff, Unix Network | | | | | |
| | Programming, Vol. 1: The Sockets Networking API 3rd, 2003 | | | | | |
| | 3. Brandon Rhodes, Foundations of Programming 3rd, 2014 | Python Netw | vork | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SLO | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|---|-----|---|---|---|---|
| 1 | X | | | | | |
| 2 | | XX | | | | |
| 3 | | XXX | | | | |
| 4 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------------|---------------------------------------|------|--------------|-----------------------------------|-----------|
| 1 | Network revisions | 1 | Homework | Lecture | 2 |
| 2 | TCP Socket Programming | 2 | Homework | Lecture, Discussion, Quiz | 1, 2 |
| 3 | UDP Socket Programming | 2 | Homework | Lecture, Discussion, Quiz | 1, 2 |
| 4 | Data Serialization | 2 | Homework | Lecture, Discussion, Quiz | 2, 3 |
| 5 | Application Protocols | 2 | Homework | Lecture, Discussion, Quiz | 2, 3 |
| 6 | HTTP Services | 2 | Homework | Lecture, Discussion, Quiz | 2, 3 |
| 7 | Working with Databases | 3 | Homework | Lecture, Discussion, Quiz | 2, 3 |
| 8 | Working with Cloud services | 3 | Homework | Lecture, Discussion, Quiz | |
| Midter | m exam | | | | • |
| 9 | Web Scrapping | 3 | Homework | Lecture, Discussion, Quiz | 2, 3 |
| 10 | Web Socket | 3 | Homework | Lecture, Discussion, Quiz | 2, 3 |
| 11 - 14 | Network Applications in the Industry | 3, 4 | Homework | Lecture, Discussion, Presentation | 2, 3 |
| 15 | Mini project Demo and Presentation | 3,4 | Presentation | Test | |
| Final e | xam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Mini project (20%) | | 10% | 30% | 100% |
| Labs, Quizzes (20%) | 30% | 30% | 20% | |
| Midterm examination (30%) | 70% | 40% | | |
| Final examination (30%) | | 20% | 50% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | |
|---------------------------------------|--|

^{1.} When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

| Student: HW/Assignment: | • | | | | | | |
|--|---|-------|----------|--|--|--|--|
| Date: Evaluator: | Date: Evaluator: | | | | | | |
| | Max. | Score | Comments | | | | |
| Technical content (60%) | | | | | | | |
| Abstract clearly identifies purpose and summarizes principal | 10 | | | | | | |
| content | | | | | | | |
| Introduction demonstrates thorough knowledge of relevant | 15 | | | | | | |
| background and prior work | | | | | | | |
| Analysis and discussion demonstrate good subject mastery | 30 | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | | |
| Organization (10%) | | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | | | |
| Presentation (20%) | | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | | |
| Clear and easy to read | 10 | | | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | | | |

TOTAL SCORE

100

5.2.Holistic rubric

| | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|------|---|--|--|--|--|
| Scor | Description | | | | |
| e | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3.Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Mile | estone | Benchmark |
|-------------|--------------------------|--------------------|----------------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | Issue/ problem to | Issue/ problem to | |
| | | be considered | be considered | |
| | Issue/ problem to be | critically is | critically is stated | |
| | considered critically is | stated, described, | but description | Issue/ problem |
| | stated clearly and | and clarified so | leaves some terms | to be |
| | described | that | undefined, | considered |
| | comprehensively, | understanding is | ambiguities | critically is |
| | delivering all relevant | not seriously | unexplored, | stated without |
| Explanation | information necessary | impeded by | boundaries | clarification or |
| of issues | for full understanding. | omissions. | undetermined, and/ | description. |

| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. Identifies own and others' assumptions and several relevant contexts when | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question. Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when |
|---|--|--|--|---|
| context and | when presenting a | presenting a | than one's own (or | presenting a |
| assumptions | position. Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. | vice versa). | position. Specific |
| | position (perspective, | Others' points of | | position |
| | thesis/ hypothesis) are | view are | Specific position | (perspective, |
| Student's | acknowledged. Others' | acknowledged | (perspective, thesis/ | thesis/ |
| position | points of view are | within position | hypothesis) | hypothesis) is |
| (perspective, | synthesized within | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | position (perspective, | thesis/ | different sides of an | simplistic and |
| esis) | thesis/ hypothesis). | hypothesis). | issue. | obvious. |

| | | Conclusion is | Conclusion is | Conclusion is |
|---------------|------------------------|---------------------|---------------------|-----------------|
| | | logically tied to a | logically tied to | inconsistently |
| | Conclusions and | range of | information | tied to some of |
| | related outcomes | information, | (because | the information |
| | (consequences and | including | information is | discussed; |
| Conclusions | implications) are | opposing | chosen to fit the | related |
| and related | logical and reflect | viewpoints; | desired | outcomes |
| outcomes | student's informed | related outcomes | conclusion); some | (consequences |
| (implications | evaluation and ability | (consequences | related outcomes | and |
| and | to place evidence and | and implications) | (consequences and | implications) |
| consequences | perspectives discussed | are identified | implications) are | are |
|) | in priority order. | clearly. | identified clearly. | oversimplified. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | | stone | Benchmark |
|--------------|--------------------|--------------------|--------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | | | |
| | conclusion, | Organizational | | |
| | sequenced | pattern (specific | Organizational | |
| | material within | introduction and | pattern (specific | |
| | the body, and | conclusion, | introduction and | Organizational |
| | transitions) is | sequenced | conclusion, | pattern (specific |
| | clearly and | material within | sequenced | introduction and |
| | consistently | the body, and | material within | conclusion, |
| | observable and is | transitions) is | the body, and | sequenced |
| | skillful and | clearly and | transitions) is | material within |
| | makes the content | consistently | intermittently | the body, and |
| | of the | observable | observable | transitions) is not |
| | presentation | within the | within the | observable within |
| Organization | cohesive. | presentation. | presentation. | the presentation. |
| | | | Language | |
| | Language choices | Language | choices are | |
| | are imaginative, | choices are | mundane and | Language choices |
| | memorable, and | thoughtful and | commonplace | are unclear and |
| | compelling, and | generally | and partially | minimally support |
| | enhance the | support the | support the | the effectiveness |
| | effectiveness of | effectiveness of | effectiveness of | of the |
| | the presentation. | the presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| | Delivery | Delivery | Delivery | Delivery |
| | techniques | techniques | techniques | techniques |
| | (posture, gesture, | (posture, gesture, | (posture, gesture, | (posture, gesture, |
| | eye contact, and | eye contact, and | eye contact, and | eye contact, and |
| | vocal | vocal | vocal | vocal |
| Delivery | expressiveness) | expressiveness) | expressiveness) | expressiveness) |

| | make the | make the | make the | detract from the |
|------------|--------------------|------------------|--------------------|----------------------|
| | presentation | presentation | presentation | understandability |
| | compelling, and | interesting, and | understandable, | of the |
| | speaker appears | speaker appears | and speaker | presentation, and |
| | polished and | comfortable. | appears | speaker appears |
| | confident. | | tentative. | uncomfortable. |
| | A variety of types | Supporting | | |
| | of supporting | materials | | Insufficient |
| | materials | (explanations, | Supporting | supporting |
| | (explanations, | examples, | materials | materials |
| | examples, | illustrations, | (explanations, | (explanations, |
| | illustrations, | statistics, | examples, | examples, |
| | statistics, | analogies, | illustrations, | illustrations, |
| | analogies, | quotations from | statistics, | statistics, |
| | quotations from | relevant | analogies, | analogies, |
| | relevant | authorities) | quotations from | quotations from |
| | authorities) make | make | relevant | relevant |
| | appropriate | appropriate | authorities) make | authorities) make |
| | reference to | reference to | appropriate | reference to |
| | information or | information or | reference to | information or |
| | analysis that | analysis that | information or | analysis that |
| | significantly | generally | analysis that | minimally |
| | supports the | supports the | partially supports | supports the |
| | presentation or | presentation or | the presentation | presentation or |
| | establishes the | establishes the | or establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on the | authority on the | authority on the |
| Material | topic. | topic. | topic. | topic. |
| | Central message | | | |
| | is compelling | | | |
| | (precisely stated, | | Central message | |
| | appropriately | Central message | is basically | Central message |
| | repeated, | is clear and | understandable | can be deduced |
| | memorable, and | consistent with | but is not often | but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Information System Management

Course Code: IT094IU

1. General information

| Course designation | This course covers the concepts of information systems and their applications to business processes | | | | | |
|---|---|--|--|--|--|--|
| Semester(s) in which the course is taught | 6 | | | | | |
| Person responsible for the course | Dr. Tran Thanh Tung | | | | | |
| Language | English | | | | | |
| Relation to curriculum | Elective course (CS, DS) Specialization (required) (NE) | | | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | | | |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | | |
| Required and recommended prerequisites for joining the course | Principles of Database Management | | | | | |
| Course objectives | This course will aim to provide students with: The concepts of information systems and their applications to business processes. Use of computer-based information systems in functional areas of business. Understanding of computer and information technology, resources, management and end-user decision making, and system development. | | | | | |
| Course learning outcomes | CLO 1. understand basic information system concepts as applied to business operations and management. CLO 2. identify the major components of a computer system, including hardware, software, operating systems and operating environments as they apply to information systems. CLO 3. develop basic MIS applications such as spreadsheet, database, and web development. | | | | | |
| | Competency level Course learning outcome (CLO) | | | | | |
| | Knowledge 1, 2 | | | | | |

| | | Skill | 3 | | | |
|------------------------------------|--|--|--|----------------------------|---------------|--|
| | | Attitude | | | | |
| Content | weig Weig | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | To | | // \ // // | Weight | Level | |
| | Info | ormation Systems in | Global Business; | 1 | I | |
| | Glo | bal E-Business and | Collaboration; | 1 | I | |
| | I I | ormation Systems, O | rganizations and | 2 | T | |
| | | ical and Social Issue tems; | s in Information | 1 | T | |
| | 1 1 | ecommunications, th reless Technology; | 1 | T | | |
| | Foundations of Business Intelligence: Databases and Information Management | | | 1 | T,U | |
| | I I | Commerce: Digital Mods; | Iarkets, Digital | 2 | T,U | |
| | | nieving Operational I stomer Intimacy: Ent | Excellence and erprise Applications; | 2 | T,U | |
| | Bui | Ilding Information Sy | ystems; | 2 | T,U | |
| | Ma | naging Knowledge; | | 1 | T | |
| | Enl | nancing Decision Ma | king. | 1 | T | |
| Examination forms | Mult | tiple-choice question | s, short-answer questio | ns | | |
| Study and examination requirements | for their enco | he class sessions. Stu class participation. Ouraged. | attendance of 80 perce idents will be assessed Questions and commen n: Students must have | on the bas ts are stroi | is of ngly | |
| Reading list | | Information System Kenneth C. Laudon | a, Jane P. Laudon, Manns: Managing the Digital and Jane Laudon, Essention Systems 11th, 2 | al Firm 14 entials of | th, 2016 | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| SLO | | | |
|-----|--|--|--|
|-----|--|--|--|

| (| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
|---|-----|---|---|---|---|---|---|
| | 1 | | X | | X | | |
| 4 | 2 | | X | | X | | |
| | 3 | | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-----|-----------------------|--------------------------------|-----------|
| 1 | Information Systems in Global Business; | 1 | Midterm exam | In-class activities | |
| 2 | Global E-Business and Collaboration; | 1 | Midterm exam | In-class activities | |
| 3 | Information Systems, Organizations and Strategy | 1,2 | Midterm exam, Quiz | In-class activities, Lab | |
| 4 | Ethical and Social Issues in Information Systems; | 1 | Midterm exam | | |
| 5 | Telecommunications, the Internet, and Wireless Technology; | 2 | Midterm exam | In-class activities, Lab | |
| 6 | Midterm | | | | |
| 7 | Foundations of Business Intelligence: Databases and Information Management | 2,3 | Final exam | In-class activities, Lab | |
| 8 | E-Commerce: Digital Markets, Digital Goods; | 1 | Final exam | In-class activities, Lab | |
| 9 | Achieving Operational Excellence and Customer Intimacy: Enterprise Applications; | 1 | Final exam | In-class activities, Lab | |
| 10 | Building Information Systems; | 2,3 | Final exam | In-class activities, Lab | |
| 11 | Managing Knowledge; | 1 | Final exam | | |
| 12 | Enhancing Decision Making. | 1 | Final exam | | |
| 13 | Final exam | | | | |

4. Assessment plan

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Midterm examination (30%) | 40% | 30% | 20% |
| Projects/Presentations/ Report (20%) | | 40% | 60% |
| Final examination (40%) | 30% | 20% | 20% |
| Exercises/ Quiz (20%) | 30% | 10% | |

5. Rubrics (optional)5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|----------------|--------|----------|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | • • • • • • | ••••• | | | |
| | Evalu | ıator: | | | |
| | • • • • • • | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. **Holistic rubric**

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|-------|--|--|--|--|--|--|
| Score | Description | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | | |
| | are included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | | |
| | task are included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | | |
| | are included. | | | | | |

| 2 | Demonstrates little understanding of the problem. Many requirements of task |
|---|---|
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

| _ | Capstone | Milest | one | Benchmark |
|-----------------------------|--|---|---|--|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem to be | |
| | Issue/ problem to be considered critically is stated clearly | Issue/ problem to be considered | considered critically is stated but description leaves some terms | |
| | and described comprehensivel y, delivering all relevant information necessary for | critically is stated, described, and clarified so that understanding is not seriously | undefined, ambiguities unexplored, boundaries undetermine d, and/ or | Issue/ problem to be considered critically is stated without clarification |
| Explanation of issues | full understanding. | impeded by omissions. | backgrounds unknown. | or description. |
| | Information is taken from source(s) with | Information is taken from source(s) with | Information is taken from source(s) with some interpretation / evaluation, but not | |
| | enough interpretation/ evaluation to develop a | enough interpretation/ evaluation to develop a | enough to develop a coherent analysis or | Information is taken from source(s) without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or conclusion | questioned thoroughly. | subject to questioning. | with little questioning. | without question. |

| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
|--|---|--|---|---|
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are | Specific position (perspective, thesis/ | Specific position (perspective, |
| Student's position (perspective, thesis/hypothesis) | synthesized within position (perspective, thesis/ hypothesis). | acknowledged within position (perspective, thesis/ hypothesis). | hypothesis) acknowledge s different sides of an issue. | thesis/ hypothesis) is stated, but is simplistic and obvious. |
| Conclusions and related outcomes (implications and consequences) | Conclusions and related outcomes (consequences and implications) are logical and reflect student's | Conclusion is logically tied to a range of information, including opposing viewpoints; related | Conclusion is logically tied to information (because information is chosen to fit the | Conclusion is inconsistently tied to some of the information discussed; related outcomes |

| informed | outcomes | desired | (consequence |
|------------------|----------------|----------------|---------------|
| evaluation and | (consequences | conclusion); | s and |
| ability to place | and | some related | implications) |
| evidence and | implications) | outcomes | are |
| perspectives | are identified | (consequence | oversimplifie |
| discussed in | clearly. | s and | d. |
| priority order. | - | implications) | |
| | | are identified | |
| | | clearly. | |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |

| | D 1' | | | |
|------------|-----------------|----------------------|------------------|--------------------------|
| | Delivery | D 11 | D 11 | |
| | techniques | Delivery | Delivery | D 11 |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | · |
| | | | | analogies, |
| | authorities) | authorities) make | authorities) | quotations from relevant |
| | make | | make | |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | Central | |
| | compelling | Central | message is | Central message |
| | (precisely | message is | basically | can be deduced |
| | stated, | clear and | understandable | but is not |
| | appropriately | consistent with | but is not often | explicitly stated |
| Central | repeated, | the supporting | repeated and is | in the |
| Message | memorable, | material. | not memorable. | presentation. |
| | | | | |

| and strongly supported.) | | |
|--------------------------|--|--|
| | | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: System and Network Security

Course Code: IT117

1. General information

| Course designation | This course introduces students to the fundamentals of compute security in including software security, cryptography, network security and web security. |
|---|--|
| Semester(s) in which the course is taught | 7,9 |
| Person responsible for the course | MSc. Le Thanh Son |
| Language | English |
| Relation to curriculum | Elective (CE) Compulsory (NE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Computer Networks |
| Course objectives | This course introduces students to cryptography systems (symmetric and public key encryptions), basic information theory, authentication and authorization, database security, malicious software, denial of service attacks, intrusion detection and prevention systems, firewalls, buffer overflow attack and software security, Internet security protocols and standards, Internet authentication applications, and wireless security. |
| Course learning outcomes | CLO 1. Gain understanding of the cryptography concepts including symmetric key encryption, hash function, message authentication code, public key encryption, digital signature and digital envelope; CLO 2. Apply the concepts of authentication and authorization in implementing secure systems and networks; CLO 3. Understand and categorize the malicious software and their attacking mechanisms; |

| | CLO 4. Explore the buffer overflow attacks and fuzzing to find software vulnerabilities, and obtain the knowledge of software and operating system security; CLO 5. Understand and practice Internet security protocols and authentication applications; CLO 6. Analyze the wireless security. | | | | | |
|------------------------------------|---|--|---|----------|------------|--|
| | | Competency Course learning outcome | | | | |
| | | level | (CLO) | | | |
| | | Knowledge | CLO1, CLO2, CLO3 | R, CLO5 | | |
| | | Skill | CLO4, CLO6 | | | |
| | | Attitude | | | | |
| Content | weig Weig | hting of the content ght: lecture session (| | | he | |
| | Top | oic | | Weigh | Leve | |
| | | | | t | 1 | |
| | 1 1 | ptographic systems lic key systems); | (symmetric and | 2 | <u>T</u> | |
| | Aut | hentication and autl | norization; | <u>1</u> | <u>T,U</u> | |
| | Mal | licious software; | | <u>1</u> | <u>T</u> | |
| | Dat | abase and cloud sec | eurity; | <u>2</u> | <u>T,U</u> | |
| | Der | nial of service attack | is; | <u>1</u> | <u>T,U</u> | |
| | | usion detection and walls; | prevention systems, | 1 | T | |
| | Buf | fer overflow and so | ftware security; | 2 | <u>T,U</u> | |
| | Ope | erating system secur | rity; | 2 | <u>T,U</u> | |
| | Inte | rnet security protoc | ols; | 1 | <u>T</u> | |
| | Inte | rnet authentication | applications; | 1 | <u>T</u> | |
| | Win | eless security. | | 1 | <u>T,U</u> | |
| Examination forms | Mult | iple-choice question | ns, short-answer quest | ions | • | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | |
| Reading list | 1. | • | and Lawrence Brown les and Practice 3rd, 2 | • | ter | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | X | X | | |
| 2 | | X | | | | |
| 3 | X | | | | | |
| 4 | X | | | | | |
| 5 | X | | | | | |
| 6 | X | | | | | |

3. Planned learning activities and teaching methods

| 5. Planned learning activities and teaching methods | | | | | | |
|---|---|-----|-------------|-------------------------------|-----------|--|
| Week | Topic | CLO | Assessments | Learning activities | Resources | |
| 1 | Cryptographic systems (symmetric and public key systems); | 1 | Quiz, Exam | Lecture, Exercises, Lab | [1] | |
| 2 | Authentication and authorization; | 2 | Quiz, Exam | Lecture, Lab | [1] | |
| 3 | Malicious software; | 3 | Quiz, Exam | Lecture, Lab | [1] | |
| 4 | Database and cloud security; | 3 | Quiz, Exam | Lecture, Lab | [1] | |
| 5 | Denial of service attacks; | 3 | Quiz, Exam | Lecture | [1] | |
| 6 | Midterm | | | | | |
| 7 | Intrusion detection and prevention systems, firewalls; | 2 | Quiz, Exam | Lecture | [1] | |
| 8 | Buffer overflow and software security; | 4 | Quiz, Exam | Lecture, Lab | [1] | |
| 9 | Operating system security; | 4 | Quiz, Exam | Lecture, Lab | [1] | |
| 10 | Internet security protocols; | 5 | Quiz, Exam | Lecture, Exercises, | [1] | |
| 11 | Internet authentication applications; | 5 | Quiz, Exam | Lecture, Exercises, | [1] | |
| 12 | Wireless security. | 6 | Quiz, Exam | Lecture, Lab | [1] | |
| 13 | Final exam | | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 |
|---------------------------|------|------|------|------|------|------|
| Midterm examination (30%) | 70% | 80% | 55% | | | |
| Final examination (40%) | | | | 75% | 70% | 75% |
| Exercises/ Quiz (30%) | 30% | 20% | 45% | 25% | 30% | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ↔

Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|------|-------|----------|--|--|
| Student: HW/Assignment: | | | | | |
| Date: Evaluator: | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|--|--|--|--|--|
| Score | Description | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | |
| | are included in response | | | |

| 4 | Demonstrates considerable understanding of the problem. All requirements of |
|---|--|
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are |
| | included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are |
| | missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | | Benchmark |
|---------------------|--|--|--|---|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all | Issue/ problem to be considered critically is stated, described, and clarified so that | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries | Issue/ problem to be considered critically is |
| | relevant information | understanding is not seriously | undetermined, and/ or | stated without clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/evaluation to | Information is taken from source(s) with enough interpretation/ evaluation to | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent | Information is taken from source(s) |
| Evidence | develop a | develop a | analysis or | without any |
| Selecting and using | comprehensive analysis or | coherent analysis or | synthesis. Viewpoints of | interpretation/ evaluation. |
| information | synthesis. | synthesis. | experts are | Viewpoints of |
| to investigate | Viewpoints of | Viewpoints of | taken as | experts are |
| a point of | experts are | experts are | mostly fact, | taken as fact, |
| view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |

| | | | Questions | Shows an emerging |
|----------------------|---|-----------------------------------|------------------------------|-------------------------------|
| | | | some assumptions. | awareness of present |
| | Thoroughly | | Identifies | assumptions |
| | (systematically and methodically) | | several relevant | (sometimes labels |
| | analyzes own and | | contexts when | assertions as |
| | others' assumptions and | Identifies own and others' | presenting a position. May | assumptions). Begins to |
| | carefully evaluates | assumptions and | be more aware | identify some |
| Influence of | the relevance of contexts when | several relevant contexts when | of others' assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. Specific position | position. | (or vice versa). | position. |
| | (perspective, | | | |
| | thesis/ hypothesis) is imaginative, | Specific position | | |
| | taking into account | (perspective, | | |
| | the complexities of an issue. Limits of | thesis/hypothesi s) takes into | | |
| | position | account the | | |
| | (perspective, thesis/ hypothesis) | complexities of an issue. Others' | Specific | Specific |
| | are acknowledged. | points of view | position | position |
| Student's position | Others' points of view are | are acknowledged | (perspective, thesis/ | (perspective, thesis/ |
| (perspective | synthesized within | within position | hypothesis) | hypothesis) is |
| , thesis/hypot | position (perspective, | (perspective, thesis/ | acknowledges different sides | stated, but is simplistic and |
| hesis) | thesis/ hypothesis). | hypothesis). | of an issue. | obvious. |
| | | Conclusion is | Conclusion is logically tied | Conclusion is |
| | | logically tied to | to information | inconsistently |
| | Conclusions and related outcomes | a range of information, | (because information is | tied to some of the |
| | (consequences and | including | chosen to fit | information |
| | implications) are logical and reflect | opposing viewpoints; | the desired conclusion); | discussed; related |
| Conclusions | student's informed | related | some related | outcomes |
| and related outcomes | evaluation and ability to place | outcomes (consequences | outcomes (consequences | (consequence s and |
| (implication | evidence and | and | and | implications) |
| s and | perspectives discussed in | implications) are identified | implications) are identified | are |
| consequence s) | priority order. | clearly. | clearly. | oversimplifie d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | <u> </u> | estone | Benchmark |
|-------------|--------------------|------------------|--------------------|-------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | | |
| | sequenced | (specific | Organizational | |
| | material within | introduction | pattern (specific | Organizational |
| | the body, and | and conclusion, | introduction and | pattern (specific |
| | transitions) is | sequenced | conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and is | transitions) is | the body, and | material within |
| | skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is |
| | content of the | observable | observable | not observable |
| Organizatio | presentation | within the | within the | within the |
| n | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | prosonuuran |
| | choices are | choices are | choices are | Language |
| | imaginative, | thoughtful and | mundane and | choices are |
| | memorable, and | generally | commonplace | unclear and |
| | compelling, and | support the | and partially | minimally |
| | enhance the | effectiveness of | support the | support the |
| | effectiveness of | the | effectiveness of | effectiveness of |
| | the presentation. | presentation. | the presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | | | | Delivery |
| | Delivery | Delivery | | techniques |
| | techniques | techniques | Delivery | (posture, |
| | (posture, gesture, | (posture, | techniques | gesture, eye |
| | eye contact, and | gesture, eye | (posture, gesture, | contact, and |
| | vocal | contact, and | eye contact, and | vocal |
| | expressiveness) | vocal | vocal | expressiveness) |
| | make the | expressiveness) | expressiveness) | detract from the |
| | presentation | make the | make the | understandabilit |
| | compelling, and | presentation | presentation | y of the |
| | speaker appears | interesting, and | understandable, | presentation, and |
| | polished and | speaker appears | and speaker | speaker appears |
| Delivery | confident. | comfortable. | appears tentative. | uncomfortable. |

| | A variety of | | | |
|------------|--------------------|------------------|--------------------|-------------------|
| | types of | Supporting | | |
| | supporting | materials | | Insufficient |
| | materials | (explanations, | Supporting | supporting |
| | (explanations, | examples, | materials | materials |
| | examples, | illustrations, | (explanations, | (explanations, |
| | illustrations, | statistics, | examples, | examples, |
| | statistics, | analogies, | illustrations, | illustrations, |
| | analogies, | quotations from | statistics, | statistics, |
| | quotations from | relevant | analogies, | analogies, |
| | relevant | authorities) | quotations from | quotations from |
| | authorities) make | make | relevant | relevant |
| | appropriate | appropriate | authorities) make | authorities) |
| | reference to | reference to | appropriate | make reference |
| | information or | information or | reference to | to information or |
| | analysis that | analysis that | information or | analysis that |
| | significantly | generally | analysis that | minimally |
| | supports the | supports the | partially supports | supports the |
| | presentation or | presentation or | the presentation | presentation or |
| | establishes the | establishes the | or establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on the | authority on the | authority on the |
| Material | topic. | topic. | topic. | topic. |
| | Central message | | | |
| | is compelling | | G 1 | G . 1 |
| | (precisely stated, | Central . | Central message | Central message |
| | appropriately | message is | is basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| Control | memorable, and | consistent with | but is not often | explicitly stated |
| Central | strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Internship for Engineers

Course Code: ITxxx

1. General information

| 1. General informa | |
|---|--|
| Course designation | This course helps students to do an internship in industry and prepare a topic for a pre-thesis and thesis |
| Semester(s) in which the course is taught | After semester 5 |
| Person responsible for the course | Lecturer of School of Computer Science and Engineering; Advisor from the peer company/organization |
| Language | English |
| Relation to curriculum | Compulsory, Information Technology |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self- study hours) | Total workload: 210 hours Self-study specified in hours: 210 |
| Credit points | Number of credits: 7 Lecture: 0 Laboratory: 7 |
| Required and recommended prerequisites for joining the course | None |
| Course objectives | This course requires students to work in organizations or companies in the summer or main semester. Each student is jointly supervised by a faculty member at SCSE and an instructor at the organization. The student will join or implement an IT-related project. The internship time at the organization must be at least 210 hours in total. For example, if a student does the internship at the company 8 hours per day, 5 days per week, then the internship time will be around 6 weeks; if the student works for 4 hours per day and 3 days per week, then it takes 18 weeks to complete the internship. Students have to report progress to instructors after 3 weeks of receiving the project. At the end of the internship, students will submit internship reports and assessment reports from the instructor at the peer organization SCSE. Instructors read the reports and confirm the internship marks for the students. Students can also take part in internships abroad for a period of 6 months. The organizations can be companies in the industry, academic institutions, or an office or department at an International University. |
| Course learning outcomes | CLO 1. Recognize the roles of an engineer in a practical environment. CLO 2. Develop practical products or run product development projects in industry CLO 3. Follow requirements/regulations and laws |

| | | Competency level | Course learning outcome (CLO) | me | |
|-------------------|---|--|-------------------------------|------------|-----------|
| | | Knowledge | CLO1, CLO2 | | |
| | | Skill | CLO1, CLO2 | | |
| | | Attitude | CLO3 | | |
| Content | the con Weight | The description of the contents should clearly indicate the weighting of the content and the level. Weight: within 3 months Feaching levels: I (Introduce); T (Teach); U (Utilize) | | | |
| | Topic | | | Weigh t | Leve |
| | Introd | duction of the internship place | | 9 | U |
| | Revie | ew the existing issues of an assigned project | | 9 | U |
| | | ly and solve some issues in product 9 elopment | | | |
| | 1 1 - | ment some new func et product | ctions or features for the | 9 | U |
| | Presei | ntation | | 9 | U |
| Examination forms | Report | | | | |
| Study and | | | tendance of 80 percent is | - | • |
| examination | class sessions. Students will be assessed on the basis of their class | | | | |
| requirements | | _ | d comments are strongly e | _ | |
| | _ | | Students must have more | than 50/10 | 00 points |
| | overall | to pass this course. | | | |
| Reading list | | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|----|-----|---|---|---|---|---|
| CL | 1 | 2 | 3 | 4 | 5 | 6 |
| О | | | | | | |
| 1 | | X | | | | X |
| 2 | | X | | | | X |
| 3 | | | | X | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-----|-----------------------|----------------------|----------------------------|
| 1 | Introduction of the internship place | 1,2 | Check and Evaluate | Research and working | At company or organization |
| 3 | Review the existing issues of an assigned project | 1,2 | Check and Evaluate | Research and working | At company or organization |

| 4 | Study and solve some issues in product development | 1,2 | Check and Evaluate | Research and working | At company or organization |
|---|--|-------|-----------------------|----------------------|----------------------------|
| 5 | Implement some new functions or features for the project product | 1,2 | Check and Evaluate | Research and working | At company or organization |
| 6 | Presentation | 1,2,3 | Check and Evaluate | Research and working | At company or organization |
| 7 | Final grade | | | | _ |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------|------|------|------|
| Final grade (100%) | 30% | 40% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1.Grading checklist

| Grading checklist for Written | Reports | | | | |
|--|---------|-------|----------|--|--|
| Student: HW/Assignment | : | | | | |
| Date: Evaluator: | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes principal | 10 | | | | |
| content | | | | | |
| Introduction demonstrates thorough knowledge of relevant | 15 | | | | |
| background and prior work | | | | | |
| Analysis and discussion demonstrate good subject mastery | | | | | |
| Summary and conclusions appropriate and complete | | | | | |
| Peer organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | | | | | |
| Clear and easy to read | | | | | |
| Quality of Layout and Graphics (10%) | | | | | |
| TOTAL SCORE | 100 | | | | |

5.2.Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|------|--|--|--|--|--|--|
| Scor | Description | | | | | |
| e | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are | | | | | |
| | included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are | | | | | |
| | included. | | | | | |

| 3 | Demonstrates partial understanding of the problem. Most requirements of task are |
|---|--|
| | included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | <i>y value rubric for evalu</i> Capstone | Miles | | Benchmark |
|----------------|---|--------------------|-------------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be considered | |
| | | | critically is | |
| | | | stated but | |
| | | | description | |
| | | Issue/ problem to | leaves some | |
| | Issue/ problem to be | be considered | terms | |
| | considered critically | critically is | undefined, | |
| | is stated clearly and | stated, described, | ambiguities | Issue/ problem |
| | described | and clarified so | unexplored, | to be |
| | comprehensively, | that | boundaries | considered |
| | delivering all | understanding is | undetermined, | critically is |
| | relevant information | not seriously | and/ or | stated without |
| Explanation | necessary for full | impeded by | backgrounds | clarification or |
| of issues | understanding. | omissions. | unknown. | description. |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is taken | Information is | some | |
| | from source(s) with | taken from | interpretation/ | |
| | enough | source(s) with | evaluation, but | Information is |
| | interpretation/ | enough | not enough to | taken from |
| | evaluation to | interpretation/ | develop a | source(s) |
| | develop a | evaluation to | coherent | without any |
| Evidence | comprehensive | develop a | analysis or | interpretation/ |
| Selecting and | analysis or | coherent analysis | synthesis. | evaluation. |
| using | synthesis. | or synthesis. | Viewpoints of | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | experts are | experts are |
| investigate a | experts are | experts are | taken as mostly | taken as fact, |
| point of view | questioned | subject to | fact, with little | without |
| or conclusion | thoroughly. | questioning. | questioning. | question. |
| | Thoroughly | Identifies own | Questions some | Shows an |
| | (systematically and | and others' | assumptions. | emerging |
| | methodically) | assumptions and | Identifies | awareness of |
| | analyzes own and | several relevant | several relevant | present |
| Influence of | others' assumptions | contexts when | contexts when | assumptions |
| context and | and carefully | presenting a | presenting a | (sometimes |
| assumptions | evaluates the | position. | position. May | labels |

| | relevance of contexts when presenting a position. | | be more aware of others' assumptions than one's own (or vice versa). | assertions as assumptions). Begins to identify some contexts when presenting a position. |
|--|--|---|--|--|
| Student's position (perspective, thesis/hypothesis) | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ hypothesis). | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis). | Specific position (perspective, thesis/ hypothesis) acknowledges different sides of an issue. | Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and obvious. |
| Conclusions and related outcomes (implications and consequences | Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order. | Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly. | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly. | Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubric for evaluating presentation tasks. | | | | | | |
|--|-------------------|-------------------|-------------------|-------------------|--|--|
| | Capstone | Mile | Milestone | | | |
| | 4 | 3 | 2 | 1 | | |
| | Organizational | Organizational | Organizational | Organizational | | |
| | pattern (specific | pattern (specific | pattern (specific | pattern (specific | | |
| | introduction and | introduction and | introduction and | introduction and | | |
| | conclusion, | conclusion, | conclusion, | conclusion, | | |
| | sequenced | sequenced | sequenced | sequenced | | |
| | material within | material within | material within | material within | | |
| Organization | the body, and | the body, and | the body, and | the body, and | | |

| l L | | trancitione) ic | trancitione) ic | transitions) is not |
|-------------------|--------------------------------|-----------------------------|--------------------------------|---------------------|
| | ransitions) is clearly and | transitions) is clearly and | transitions) is intermittently | observable within |
| | • | • | observable | |
| | consistently observable and is | consistently | | the presentation. |
| | | observable | within the | |
| | skillful and | within the | presentation. | |
| | nakes the content | presentation. | | |
| | of the | | | |
| 1 | presentation | | | |
| С | cohesive. | | | |
| | | | Language | |
| I | Language choices | Language | choices are | |
| a | re imaginative, | choices are | mundane and | Language choices |
| n | nemorable, and | thoughtful and | commonplace | are unclear and |
| c | compelling, and | generally | and partially | minimally support |
| e | enhance the | support the | support the | the effectiveness |
| e | effectiveness of | effectiveness of | effectiveness of | of the |
| ti | he presentation. | the presentation. | the presentation. | presentation. |
| I | Language in | Language in | Language in | Language in |
| l p | presentation is | presentation is | presentation is | presentation is not |
| a | appropriate to | appropriate to | appropriate to | appropriate to |
| Language a | udience. | audience. | audience. | audience. |
| Ι | Delivery | | Delivery | Delivery |
| t | echniques | Delivery | techniques | techniques |
| (| posture, gesture, | techniques | (posture, gesture, | (posture, gesture, |
| e | eye contact, and | (posture, gesture, | eye contact, and | eye contact, and |
| | vocal | eye contact, and | vocal | vocal |
| e | expressiveness) | vocal | expressiveness) | expressiveness) |
| n | nake the | expressiveness) | make the | detract from the |
| l p | presentation | make the | presentation | understandability |
| - | compelling, and | presentation | understandable, | of the |
| s | speaker appears | interesting, and | and speaker | presentation, and |
| l p | oolished and | speaker appears | appears | speaker appears |
| Delivery c | confident. | comfortable. | tentative. | uncomfortable. |
| I A | A variety of types | Supporting | Supporting | Insufficient |
| | of supporting | materials | materials | supporting |
| n | naterials | (explanations, | (explanations, | materials |
| (| explanations, | examples, | examples, | (explanations, |
| e | examples, | illustrations, | illustrations, | examples, |
| i | llustrations, | statistics, | statistics, | illustrations, |
| s | statistics, | analogies, | analogies, | statistics, |
| | nalogies, | quotations from | quotations from | analogies, |
| | quotations from | relevant | relevant | quotations from |
| | elevant | authorities) | authorities) make | relevant |
| a | nuthorities) make | make | appropriate | authorities) make |
| | appropriate | appropriate | reference to | reference to |
| | reference to | reference to | information or | information or |
| i | nformation or | information or | analysis that | analysis that |
| a | nalysis that | analysis that | partially supports | minimally |
| | significantly | generally | the presentation | supports the |
| | supports the | supports the | or establishes the | presentation or |
| | presentation or | presentation or | presenter's | establishes the |

| | establishes the presenter's credibility/ authority on the topic. | establishes the presenter's credibility/ authority on the topic. | credibility/ authority on the topic. | presenter's credibility/ authority on the topic. |
|---------|--|--|--|--|
| | Central message is compelling | | | |
| | (precisely stated, | | Central message | |
| | appropriately | Central message | is basically | Central message |
| | repeated, | is clear and | understandable | can be deduced |
| | memorable, and | consistent with | but is not often | but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: May 1, 2024

Ho Chi Minh City, 1/05/2024 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Artificial Intelligence

Course Code: IT159

1. General information

| 1. General informa | uon | | | |
|---|--|---|--|--|
| Course designation | fundamental alg | ntroduces the students to the principles and orithms of Artificial Intelligence, the use cases and esses in Artificial Intelligence. | | |
| Semester(s) in which the course is taught | 6,8 | | | |
| Person responsible for the course | Dr. Nguyen Tru | ng Ky | | |
| Language | English | | | |
| Relation to curriculum | Elective | | | |
| Teaching methods | Lecture, lesson, | project, laboratory. | | |
| Workload (incl. contact hours, self-study hours) | | 195 5 hours (lectures) + 30 hours (laboratory) cluding examination preparation, specified in | | |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | | | |
| Required and recommended prerequisites for joining the course | Object-Oriented Algorithms and Discrete Mather | Data Structures | | |
| Course objectives | This course in Artificial Intelligation that studies how computer. The unlearn, plan, and student will be implementing so problem solving Accordingly, study assembling understand the reand learning in role of problem | troduces students to the basic knowledge on gence. Artificial intelligence (AI) is a research field to realize the intelligent human behaviors on a altimate goal of AI is to make a computer that can a solve problems autonomously. In this course, earn the foundational principles and practice ome of these applications including representation, and learning methods of artificial intelligence, dents should be able to develop intelligent systems solutions to concrete computational problems; tole of knowledge representation, problem solving, antelligent-system engineering; and appreciate the solving, vision, and language in understanding are from a computational perspective. | | |
| Course learning outcomes | Competency | Course learning outcome (CLO) | | |

| | Knowledge | CLO 1. Apply knowledge of AI techniques and synthesize solutions to the discipline and ability to develop a range of typical applications using artificial intelligence methods CLO 2. Represent knowledge corresponding to practical problems, design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs by properly using classical search algorithms, including breadth-first, depth-first, A*, and heuristic search |
|---------|-----------------|--|
| | Skill | heuristic search CLO 3. Produce intelligent applications of machine learning with statistical learning methods (Naive Bayes), supervised and unsupervised learning models: decision tree, neural networks, single-layer (perceptron) and multilayer networks CLO 4. Communicate effectively with a range of audiences, ability to use current techniques, skills, and tools necessary for computing practice, ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs |
| | Attitude | involved in design choices and ability to apply design and development principles in the construction of software systems of varying complexity |
| Contont | | of the contents should clearly indicate the |
| Content | rne aescription | of the contents should clearly indicate the |

weighting of the contents should clearly to weighting of the content and the level.

Weight: lecture session (3 hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weight | Level |
|---|--------|-------|
| Introduction and Intelligent Agents | 1 | I |
| States and Searching: Uninformed Search | 1 | T, U |
| States and Searching: Informed and More Sophisticated Search | 1 | T, U |
| Features and Constraints: Constraint Satisfaction Problems | 1 | T, U |
| Features and Constraints: Constraint Satisfaction Problems (continue) | 1 | T, U |
| Reasoning Under Uncertainty: | 1 | T, U |

| | Random Variables and Events | | |
|-------------------|---|--------------|------------|
| | Kandom Variables and Events Joint and Marginal Distributions | | |
| | Conditional Distribution | | |
| | Product Rule, Chain Rule, Bayes' | | |
| | Rule | | |
| | • Inference | | |
| | Reasoning Under Uncertainty: Naïve Bayes | 1 | T, U |
| | Classifier (continue) | _ | _, -, - |
| | Supervised Learning: Neural Networks | 1 | T, U |
| | Supervised Learning: Neural Networks (continue) | 1 | T, U |
| | Supervised Learning: Support Vector Machine | 1 | T, U |
| | Supervised Learning: Support Vector Machine in Mathematics | 1 | T, U |
| | Beyond Supervised Learning: Kernels and Clustering | 1 | T, U |
| | Beyond Supervised Learning: Kernels and Clustering (continue) | 1 | T, U |
| | Gaussian Mixture Model and Expectation- Maximization Algorithm | 1 | T, U |
| | Revision | 1 | |
| Examination forms | Multiple-choice questions, short-answer questio | ns | |
| Study and | Attendance: A minimum attendance of 80 perc | ent is con | npulsory |
| examination | for the class sessions. Students will be assessed o | | • |
| requirements | class participation. Questions and commen | nts are | strongly |
| | encouraged. | | |
| | Assignments/Examination: Students must have points overall to pass this course. | more than | n 50/100 |
| Reading list | [1] Stuart Russell and Peter Norvig, "Artific | cial Intell | igence: 1 |
| | Modern Approach", Fourth Edition, 2020. | | |
| | [2] David L. Poole and Alan K. Mackworth, "An | rtificial In | telligence |
| | Foundations of Computational Agents", Second | Edition, 2 | 2017. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | | X | | | | X |

| 3 | | X | | X |
|---|---|---|--|---|
| 4 | X | X | | X |

3. Planned learning activities and teaching methods

| 3. Planned learning activities and teaching methods | | | | | | | | | |
|---|---|------|-------------|---------------------------|--|--|--|--|--|
| Week | Topic | CLO | Assessments | Learning activities | Resources | | | | |
| 1 | Introduction and Intelligent Agents | 1, 2 | Quiz | Lecture, Discussion | [1]. Chapter 1, 2 [2]. Chapter 1 | | | | |
| 2 | States and Searching: Graph Searching Techniques | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 3 | | | | |
| 3 | States and Searching: Heuristic Search and More Sophisticated Search | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 3 | | | | |
| 4 | Features and Constraints: Constraint Satisfaction Problems | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 6 | | | | |
| 5 | Features and Constraints: Constraint Satisfaction Problems (continue) | 1, 2 | Quiz | Lecture, In-class quiz | [1]. Chapter 6 | | | | |
| 6 | Reasoning Under Uncertainty | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 12 | | | | |
| 7 | Reasoning Under Uncertainty (continue) | 3, 4 | Quiz | Lecture, In-class quiz | 1]. Chapter 12 | | | | |
| 8 | Midterm | | | | | | | | |
| 9 | Supervised Learning: Neural Networks | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 19 [2]. Chapter 20 | | | | |
| 10 | Supervised Learning: Neural Networks (continue) | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 19 [2]. Chapter 20 | | | | |
| 11 | Supervised Learning: Support Vector Machine | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 19 [2]. Chapter 15 | | | | |
| 12 | Supervised Learning: Support Vector Machine in Mathematics (continue) | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 19 [2]. Chapter 15 | | | | |

| 13 | Beyond Supervised Learning: Kernels and | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 21 |
|----|--|------|------|---------------------------|-------------------------------------|
| | Clustering | | | | [2]. Chapter 16, 22 |
| 14 | Beyond Supervised Learning: Kernels and Clustering (continue) | 3, 4 | Quiz | Lecture, In-class quiz | [1]. Chapter 21 [2]. Chapter 16, 22 |
| 15 | Gaussian Mixture Model and Expectation- Maximization Algorithm | 3, 4 | Quiz | Lecture, Discussion | [1]. Chapter 20 [2]. Chapter 24 |
| 16 | Revision | | | Review-test | |
| 17 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Labs (20%) | | 50% | 50% |
| Midterm examination (30%) | 50% | 50% | |
| Final examination (40%) | | 100% | |
| Exercises/ Quiz (10%) | 50% | 50% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

| 1. (| ling c | |
|------|--------|--|
| | | |
| | | |
| | | |

| Grading checklist for Written Reports | | | |
|--|----------------|-------|----------|
| Student: | HW/Assignment: | | ent: |
| Date: | | | |
| | Evaluator: | | |
| | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |

| Summary and conclusions appropriate and complete | 5 | |
|--|-----|--|
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

2. Holistic rubric

| | ionstic rubi ic | | | | |
|-------|--|--|--|--|--|
| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Information | |
|------------------|----------------------------------|----------------------------------|-----------------------|---------------------------|
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | If., |
| | enough | enough | enough to | Information is taken from |
| | interpretation/ evaluation to | interpretation/ evaluation to | develop a coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts when | assumptions |
| | methodically) analyzes own | | presenting a | (sometimes labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | | |
| | position | position | | |
| | (perspective, | (perspective, | a ·c· | |
| | thesis/ | thesis/hypothesi | Specific | Chasicia |
| | hypothesis) is imaginative, | s) takes into account the | position | Specific position |
| | taking into | complexities of | (perspective, thesis/ | (perspective, |
| Student's | account the | an issue. Others' | hypothesis) | thesis/ |
| position | complexities of | points of view | acknowledge | hypothesis) is |
| (perspective, | an issue. Limits | are | s different | stated, but is |
| thesis/hypothesi | of position | acknowledged | sides of an | simplistic and |
| \mathbf{s}) | (perspective, | within position | issue. | obvious. |

| | thesis/ hypothesis) are acknowledged. | (perspective, thesis/hypothesis). | | |
|---------------|---|-----------------------------------|----------------------|----------------|
| | Others' points of | , | | |
| | view are | | | |
| | synthesized | | | |
| | within position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | Conclusion | |
| | | | | |
| | Conclusions | | is logically tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communic | anon value rubrio | : jor evatuating pr | esemanon tasks. | |
|---------------|-------------------|---------------------|-----------------|---------------------|
| | Capstone | Mile | stone | Benchmark |
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | Organizational | | |
| | (specific | pattern | Organizational | |
| | introduction | (specific | pattern | |
| | and conclusion, | introduction | (specific | Organizational |
| | sequenced | and conclusion, | introduction | pattern (specific |
| | material within | sequenced | and conclusion, | introduction and |
| | the body, and | material within | sequenced | conclusion, |
| | transitions) is | the body, and | material within | sequenced |
| | clearly and | transitions) is | the body, and | material within |
| | consistently | clearly and | transitions) is | the body, and |
| | observable and | consistently | intermittently | transitions) is not |
| | is skillful and | observable | observable | observable |
| | makes the | within the | within the | within the |
| Organization | content of the | presentation. | presentation. | presentation. |

| | presentation | | | |
|------------|-------------------------------|----------------------------|------------------------------|-------------------------------------|
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Languaga | choices are | |
| | and | Language choices are | mundane and | Longuaga |
| | | thoughtful and commonplace | | Language choices are |
| | compelling, and enhance | • | _ | |
| | | generally | and partially | unclear and |
| | the effectiveness | support the effectiveness | support the effectiveness of | minimally |
| | of the | | | support the effectiveness of |
| | | of the | the | |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| T | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | Dolivory | Dolivory | |
| | techniques (posture, | Delivery | Delivery | Delivery |
| | ` L | techniques (posture, | techniques | techniques |
| | gesture, eye contact, and | ` L | (posture, | _ |
| | vocal | gesture, eye contact, and | gesture, eye | (posture, gesture, eye contact, and |
| | expressiveness) vocal vocal | | contact, and | vocal |
| | 1 | | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, illustrations, | | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| | quotations | authorities) | authorities) | relevant |
| | from relevant | make | make | authorities) |
| | authorities) | appropriate | appropriate | make reference |
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| Supporting | reference to | analysis that | analysis that | minimally |
| Material | information or | generally | partially | supports the |
| | | <u> </u> | <u> </u> | |

| | analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | supports the presentation or establishes the presenter's credibility/ authority on the topic. | supports the presentation or establishes the presenter's credibility/ authority on the topic. | presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|---|---|---|---|
| | Central message is | | | |
| | compelling (precisely | | Central | |
| | stated, appropriately | Central message is | message is basically | Central message can be deduced |
| | repeated, | clear and | understandable | but is not |
| Cantral | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Scalable and Distributed Computing

Course Code: IT139

1. General information

| Course designation | Fundamental concepts in distributed computing and discuss |
|---|---|
| | system designs enabling distributed applications |
| Semester(s) in which the course is taught | 5,7 |
| Person responsible for the course | Assoc. Prof. Vo Thi Luu Phuong |
| Language | English |
| Relation to curriculum | Compulsory (NE, DS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. | Total workload: 195 |
| contact hours, self- study hours) | Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Algorithms and Data Structure Fundamentals of Programming or C/C++ Programming |
| Course objectives | This course presents the theory, design, implementation, and analysis of distributed systems. Through classroom lectures, labs, projects and exercises, students learn the fundamentals of distributed systems, system models, remote procedure call, distributed objects, operating system support, security in distributed systems, distributed file systems, concurrency, transaction and synchronization, replication. The course also covers advanced topics related to cloud and distributed data processing technologies: data partitioning, storage schemes, stream processing, and parallel algorithms. Course introduces some modern Internet and cloud computing services running on multiple geographically distributed data centers: Google, Yahoo, Facebook, iTunes, Amazon, eBay, Bing, etc. |
| Course learning outcomes | CLO 1. Understand the concept and design of distributed systems CLO 2. Apply distributed data processing models and technologies |

| | CLO 3. Communicate to the team to design the data pipeline that can be integrated with distributed system, CLO 4. Design and implement components of a scalable and distributed system (millions of users and petabytes of data) Competency Course learning outcome (CLO) Knowledge CLO 1, CLO 2, CLO 3, CLO 4 | | | | e and |
|-------------------|---|---|-------------------------|------------|---------------------------------------|
| | | Skill | CLO 2, CLO 4 CLO 3 | | |
| Contant | The | Attitude | | indicate t | h o |
| Content | weig Weig Teac | hting of the content ght: lecture session (hing levels: I (Intro | | | · · · · · · · · · · · · · · · · · · · |
| | Top | oic | | Weigh | Leve |
| | T . | 1 D' | . 10 | 1 | IT |
| | Mod | | ited Systems, System | 1 | I, T |
| | Ren | note Procedure Call | , Distributed Objects | 1 | I, T |
| | _ | erating System Supp tems | 1 | I, T | |
| | Trai | nsaction and Synchi | 1 | T, U | |
| | Con | currency Control | 1 | T, U | |
| | Sec | urity | | 1 | T, U |
| | Fau | lt and Failure | | 1 | T, U |
| | Intr | oduction to MapRed | duce | 1 | T, U |
| | Sca | lable K-means algor | rithms | 1 | T, U |
| | Gra | ph and Random-wa | lk algorithms | 1 | T, U |
| | Wel | o services, XML, JS | SON, Node.js | 1 | T, U |
| | Pee | r-to-Peer | | 1 | I, T |
| | 1 1 | ected seminar 1: Intr ributed pipeline in I | | 1 | I |
| | Selected seminar 2: Introduce some scalable and distributed products used in Industry. | | | | I |
| Examination forms | | _ | ns, short-answer questi | ons | |
| Study and | | | attendance of 80 perc | | |
| examination | compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments | | | | |
| requirements | | asis of their class pa trongly encouraged. | _ | and com | ments |
| | Assig | | on: Students must have | e more tha | an |

| Reading list | 1. | G. Coulouris, J. Dollimore, T. Kindberg, G. Blair, Distributed Systems: Concepts and Design 5th, 2011 |
|--------------|----|--|
| | 2. | T. White, Hadoop: The Definitive Guide 4th, 2015 |
| | 3. | A.S. Tanenbaum, M.V. Steen, Distributed Systems: |
| | | Principles and Paradigms 2nd, 2007 |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|---------|-----|---|---|---|---|---|
| CL O | 1 | 2 | 3 | 4 | 5 | 6 |
| O | | | | | | |
| 1 | X | | | | | |
| 2 | X | X | | | | |
| 3 | X | X | | | | X |
| 4 | | X | | | | X |

3. Planned learning activities and teaching methods

| Wee k | Topic | CL O | Assessmen ts | Learning activities | Resource s |
|----------|---|---------|--------------|-----------------------------------|-------------------------|
| 1 | Introduction to Distributed Systems, System Models | 1 | | Lecture, Discussion | [1,2,3] Chapter 1 |
| 2 | Remote Procedure Call, Distributed Objects | 1 | Exercises | Lecture, In-class exercises | [1,3] Chapter 2 |
| 3 | Operating System Support, Distributed File Systems | 1 | Exercises | Lecture, In-class exercises | [1,3] Chapter 3 |
| 4 | Transaction and Synchronization | 1,2 | Labs | Lecture, In-class exercises | [1,3] Chapter 3,4 |
| 5 | Concurrency Control | 1,2 | Labs | Lecture, In-class exercises | [1,3] Chapter 5,6 |
| 6 | Midterm | | | | |
| 7 | Security | 2,3 | Exercises | Lecture, In-class exercises | [1,3] Chapter 6,7 |
| 8 | Fault and Failure | 2,3 | Labs | Lecture, In-class exercises | [2] Chapter 5 |

| 9 | Introduction to MapReduce | 2,3 | Exercises | Lecture, In-class exercises | [2] Chapter 6,7 |
|----|--|-----|-----------|-----------------------------------|-----------------------------|
| 10 | Scalable K-means algorithms | 2,3 | Labs | Lecture, In-class exercises | Outside resources |
| 11 | Graph and Random-walk algorithms | 2,3 | Exercises | Lecture, In-class exercises | Outside resources |
| 12 | Web services, XML, JSON, Node.js | 3,4 | Labs | Lecture, In-class exercises | [1,3] Chapter 9,10,11 |
| 13 | Peer-to-Peer | 3,4 | Labs | Lecture, In-class exercises | [1,3] Chapter 12 |
| 14 | Selected seminar 1: Introduce some distributed pipeline in Industry. | 4 | | Discussion | Outside resources |
| 15 | Selected seminar 2: Introduce some scalable and distributed products used in Industry. | 4 | | Discussion | Outside resources |
| 16 | Revision | | | Review-test | |
| 17 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO 1 | CLO 2 | CLO 3 |
|---------------------------|----------|----------|----------|
| Labs (20%) | | 50% | 50% |
| Midterm examination (30%) | 50% | 50% | |
| Final examination (40%) | 20% | 50% | 30% |
| Exercises/ Quiz (10%) | 50% | 50% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organization of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.1. Grading checklist

Grading checklist for Written Reports

| Student: HW/Assignme | ent: | | |
|--|------|-------|----------|
| Date: Evaluator: | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Hol | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|------|--|--|--|--|--|
| Scor | Description | | | | |
| e | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | | | |
| | included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | |
| | missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |
| | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Miles | tone | Benchmark |
|----------|-------|------|-----------|
| 4 | 3 | 2 | 1 |

| | | | Issue/problem | |
|----------------|----------------------|-------------------|----------------------|-----------------|
| | | | Issue/ problem to be | |
| | | | considered | |
| | | | | |
| | | | critically is | |
| | T / 11 / | | stated but | |
| | Issue/ problem to | - / 11 | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | Issue/ |
| | described | stated, | ambiguities | problem to be |
| | comprehensively, | described, and | unexplored, | considered |
| | delivering all | clarified so that | boundaries | critically is |
| | relevant | understanding is | undetermined, | stated without |
| | information | not seriously | and/ or | clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is | Information is | some | |
| | taken from | taken from | interpretation/ | |
| | source(s) with | source(s) with | evaluation, but | |
| | enough | enough | not enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| Evidence | develop a | develop a | analysis or | without any |
| Selecting | comprehensive | coherent | synthesis. | interpretation/ |
| and using | analysis or | analysis or | Viewpoints of | evaluation. |
| information | synthesis. | synthesis. | experts are | Viewpoints of |
| to investigate | Viewpoints of | Viewpoints of | taken as | experts are |
| a point of | experts are | experts are | mostly fact, | taken as fact, |
| view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | Shows an |
| | | | assumptions. | emerging |
| | Thoroughly | | Identifies | awareness of |
| | (systematically and | | several | present |
| | methodically) | | relevant | assumptions |
| | analyzes own and | T 1 | contexts when | (sometimes |
| | others' | Identifies own | presenting a | labels |
| | assumptions and | and others' | position. May | assertions as |
| | carefully evaluates | assumptions and | be more aware | assumptions). |
| T 61 6 | the relevance of | several relevant | of others' | Begins to |
| Influence of | contexts when | contexts when | assumptions | identify some |
| context and | presenting a | presenting a | than one's own | contexts |
| assumptions | position. | position. | (or vice versa). | when |

| I | I | 1 | I | presenting a |
|--------------|----------------------|-------------------|-----------------|----------------|
| | | | | position. |
| | Specific position | | | position. |
| | (perspective, | | | |
| | thesis/ hypothesis) | Specific | | |
| | is imaginative, | position | | |
| | taking into account | (perspective, | | |
| | the complexities of | thesis/hypothesi | | |
| | an issue. Limits of | s) takes into | | |
| | position | account the | | |
| | (perspective, | complexities of | | |
| | thesis/ hypothesis) | an issue. Others' | Specific | Specific |
| | are acknowledged. | points of view | position | position |
| Student's | Others' points of | are | (perspective, | (perspective, |
| position | view are | acknowledged | thesis/ | thesis/ |
| (perspective | synthesized within | within position | hypothesis) | hypothesis) is |
| , | position | (perspective, | acknowledges | stated, but is |
| thesis/hypot | (perspective, | thesis/ | different sides | simplistic and |
| hesis) | thesis/ hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | Conclusion is | logically tied | Conclusion is |
| | | logically tied to | to information | inconsistently |
| | Conclusions and | a range of | (because | tied to some |
| | related outcomes | information, | information is | of the |
| | (consequences and | including | chosen to fit | information |
| | implications) are | opposing | the desired | discussed; |
| | logical and reflect | viewpoints; | conclusion); | related |
| Conclusions | student's informed | related | some related | outcomes |
| and related | evaluation and | outcomes | outcomes | (consequence |
| outcomes | ability to place | (consequences | (consequences | s and |
| (implication | evidence and | and | and | implications) |
| s and | perspectives | implications) | implications) | are |
| consequence | discussed in | are identified | are identified | oversimplifie |
| s) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubite for evaluating presentation tasks. | | | | | | |
|--|-------------------|-----------------|-----------------|-------------------|--|--|
| | Capstone | Mile | stone | Benchmark | | |
| | 4 | 3 | 2 | 1 | | |
| | Organizational | Organizational | Organizational | Organizational | | |
| | pattern (specific | pattern | pattern | pattern (specific | | |
| | introduction and | (specific | (specific | introduction and | | |
| | conclusion, | introduction | introduction | conclusion, | | |
| | sequenced | and conclusion, | and conclusion, | sequenced | | |
| Organizatio | material within | sequenced | sequenced | material within | | |
| n | the body, and | material within | material within | the body, and | | |

| | transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | the body, and transitions) is clearly and consistently observable within the presentation. | the body, and transitions) is intermittently observable within the presentation. | transitions) is not observable within the presentation. |
|------------------------|--|---|--|--|
| | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is |
| Language | appropriate to audience. | appropriate to audience. | appropriate to audience. | not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. A variety of types of supporting materials | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. Supporting materials (explanations, examples, | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. Supporting materials (explanations, examples, | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandabilit y of the presentation, and speaker appears uncomfortable. Insufficient supporting materials (explanations, |
| | (explanations, examples, | illustrations, statistics, | illustrations, statistics, | examples, illustrations, |
| | illustrations, statistics, analogies, quotations from | analogies, quotations from relevant authorities) | analogies, quotations from relevant authorities) | statistics, analogies, quotations from relevant |
| Supporting Material | relevant authorities) | make appropriate | make appropriate | authorities) make reference |

| | make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic. |
|--------------------|--|---|---|---|
| Central Message | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.) | Central message is clear and consistent with the supporting material. | Central message is basically understandable but is not often repeated and is not memorable. | Central message can be deduced but is not explicitly stated in the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Special Study of the Field

Course Code: IT083IU

1. General information

| Course designation | This course helps studer a thesis | nts to do a research topic and prepare for | | |
|---|---|--|--|--|
| Semester(s) in which the course is taught | 7 | | | |
| Person responsible for the course | Lecturers (thesis advisor | r) | | |
| Language | English | | | |
| Relation to curriculum | Compulsory | | | |
| Teaching methods | Lecture, lesson, project, | seminar. | | |
| Workload (incl. contact hours, self-study hours) | (Total workload: 90 hours Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: 90 | | | |
| Credit points | Number of credits : 3 Lecture: 0 Laboratory: 3 | | | |
| Required and recommended prerequisites for joining the course | Required number of credits, Internship | | | |
| Course objectives | Students are advised to select a subject under the guidance of a faculty member. Project content might be a research topic or building a new application that underlies the graduation thesis. Research topics include fields of academic program that are academic or practical. | | | |
| Course learning outcomes | CLO 1. Research a specific topic in the field. CLO 2. Design the model or system architecture of the application product CLO 3. Have a good preparation to develop and improve the product in the thesis. | | | |
| | Competency level Course learning outcome (CLO) | | | |
| | Knowledge | CLO1 | | |
| | Skill | CLO1, CLO2 | | |
| | Attitude | CLO3 | | |

| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: in the whole semester. Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
|-----------------------|---|-----|---|--|--|
| | Topic Weight Level | | | | |
| | Find out/define a topic of the subject | 3 | U | | |
| | Review and evaluate existing issues/problems | 8 | U | | |
| | Research and propose some solutions 8 U | | | | |
| | Deploy some main functions or new features 8 U for the product project | | | | |
| | Testing and evaluating solutions or products | 8 | U | | |
| | Write a report | 10 | U | | |
| Examination forms | Multiple-choice questions, short-answer questions | ons | | | |
| Study and examination | Attendance: A minimum attendance of 80 percent is compulsory for the appointments with lecturer. Students will be assessed on | | | | |
| requirements | the basis of their class participation. Questions and comments are strongly encouraged. | | | | |
| | Assignments/Tasks: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | Related works and books | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | X | | | | |
| 2 | | X | | | | X |
| 3 | | | X | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|-------------------------------------|-----|-----------------------|-------------------------|---|
| 1 | Find out the topic of the subject | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 2 | Review and evaluate existing issues | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |

| 4 | Research and propose some solutions | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
|---|--|-----|-----------------------|-------------------------|---|
| 5 | Deploy some main functions or new features for the product project | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 6 | Testing and evaluating solutions or products | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 7 | Write a report | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 8 | Final grade | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|------------------------|------|------|------|
| Final grade (100%) | 30% | 40% | 30% |

Note: %Pass: Target that % of students having scores greater than 60 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------|----------|---|--|--|
| Student: | HW/ | Assignme | ent: | | |
| Date: | | | | | |
| | Evalı | iator: | | | |
| | | | • | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling grammar and syntax | 10 | | | | |

| Clear and easy to read | 10 | |
|--------------------------------------|-----|--|
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Information | |
|------------------|----------------------------------|----------------------------------|-----------------------|---------------------------|
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | If., |
| | enough | enough | enough to | Information is taken from |
| | interpretation/ evaluation to | interpretation/ evaluation to | develop a coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts when | assumptions |
| | methodically) analyzes own | | presenting a | (sometimes labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | | |
| | position | position | | |
| | (perspective, | (perspective, | a ·c· | |
| | thesis/ | thesis/hypothesi | Specific | Chasicia |
| | hypothesis) is imaginative, | s) takes into account the | position | Specific position |
| | taking into | complexities of | (perspective, thesis/ | (perspective, |
| Student's | account the | an issue. Others' | hypothesis) | thesis/ |
| position | complexities of | points of view | acknowledge | hypothesis) is |
| (perspective, | an issue. Limits | are | s different | stated, but is |
| thesis/hypothesi | of position | acknowledged | sides of an | simplistic and |
| \mathbf{s}) | (perspective, | within position | issue. | obvious. |

| | thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ | (perspective, thesis/ hypothesis). | | |
|---------------|--|---|--|---|
| Conclusions | hypothesis). Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and | Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes | Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communic | anon value rubrio | : jor evatuating pr | Oral communication value rubric for evaluating presentation tasks: | | | | | |
|---------------|-------------------|---------------------|--|---------------------|--|--|--|--|
| | Capstone | Mile | stone | Benchmark | | | | |
| | 4 | 3 | 2 | 1 | | | | |
| | Organizational | | | | | | | |
| | pattern | Organizational | | | | | | |
| | (specific | pattern | Organizational | | | | | |
| | introduction | (specific | pattern | | | | | |
| | and conclusion, | introduction | (specific | Organizational | | | | |
| | sequenced | and conclusion, | introduction | pattern (specific | | | | |
| | material within | sequenced | and conclusion, | introduction and | | | | |
| | the body, and | material within | sequenced | conclusion, | | | | |
| | transitions) is | the body, and | material within | sequenced | | | | |
| | clearly and | transitions) is | the body, and | material within | | | | |
| | consistently | clearly and | transitions) is | the body, and | | | | |
| | observable and | consistently | intermittently | transitions) is not | | | | |
| | is skillful and | observable | observable | observable | | | | |
| | makes the | within the | within the | within the | | | | |
| Organization | content of the | presentation. | presentation. | presentation. | | | | |

| | T | | | |
|------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | _ | statistics, | | _ |
| | examples, | ' | statistics, | illustrations, |
| | illustrations, statistics, | analogies, | analogies, | statistics, |
| | · · | quotations from relevant | quotations from relevant | analogies, |
| | analogies, | | | quotations from relevant |
| | quotations from relevant | authorities) make | authorities) make | |
| | | | | authorities) make reference |
| | authorities) | appropriate | appropriate | |
| | make | reference to | reference to | to information or |
| C | appropriate | information or | information or | analysis that |
| Supporting | reference to | analysis that | analysis that | minimally |
| Material | information or | generally | partially | supports the |

| | analysis that significantly supports the presentation or establishes the presenter's | supports the presentation or establishes the presenter's credibility/ authority on | supports the presentation or establishes the presenter's credibility/ authority on | presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|---|--|--|---|
| | credibility/ | the topic. | the topic. | • |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Internet of Things

Course Code: IT134IU

1. General information

| 1. General information | Τ | | | | | |
|---|--|---|-----------------|--|--|--|
| Course designation | | The course explains the architecture, components of Internet of Thing networks. | | | | |
| Semester(s) in which the course is taught | | | | | | |
| Person responsible for the course | Dr. Le Duy | Tan | | | | |
| Language | English | | | | | |
| Relation to curriculum | Elective (A | Elective (All programs) | | | | |
| Teaching methods | Lecture, les | son, project, semin | ar. | | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | |
| Credit points | Number of credits: 4 Lecture: 2 Laboratory: 1 Mini project: 1 | | | | | |
| Required and recommended prerequisites for joining the course | Computer Networks | | | | | |
| Course objectives | The students will study the communication techniques between the components from short range to long range such as Bluetooth, Zigbee, Wi-fi, Lora, NB-IoT, Moreover, the data storage, organization and analytics are also studied in this course. Furthermore, the mini project within this course will elevate students' understanding of the current state of the IoT industry world. | | | | | |
| Course learning outcomes | CLO 1. The ability of designing and implementing some Internet of Thing systems; CLO 2. The ability of collecting data then applying some data mining techniques to analyze the data in some IoT applications. Competency Course learning | | | | | |
| | | level | outcome (CLO) | | | |
| | | Knowledge | CLO 1 | | | |
| | | Skill | CLO 1 and CLO 2 | | | |
| | | Attitude | CLO 1 | | | |
| Content | weighting of Weight: lec | tion of the contents of the content and the ture session (3 hour | | | | |

| | | Topic | Weight | Level | |
|-----------------------|--|---|------------|-----------|----------|
| | | Week 1: Introduction to Internet of Things | 1 | I | |
| | | Week 2 : IoT System Design | 1 | U | |
| | | Week 3: Sensors and actuators in IoTs | 1 | Т | |
| | | Week 4-8: Communication technologies in IoTs: PAN (Bluetooth, Zigbee), LAN (IEEE 802.11), WAN (LoRa, LTE) | 5 | Т | |
| | | Week 9: Data collection in IoT | 1 | T, U | |
| | | Week 10: Data analytics | 1 | U | |
| | | Week 11-14: IoT Applications in Industry | 4 | T, U | |
| | | Week 15: Mini Project Presentation | 1 | U | |
| Examination forms | Multipl | e-choice questions, short-an | swer quest | tions | |
| Study and examination | | ance: A minimum attendance | - | | _ |
| requirements | _ | sory for the class sessions. S | | | essed |
| | | pasis of their class participat nts are strongly encouraged. | - | ions and | |
| | | ments/Examination: Student | | e more th | nan |
| | _ | points overall to pass this co | | | |
| Reading list | | Raj Kamal, Internet of Thin | _ | | |
| | | hitecture and Design Princi | iples, Mc | Graw Hil | l India, |
| | 201 | | | | |
| | [2] Hanes, David, et al. IoT fundamentals: Networking | | | | |
| | technologies, protocols, and use cases for the internet of | | | | |
| | things. Cisco Press, 2017. | | | | |
| | [3] Singh, Rajesh, et al. Internet of things with Raspberry Pi and Arduino. CRC Press, 2019. | | | | |
| | | Dow, Colin. Internet of thi | | nmming n | rojects: |
| | | d modern IoT solutions wi | | | |
| | | hon. Packt Publishing Ltd, 2 | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CT C | | | |
|-------|--|--|--|
| | | | |
| I SLO | | | |

| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
|-----|---|------------|---|---|-----------|----------|
| 1 | | /// | | | // | |
| 2 | | | | | | √ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessment s | Learning activities | Resources |
|------------|---|------|-----------------|--|------------|
| 1 | Introduction to Internet of Things | 1, 2 | Homework | Lecture, Discussion, Inclass- Quiz | [1] |
| 2 | IoT System Design | 1 | Homework | Lecture, Group work | [2] |
| 3 | Sensors and actuators in IoTs | 1 | Homework | Lecture, Discussion, Inclass- Quiz | [1] |
| | Midterm | | Written exam | | |
| 4 - 8 | Communication technologies in IoTs: PAN (Bluetooth, Zigbee), LAN (IEEE 802.11), WAN (LoRa, LTE) | 1 | Homework | Lecture, Discussion, Inclass- Quiz | [1] [2] |
| 9 | Data collection in IoT | 2 | Homework | Lecture, Discussion, Inclass- Quiz | [1] |
| 10 | Data analytics | 1, 2 | Homework | Lecture, Group work | [2] |
| 12 - 14 | IoT Applications in Industry | 2 | Homework | Lecture, Discussion, Inclass- Quiz, Presentation | [1] |
| 15 | Week 15: Mini Project Presentation | 1, 2 | Presentation | Test | |
| | Final exam | | Written exam | | |

Assessment plan

| Assessment Type | CLO1 | CLO2 |
|---------------------------|------|------|
| Quiz (5%) | | 10% |
| Labs (20%) | 20% | 20% |
| Midterm examination (30%) | 30% | 20% |
| Mini Project (5%) | 25% | |

| Final examination (40%) | 25% | 50% |
|-------------------------|-----|-----|
|-------------------------|-----|-----|

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written | Repor | ts | |
|---|-------|-------|----------|
| Student: HW/Assignmer | nt: | | • • • • |
| Date: Evaluator: | | | ••• |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good transitions | 5 | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2.Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|------|--|
| Scor | Description |
| e | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are |
| | included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are |
| | included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are |
| | included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are |
| | missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3.Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| Explanation of issues | Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding. | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions. | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/ or backgrounds unknown. | Issue/ problem to be considered critically is stated without clarification or description. |
|---|---|---|--|---|
| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question. |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |

| Student's position (perspective, | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/ | Specific position (perspective, thesis/hypothesis) acknowledges | Specific position (perspective, thesis/ hypothesis) is stated, but is cimplication and |
|----------------------------------|---|---|--|--|
| thesis/hypoth esis) | (perspective, thesis/ hypothesis). | thesis/ hypothesis). | different sides of an issue. | simplistic and obvious. |
| | Conclusions and related outcomes (consequences and implications) are logical and reflect | Conclusion is logically tied to a range of information, including | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); | Conclusion is inconsistently tied to some of the information discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-------------------|-------------------|-------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | Organizational | | |
| | introduction and | pattern (specific | Organizational | |
| | conclusion, | introduction and | pattern (specific | |
| | sequenced | conclusion, | introduction and | Organizational |
| | material within | sequenced | conclusion, | pattern (specific |
| | the body, and | material within | sequenced | introduction and |
| | transitions) is | the body, and | material within | conclusion, |
| | clearly and | transitions) is | the body, and | sequenced |
| | consistently | clearly and | transitions) is | material within |
| | observable and is | consistently | intermittently | the body, and |
| | skillful and | observable | observable | transitions) is not |
| | makes the content | within the | within the | observable within |
| Organization | of the | presentation. | presentation. | the presentation. |

| | | | <u> </u> | |
|------------|--------------------|--------------------|--------------------|---------------------|
| | presentation | | | |
| | cohesive. | | | |
| | | | Language | |
| | Language choices | Language | choices are | |
| | are imaginative, | choices are | mundane and | Language choices |
| | memorable, and | thoughtful and | commonplace | are unclear and |
| | compelling, and | generally | and partially | minimally support |
| | enhance the | support the | support the | the effectiveness |
| | effectiveness of | effectiveness of | effectiveness of | of the |
| | the presentation. | the presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| 8 8 | Delivery | | Delivery | Delivery |
| | techniques | Delivery | techniques | techniques |
| | (posture, gesture, | techniques | (posture, gesture, | (posture, gesture, |
| | eye contact, and | (posture, gesture, | eye contact, and | eye contact, and |
| | vocal | eye contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandability |
| | compelling, and | presentation | understandable, | of the |
| | speaker appears | interesting, and | and speaker | presentation, and |
| | polished and | speaker appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| · | A variety of types | Supporting | | |
| | of supporting | materials | | Insufficient |
| | materials | (explanations, | Supporting | supporting |
| | (explanations, | examples, | materials | materials |
| | examples, | illustrations, | (explanations, | (explanations, |
| | illustrations, | statistics, | examples, | examples, |
| | statistics, | analogies, | illustrations, | illustrations, |
| | analogies, | quotations from | statistics, | statistics, |
| | quotations from | relevant | analogies, | analogies, |
| | relevant | authorities) | quotations from | quotations from |
| | authorities) make | make | relevant | relevant |
| | appropriate | appropriate | authorities) make | authorities) make |
| | reference to | reference to | appropriate | reference to |
| | information or | information or | reference to | information or |
| | analysis that | analysis that | information or | analysis that |
| | significantly | generally | analysis that | minimally |
| | supports the | supports the | partially supports | supports the |
| | presentation or | presentation or | the presentation | presentation or |
| | establishes the | establishes the | or establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on the | authority on the | authority on the |
| Material | topic. | topic. | topic. | topic. |

| | Central message | | | |
|---------|--------------------|-----------------|------------------|----------------------|
| | is compelling | | | |
| | (precisely stated, | | Central message | |
| | appropriately | Central message | is basically | Central message |
| | repeated, | is clear and | understandable | can be deduced |
| | memorable, and | consistent with | but is not often | but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: System and Network Administration

Course Code: IT125IU

1. General information

| Course designation | Introduce new networking tec topologies, deployment conce and management techniques | |
|---|---|---|
| Semester(s) in which the course is taught | 5 | |
| Person responsible for the course | MSc. Le Thanh Son | |
| Language | English | |
| Relation to curriculum | Compulsory (NE) | |
| Teaching methods | Lecture | |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify laboratory session, etc.): 45 (I Private study including examin hours: 120 | ecture) + 30 (laboratory) |
| Credit points | Number of credits: 4 Lecture: 2 Laboratory: 1 Mini project: 1 | |
| Required and recommended prerequisites for joining the course | Computer Networks | |
| Course objectives | Introduce new networking tectopologies, example deploym management techniques. Exp and technologies that are used how they relate to each other. concepts and principles. Prov foundation to successfully nat topics and apply those concept Working in an industrial envistudents deepen their understations and sharpen their skills. | ent concepts, protocols, and lains the different elements d in enterprise network and Focus on fundamental ides a solid technical vigate network management ots to particular situations. ronment can help anding of administration |
| Course learning outcomes | CLO 1. Understand key element networked systems in enterpreduction CLO 2. Understand the technology and how they related CLO 3. Understand the role and administrator | ise environments ologies used in enterprise d to each other |
| | Competency level | Course learning outcome (CLO) |
| | Knowledge | 1, 2, 3 |
| | Skill | 2 |

| | Attitude 3 | | |
|------------------------------------|---|-------------------------------------|-------------------|
| Content | The description of the contents should a weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach | · | |
| | Topic | Weight | Level |
| | Introduction to system and network administration | 3 | Ι |
| | System element: Workstations | 3 | T, U |
| | System element: Servers | 3 | T, U |
| | Server strategies | 3 | T, U |
| | Enterprise Services | 3 | T, U |
| | Data center | 3 | |
| | Networks | 3 | T, U |
| | Disaster Recovery and Data Integrity | 3 | T, U |
| | Security Policy | 3 | T, U |
| | System Administrators | 3 | T, U |
| | System and Network in the Industry | 3 | T, U |
| | Working in Industry Report and Presentation | 3 | T, U |
| Examination forms | Multiple-choice questions, short-answe | r questions | • |
| Study and examination requirements | Attendance: A minimum attendance of compulsory for the class sessions. Stud on the basis of their class participation. comments are strongly encouraged. Assignments/Examination: Students me 50/100 points overall to pass this course. | ents will be Questions ust have mo | e assessed and |
| Reading list | Thomas Limoncelli, Practice of Network Administration, Volum Alexander Clemm, Network Ma Fundamentals 1st, 2006 | ne 1, 2016 | d |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SLO | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|-----|---|---|-----|---|---|
| 1 | XXX | | | | | |
| 2 | XXX | | | | | |
| 3 | | | X | XXX | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning | Resources |
|------|-------|-----|-------------|------------|-----------|
| | | | | activities | |

| 1 | Introduction to system and network administration | 3 | Quiz | Lecture | 1, 2 |
|----------|---|------|-----------------------|------------------------|------|
| 2 | System element: Workstations | 1, 2 | Quiz, Midterm | Lecture | 1 |
| 3 | System element: Servers | 1, 2 | Quiz, Lab, Midterm | Lecture, Discussion | 1 |
| 4 | Server strategies | 1, 2 | Quiz, Lab, Midterm | Lecture, Discussion | 1 |
| 5 | Enterprise Services | 1, 2 | Quiz, Lab, Midterm | Lecture, Discussion | 1 |
| 6 | Data center | 1, 2 | Quiz, Lab, Midterm | Lecture, Discussion | 1 |
| 7 | Networks | 1, 2 | Quiz, Lab, Midterm | Lecture, Discussion | 1 |
| 8 | Disaster Recovery and Data Integrity | 1, 2 | Quiz, Lab, Midterm | Lecture, Discussion | 1 |
| MIdter | m exam | | | | |
| 9 | Security Policy | 1, 2 | Quiz, Final | Lecture, Discussion | 1 |
| 10 | System Administrators | 1, 2 | Quiz, Final | Lecture, Discussion | 1 |
| 11-14 | System and Network in the Industry | 1, 2 | Quiz, Final | Lecture, Discussion | 1 |
| 15 | Working in Industry Report and Presentation | 1, 2 | Quiz, Final | Test | 1 |
| Final ex | kam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Presentation (20%) | 20% | 20% | 20% |
| Lab (10%) | 10% | 10% | |
| Midterm examination (30%) | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 50% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organization of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.1.Grading checklist

| Grading checklist for Written Reports | | | | |
|---------------------------------------|------|-------|----------|--|
| Student: HW/Assignment: | | | | |
| Date: Evaluator: | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |

| Abstract clearly identifies purpose and summarizes principal content | 10 | |
|--|-----|--|
| Introduction demonstrates thorough knowledge of | 15 | |
| relevant background and prior work | | |
| Analysis and discussion demonstrate good subject | 30 | |
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good transitions | 5 | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2.Holistic rubric

| H | Iolistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are |
| | included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are |
| | included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are |
| | included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are |
| | missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|-------------|-----------------------|--------------------|------------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be considered | |
| | | | critically is | |
| | | Issue/ problem to | stated but | |
| | Issue/ problem to be | be considered | description | |
| | considered critically | critically is | leaves some | |
| | is stated clearly and | stated, described, | terms | Issue/ problem |
| | described | and clarified so | undefined, | to be |
| | comprehensively, | that | ambiguities | considered |
| | delivering all | understanding is | unexplored, | critically is |
| | relevant information | not seriously | boundaries | stated without |
| Explanation | necessary for full | impeded by | undetermined, | clarification or |
| of issues | understanding. | omissions. | and/ or | description. |

| | T | T | 1 1 1 | T |
|----------------|-----------------------|--------------------|-------------------|--------------------|
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is taken | Information is | some | |
| | from source(s) with | taken from | interpretation/ | |
| | enough | source(s) with | evaluation, but | Information is |
| | interpretation/ | enough | not enough to | taken from |
| | evaluation to | interpretation/ | develop a | source(s) |
| | develop a | evaluation to | coherent | without any |
| Evidence | comprehensive | develop a | analysis or | interpretation/ |
| Selecting and | analysis or | coherent analysis | synthesis. | evaluation. |
| using | synthesis. | or synthesis. | Viewpoints of | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | experts are | experts are |
| investigate a | experts are | experts are | taken as mostly | taken as fact, |
| point of view | questioned | subject to | fact, with little | without |
| or conclusion | thoroughly. | questioning. | questioning. | |
| or conclusion | uiorouginy. | questioning. | questioning. | question. Shows an |
| | | | | |
| | | | 0 | emerging |
| | TT1 1.1 | | Questions some | awareness of |
| | Thoroughly | | assumptions. | present |
| | (systematically and | | Identifies | assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | | contexts when | labels |
| | others' assumptions | Identifies own | presenting a | assertions as |
| | and carefully | and others' | position. May | assumptions). |
| | evaluates the | assumptions and | be more aware | Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| | Specific position | | | |
| | (perspective, thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, taking | Specific position | | |
| | into account the | (perspective, | | |
| | complexities of an | thesis/hypothesis) | | |
| | issue. Limits of | takes into account | | |
| | position | the complexities | | |
| | (perspective, thesis/ | of an issue. | Specific | Specific |
| | hypothesis) are | Others' points of | position | position |
| | acknowledged. | view are | (perspective, | (perspective, |
| Student's | Others' points of | acknowledged | thesis/ | thesis/ |
| position | view are synthesized | within position | hypothesis) | hypothesis) is |
| (perspective, | within position | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | (perspective, thesis/ | thesis/ | different sides | simplistic and |
| esis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| COID | nypouicois). | nyponicsis). | or an issue. | ouvious. |

| | | | Conclusion is | |
|---------------|-----------------------|---------------------|-------------------|-----------------|
| | | | logically tied to | |
| | | | information | |
| | Conclusions and | Conclusion is | (because | Conclusion is |
| | related outcomes | logically tied to a | information is | inconsistently |
| | (consequences and | range of | chosen to fit the | tied to some of |
| | implications) are | information, | desired | the information |
| | logical and reflect | including | conclusion); | discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Milestone | | Benchmark |
|--------------|-------------------------|--------------------|--------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | | Organizational | | |
| | | pattern (specific | Organizational | |
| | Organizational pattern | introduction and | pattern (specific | |
| | (specific introduction | conclusion, | introduction and | Organizational |
| | and conclusion, | sequenced | conclusion, | pattern (specific |
| | sequenced material | material within | sequenced | introduction and |
| | within the body, and | the body, and | material within | conclusion, |
| | transitions) is clearly | transitions) is | the body, and | sequenced |
| | and consistently | clearly and | transitions) is | material within |
| | observable and is | consistently | intermittently | the body, and |
| | skillful and makes the | observable | observable | transitions) is not |
| | content of the | within the | within the | observable within |
| Organization | presentation cohesive. | presentation. | presentation. | the presentation. |
| | | | Language | |
| | Language choices are | Language | choices are | |
| | imaginative, | choices are | mundane and | Language choices |
| | memorable, and | thoughtful and | commonplace | are unclear and |
| | compelling, and | generally support | and partially | minimally support |
| | enhance the | the effectiveness | support the | the effectiveness |
| | effectiveness of the | of the | effectiveness of | of the |
| | presentation. | presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| | Delivery techniques | Delivery | Delivery | Delivery |
| | (posture, gesture, eye | techniques | techniques | techniques |
| | contact, and vocal | (posture, gesture, | (posture, gesture, | (posture, gesture, |
| | expressiveness) make | eye contact, and | eye contact, and | eye contact, and |
| | the presentation | vocal | vocal | vocal |
| Delivery | compelling, and | expressiveness) | expressiveness) | expressiveness) |

| | speaker appears | make the | make the | detract from the |
|------------|----------------------------|-------------------|--------------------|----------------------|
| | polished and | presentation | presentation | understandability |
| | confident. | interesting, and | understandable, | of the |
| | | speaker appears | and speaker | presentation, and |
| | | comfortable. | appears | speaker appears |
| | | | tentative. | uncomfortable. |
| | | Supporting | | Insufficient |
| | | materials | Supporting | supporting |
| | | (explanations, | materials | materials |
| | | examples, | (explanations, | (explanations, |
| | | illustrations, | examples, | examples, |
| | | statistics, | illustrations, | illustrations, |
| | A variety of types of | analogies, | statistics, | statistics, |
| | supporting materials | quotations from | analogies, | analogies, |
| | (explanations, | relevant | quotations from | quotations from |
| | examples, | authorities) make | relevant | relevant |
| | illustrations, statistics, | appropriate | authorities) make | authorities) make |
| | analogies, quotations | reference to | appropriate | reference to |
| | from relevant | information or | reference to | information or |
| | authorities) make | analysis that | information or | analysis that |
| | appropriate reference | generally | analysis that | minimally |
| | to information or | supports the | partially supports | supports the |
| | analysis that | presentation or | the presentation | presentation or |
| | significantly supports | establishes the | or establishes the | establishes the |
| | the presentation or | presenter's | presenter's | presenter's |
| | establishes the | credibility/ | credibility/ | credibility/ |
| Supporting | presenter's credibility/ | authority on the | authority on the | authority on the |
| Material | authority on the topic. | topic. | topic. | topic. |
| | Central message is | | Central message | |
| | compelling (precisely | Central message | is basically | Central message |
| | stated, appropriately | is clear and | understandable | can be deduced |
| | repeated, memorable, | consistent with | but is not often | but is not |
| Central | and strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Entrepreneurship

Course Code: IT120

1. General information

| Covered designation | |
|---|--|
| Course designation | An introduction to the creative and innovative managerial practices of successful entrepreneurship. |
| Semester(s) in which the course is taught | 7 |
| Person responsible for the course | MSc. Dao Tran Hoang Chau |
| Language | English |
| Relation to curriculum | Compulsory (CS, NE, CE) Elective (DS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 135 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits : 3 Lecture: 3 Laboratory: 0 |
| Required and recommended prerequisites for joining the course | |
| Course objectives | This course reviews the significant economic and social contributions entrepreneurs provide to society, the intense lifestyle commitment, and the skills necessary for entrepreneurial success. It explores how to identify and develop solutions to the most common leadership and personal challenges faced by entrepreneurs when starting new ventures or launching new products. It also promotes a deeper understanding of what is required to be a successful entrepreneur, highlights the skills and tools necessary to start a new business and explores alternatives to common pitfalls. This course applies entrepreneurial marketing approaches used by successful entrepreneurs. These include utilizing industry sector trends, identifying emerging customer niches, developing new products/services, using guerilla marketing strategies, and Internet and social marketing strategies. It emphasizes the importance of managing cash flows, ratio analysis, pro forma development, and the basics of deal structure and harvesting a business venture. Students will identify and |

| Course learning outcomes | interpret sources of information from company financial reports, financial publications, industry benchmarks, the media, and web sites. An introduction to the process of researching, writing, and presenting a business plan. Students identify and screen ideas using a business feasibility study that describes the product features, market opportunity, customer profile, sales forecast, competitive advantage, and profit potential. Following a successful feasibility study, students may use business plan software as each develops their own complete business plan. CLO 1. Understand entrepreneurial processes; CLO 2. Apply new technology to boost business performance; | | | | | |
|------------------------------------|---|---|-------------------------------|-------------|------------|--|
| | CLC | 3. Manage marketin | ng strategy and financi | _ | | |
| | ente | rprise; Competency level | Course learning out | reome (CI | <u>()</u> | |
| | | Knowledge | 1, 2, 3 | come (CL | .0) | |
| | | Skill | 1, 3 | | | |
| | | Attitude | 3 | | | |
| Content | The | | ı ntents should clearly ii | ndicate the | ? | |
| | | ghting of the content of | = | | | |
| | | ght: lecture session (| | | | |
| | | ` ` ` | luce); T (Teach); U (U | T | T1 | |
| | | pic 1: C | · ·, 1T , | Weight 3 | Level I, T | |
| | | | ivity and Innovation; | 3 | | |
| | | eative Problem Solvin | - | | T, U | |
| | 1 1 | velop a Product. Gen otect Inventions; | erate Ideas and | 2 | T | |
| | Ma | arketing Strategies; | | 3 | T, U | |
| | Fin | nance and Accounting | | 4 | T, U | |
| Examination forms | Multiple-choice questions, short-answer questions | | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 | | | | | |
| Reading list | | tts overall to pass this Duening & Hisrich Entrepreneurship 2 | & Lechter, Technolog | S.Y | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | | X | | | |
| 2 | | X | | | | |
| 3 | | | | X | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-----|-----------------------------|--------------------------------------|-----------|
| 1 | Entrepreneurship, Creativity and Innovation; | 1 | Midterm exam | Lecture, Inclass activities, Quiz | |
| 2 | Creative Problem Solving Model; | 1 | Midterm exam | Lecture, Inclass activities, Quiz | |
| 3 | Develop a Product. Generate Ideas and Protect Inventions; | 2 | Midterm exam, Assignment | Lecture, Inclass activities, Project | |
| 4 | Midterm | | | | |
| 5 | Marketing Strategies; | 3 | Final exam, Assignment | Lecture, Project | |
| 6 | Finance and Accounting | 3 | Final exam, Assignment | Lecture, Project | |
| 7 | Final exam | | | | |

4. Assessment plan

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Midterm examination (25%) | 50% | 50% | |
| Projects/Presentations/ Report (25%) | | | 60% |
| Final examination (40%) | | | 40% |
| Exercises/ Quiz (10%) | 50% | 50% | |

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|---------------------------------------|----------------|--|--|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | | | | | |

| | Evaluator: | | | |
|--|------------|-------|----------|--|
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |
| Content clearly and logically organized, good | 5 | | | |
| transitions | | | | |
| Presentation (20%) | | | | |
| Correct spelling, grammar, and syntax | 10 | | | |
| Clear and easy to read | 10 | | | |
| Quality of Layout and Graphics (10%) | 10 | | | |
| TOTAL SCORE | 100 | | | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. **Analytic rubric**

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|----------------|----------------------|--------------------|----------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to | Issue/ problem to | Issue/ problem | Issue/ problem |
| | be considered | be considered | to be | to be |
| | critically is stated | critically is | considered | considered |
| Explanation of | clearly and | stated, described, | critically is | critically is |
| issues | described | and clarified so | stated but | stated without |

| | comprehensivaly | that | description | clarification or |
|-------------------|---------------------------------|-------------------|-----------------------------|-----------------------------|
| | comprehensively, delivering all | | description leaves some | description. |
| | relevant | understanding is | | description. |
| | | not seriously | terms | |
| | information | impeded by | undefined, | |
| | necessary for full | omissions. | ambiguities | |
| | understanding. | | unexplored, | |
| | | | boundaries | |
| | | | undetermined, | |
| | | | and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | | | some | |
| | Information is | | interpretation/ | |
| | taken from | Information is | evaluation, | |
| | source(s) with | taken from | but not | |
| | enough | source(s) with | enough to | Information is |
| | interpretation/ | enough | develop a | taken from |
| | evaluation to | interpretation/ | coherent | source(s) |
| | develop a | evaluation to | analysis or | without any |
| | comprehensive | develop a | synthesis. | interpretation/ |
| Evidence | analysis or | coherent analysis | Viewpoints of | evaluation. |
| Selecting and | synthesis. | or synthesis. | experts are | Viewpoints of |
| using information | Viewpoints of | Viewpoints of | taken as | experts are |
| to investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| Conclusion | thoroughly. | questioning. | Questions | question. |
| | | | some | Shows an |
| | Thoroughly | | assumptions. | emerging |
| | (systematically | | Identifies | awareness of |
| | and | | several | present |
| | methodically) | | relevant | assumptions |
| | analyzes own | | contexts when | (sometimes |
| | and others' | | | labels |
| | | Identifies own | presenting a | assertions as |
| | assumptions and carefully | and others' | position. May be more aware | assertions as assumptions). |
| | evaluates the | assumptions and | of others' | Begins to |
| | relevance of | several relevant | assumptions | identify some |
| Influence of | contexts when | contexts when | than one's | contexts when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| | position. | position. | | _ |
| assumptions | position. | postuon. | versa). | position. |

| | G 101 11 | | | |
|------------------------|-------------------|---------------------|-----------------|-----------------|
| | Specific position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | | | |
| | complexities of | Specific position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesis) | | |
| | (perspective, | takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | | |
| | acknowledged. | an issue. Others' | Specific | Specific |
| | Others' points of | points of view | position | position |
| | view are | are | (perspective, | (perspective, |
| | synthesized | acknowledged | thesis/ | thesis/ |
| Student's | within position | within position | hypothesis) | hypothesis) is |
| position | (perspective, | (perspective, | acknowledges | stated, but is |
| (perspective, | thesis/ | thesis/ | different sides | simplistic and |
| thesis/hypothesis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | | - | Conclusion is | |
| | | | logically tied | |
| | Conclusions and | | to information | Conclusion is |
| | related outcomes | Conclusion is | (because | inconsistently |
| | (consequences | logically tied to a | information is | tied to some of |
| | and implications) | range of | chosen to fit | the |
| | are logical and | information, | the desired | information |
| | reflect student's | including | conclusion); | discussed; |
| | informed | opposing | some related | related |
| | evaluation and | viewpoints; | outcomes | outcomes |
| | ability to place | related outcomes | (consequences | (consequences |
| Conclusions and | evidence and | (consequences | and | and |
| related outcomes | perspectives | and implications) | implications) | implications) |
| (implications and | discussed in | are identified | are identified | are |
| consequences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| oral communication value rabble for evaluating presentation tasks. | | | | | | |
|--|-----------------|-----------------|-----------------|-------------------|--|--|
| | Capstone | Mile | Milestone | | | |
| | 4 | 3 | 2 | 1 | | |
| | Organizational | Organizational | Organizational | Organizational | | |
| | pattern | pattern | pattern | pattern (specific | | |
| | (specific | (specific | (specific | introduction and | | |
| | introduction | introduction | introduction | conclusion, | | |
| | and conclusion, | and conclusion, | and conclusion, | sequenced | | |
| Organization | sequenced | sequenced | sequenced | material within | | |

| | | 4 1 1,1 1 | 4 1 1 1 | 41 1 1 1 |
|------------|-----------------|------------------|------------------|---------------------|
| | material within | material within | material within | the body, and |
| | the body, and | the body, and | the body, and | transitions) is not |
| | transitions) is | transitions) is | transitions) is | observable |
| | clearly and | clearly and | intermittently | within the |
| | consistently | consistently | observable | presentation. |
| | observable and | observable | within the | |
| | is skillful and | within the | presentation. | |
| | makes the | presentation. | | |
| | content of the | | | |
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | | | | |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| _ | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | - · | 5 11 | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| Supporting | examples, | statistics, | statistics, | illustrations, |
| Material | illustrations, | analogies, | analogies, | statistics, |
| | | 1 | 1 6 | 1 |

| | -4-4:-4: | 4-4: | 4-4: | 1 |
|---------|-----------------|-----------------|------------------|-------------------|
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| | quotations | authorities) | authorities) | relevant |
| | from relevant | make | make | authorities) |
| | authorities) | appropriate | appropriate | make reference |
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Thesis

Course code: IT058IU

1. General information

| Course designation | This course evaluates students obtained knowledges to complete the academic program. |
|---|--|
| Semester(s) in which the course is taught | 8 |
| Person responsible for the course | Lecturers (thesis advisor) |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Contact hours: 300 hours Private study including examination preparation, specified in hours: 300 |
| Credit points | Number of credits: 10 Lecture: 0 Laboratory: 10 |
| Required and recommended prerequisites for joining the course | Required number of credits Special Study of the Field |
| Course objectives | Dissertations are industrial projects designed to ensure that students have mastered their subjects in the program. All projects are based on "real projects" provided by the industry to students to develop skills and apply knowledge gained from all courses throughout the program. Students will work independently to develop requirements, design, implement and provide solutions to business problems. Students can follow any appropriate process model, must self-manage the project, follow all appropriate project management techniques. The success of the project is largely determined by whether the student adequately solves the client's problem. Students will provide the final product with all artifacts that match the process model being used (e.g. project plan, technical requirements, system architecture, design documentation, test plan, source code and installed software products). |
| Course learning outcomes | CLO 1. Research a specific topic in the field. CLO 2. Design the model or system architecture of the application product |

| | Competency level | Course learning out | tcome (CI | LO) | |
|-------------------|---|-------------------------|-------------|-------------|--|
| | Knowledge | CLO1 | | | |
| | Skill | CLO1, CLO2 | | | |
| | Attitude | CLO3 | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: in the whole last semester Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | Topic | Weight | Level | | |
| | Find out the thesis topic | 4 | U | | |
| | Review and evaluate ex | 20 | U | | |
| | Research and propose s | 30 | U | | |
| | Deploy the thesis produ | ıct | 40 | U | |
| | Testing and evaluating | solutions or products | 40 | U | |
| | Thesis defense | | 1 | U | |
| Examination forms | Multiple-choice question | ns, short-answer questi | ons | 1 | |
| Study and | Attendance: A minimum | attendance of 80 perc | ent is con | pulsory | |
| examination | for the class sessions. St | udents will be assessed | d on the ba | asis of | |
| requirements | their class participation. Questions and comments are strongly encouraged. | | | | |
| | Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | P = 30 = 5 = 5 = 5 = 5 | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | X | | | | X |
| 3 | | | X | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-------|-----------------------|-------------------------|---|
| 1 | Find out the thesis topic | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 2 | Review and evaluate existing issues | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 4 | Research and propose some solutions | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 5 | Deploy the thesis product | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 6 | Testing and evaluating solutions or products | 1,2 | Check and Evaluate | Discuss and Research | Related work, books and research papers |
| 7 | Thesis defense | 1,2,3 | By committee | presentation | |
| 8 | Final grade | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|------------------------|------|------|------|
| Final grade (100%) | 30% | 40% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| 8 | | | | | | |
|--|----------------|-------|----------|--|--|--|
| Grading checklist for Written Reports | | | | | | |
| Student: | HW/Assignment: | | | | | |
| Date: | | | | | | |
| | Evaluator: | | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |

| Summary and conclusions appropriate and complete | 5 | |
|--|-----|--|
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|----------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | Issue/ problem | | considered | |
| | to be considered | | critically is | |
| | critically is | Issue/ problem | stated but | |
| | stated clearly | to be considered | description | |
| | and described | critically is | leaves some | Issue/ |
| | comprehensivel | stated, | terms | problem to be |
| | y, delivering all | described, and | undefined, | considered |
| | relevant | clarified so that | ambiguities | critically is |
| | information | understanding is | unexplored, | stated without |
| | necessary for | not seriously | boundaries | clarification |
| Explanation of | full | impeded by | undetermine | or |
| issues | understanding. | omissions. | d, and/ or | description. |

| | | | 1 1 1 | |
|---------------------------------------|------------------|-------------------|----------------|--|
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | 1 |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| , , , , , , , , , , , , , , , , , , , | Specific | Specific | ,,· | 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1 |
| | position | position | Specific | |
| | (perspective, | (perspective, | position | Specific |
| | thesis/ | thesis/hypothesi | (perspective, | position |
| | hypothesis) is | s) takes into | thesis/ | (perspective, |
| Student's | imaginative, | account the | hypothesis) | thesis/ |
| position | taking into | complexities of | acknowledge | hypothesis) is |
| (perspective, | account the | an issue. Others' | s different | stated, but is |
| thesis/hypothesi | complexities of | points of view | sides of an | simplistic and |
| s) | an issue. Limits | are | issue. | obvious. |
| 3) | an issue. Limits | arc | 155uc. | ouvious. |

| | of position | acknowledged | | |
|---------------|-------------------|-------------------|----------------|----------------|
| | (perspective, | within position | | |
| | thesis/ | (perspective, | | |
| | hypothesis) are | thesis/ | | |
| | acknowledged. | hypothesis). | | |
| | Others' points of | J F • •• | | |
| | view are | | | |
| | synthesized | | | |
| | within position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | | |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | Organizational | |
| | pattern | Organizational | pattern | |
| | (specific | pattern | (specific | Organizational |
| | introduction | (specific | introduction | pattern (specific |
| | and conclusion, | introduction | and conclusion, | introduction and |
| | sequenced | and conclusion, | sequenced | conclusion, |
| | material within | sequenced | material within | sequenced |
| | the body, and | material within | the body, and | material within |
| | transitions) is | the body, and | transitions) is | the body, and |
| | clearly and | transitions) is | intermittently | transitions) is not |
| | consistently | clearly and | observable | observable |
| | observable and | consistently | within the | within the |
| Organization | is skillful and | observable | presentation. | presentation. |

| | makes the content of the | within the presentation. | | |
|------------|--------------------------------|--------------------------------|--------------------------------|----------------------------------|
| | presentation | presentation. | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | Languaga | |
| | imaginative, memorable, | Language | Language choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the . | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is appropriate to | presentation is appropriate to | presentation is appropriate to | presentation is not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) make the | vocal | vocal | vocal |
| | presentation | expressiveness) make the | expressiveness) make the | expressiveness) detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, illustrations, | examples, illustrations, | (explanations, |
| | (explanations, examples, | statistics, | statistics, | examples, illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| | quotations | authorities) | authorities) | relevant |
| | from relevant | make | make | authorities) |
| Supporting | authorities) | appropriate | appropriate | make reference |
| Material | make | reference to | reference to | to information or |

| | appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's | information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on | information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on | analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|--|---|---|---|
| | credibility/ authority on | the topic. | the topic. | |
| | the topic. | | | |
| | Central message is compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Principles of Electrical Engineering I

Course Code: IT068IU

1. General information

| 1. General informat | non |
|---|--|
| Course designation | This subject covers the fundamental knowledge of electrical engineering |
| Semester(s) in which the course is taught | 2 |
| Person responsible for the course | Dr. Ly Tu Nga |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self- | (Estimated) Total workload: 135 |
| study hours) | Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture). |
| | Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits: 3 Lecture: 3 Laboratory: 0 |
| Required and recommended prerequisites for joining the course | Calculus 1 |
| Course objectives | This course covers the following topics: Circuit elements; Independent sources; Dependent sources; Circuit analysis in DC and AC steady state; Operational amplifiers; Power Computations; Two-port circuits; Balanced three-phase circuits. Special seminar(s). |
| Course learning outcomes | CLO 1. Understand how to use electric equipment, meters, multi-meters, power supplies, oscilloscopes and counters; To study the behavior of some specified circuits. CLO 2. Apply critical and analytic thinking to the principles of electrical engineering process; CLO 3. Analyze and evaluate creative thinking in the design of electrical engineering solutions; CLO 4. Have an opportunity to exam case studies to understand the professional and ethical responsibility as an engineer. |

| | Competency level | Course learning o | utcome (C | LO) | | |
|-------------------|--|--|---------------|-----------|--|--|
| | Knowledge | CLO1 | | | | |
| | Skill | CLO2,3 | | | | |
| | Attitude | CLO4 | | | | |
| Content | The description of the co | ontents should clearly | y indicate th | ne | | |
| | weighting of the content | - | | | | |
| | Weight: lecture session (| | | | | |
| | | aching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | Conte | | Weight | Level | | |
| | Introduction to EE051I | | 1 | I | | |
| | Simple resistive circuits | | 1 | T | | |
| | Techniques of circuit and | | 2 | T,U | | |
| | The operational amplifi | er. | 1 | T | | |
| | | | | | | |
| | Industrinas conscitanas | and mutual | 1 | T | | |
| | Inductance, capacitance inductance. | e and mutual | 1 | | | |
| | | onolygic | 1 | Т | | |
| | Sinusoidal steady state | | 1 | - | | |
| | Sinusoidal steady-state Two-port circuits. | power carculations. | 1 | T,U T | | |
| | Balanced three-phase c | iranita: throa phaga | 2 | T | | |
| | voltage sources, analysis | _ | 2 | | | |
| | 11 | cuit, power | | | | |
| | calculation and measure | _ | | | | |
| | Response of first-order | | 1 | Т | | |
| | natural and step respons | | 1 | | | |
| | switching and unbound | - | | | | |
| | Introduction to Laplace | | 1 | T | | |
| | definition, step and imp | | | | | |
| | functional and operation | | | | | |
| | inverse transform, pole | | | | | |
| | and final value theorem | is. | | | | |
| | Term project presentati | on | 1 | | | |
| | Review / Questions & A | Answers | 1 | | | |
| Examination forms | Multiple-choice question | ns, short-answer ques | stions | | | |
| Study and | Attendance: A minimum | | | _ | | |
| examination | for the class sessions. St | | | | | |
| requirements | their class participation. | Questions and comm | nents are str | ongly | | |
| | encouraged. | | | | | |
| | Assignments/Examination | | ve more tha | in 50/100 | | |
| D 11 11 1 | points overall to pass thi | | | | | |
| Reading list | 1. J. W. Nilsson and S | | | | | |
| | 2. R. C. Dorf and J. A Circuits 9th, 2014 | A. Svoboda, Introduc | tion to Elec | tric | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SL | O | | | | |
|-----|----|---|----------|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | ✓ | ✓ | | | | |
| 2 | ✓ | ✓ | | | | |
| 3 | | | > | | | ✓ |
| 4 | | | √ | | | / |

3. Planned learning activities and teaching methods

| | anneu learning activitie | | Teaching | | Resources |
|---------|--|--------------------|--|-----------------|-----------|
| Week | Content | CLO | and learning activities | Assessment | |
| 1 | Introduction to EE051IU: Circuit variables | CLO 1 | -Lecture -Class discussion | | [1] |
| 2 | Simple resistive circuits. | CLO 1 | - Lecture - Class discussion | Homework | [1] |
| 3 & 4 | Techniques of circuit analysis | CLO 1, CLO 2 | - Lecture - Class discussion | Quiz 1 | [1] |
| 5 | The operational amplifier. | CLO 1, CLO 2 | LectureClassdiscussion | Homework | [1] |
| 6 | Inductance, capacitance and mutual inductance. | CLO 1, CLO 2 | - Lecture - Class discussion | Homework | [1] |
| 7 | Sinusoidal steady- state analysis. | CLO 1, CLO 2 | - Lecture - Class discussion | Homework | [1] |
| Midtern | n exam | CLO 1; CLO 2 | | Written exam | |
| 8 | Sinusoidal steady- state power calculations. | CLO 1, CLO 2 | - Lecture - Class discussion | Quiz 2 | [1,2] |
| 9 | Two-port circuits. | CLO 1, CLO 2 | - Lecture - Class discussion | Quiz 3 | [1,2] |

| 10-11 | Balanced three-phase circuits: three-phase voltage sources, analysis of the wye-wye and wye-delta circuit, power calculation and measurements. | CLO 1, CLO 2, CLO 3 | - Lecture - Class discussion | Homework | [1,2] |
|-------|--|---------------------------|------------------------------------|---------------------------|-------|
| 12 | Response of first- order RL and RC circuit: natural and step responses, sequential switching and unbounded response. | CLO 1, CLO 2, CLO 3 | - Lecture - Class discussion | Homework | [1,2] |
| 13 | Introduction to Laplace transform: definition, step and impulse functions, functional and operational transform, inverse transform, poles and zeros, initial and final value theorems. | CLO 1, CLO 2, CLO 3 | - Lecture - Class discussion | Homework | [1,2] |
| 14 | Term project presentation | CLO 1, CLO 2, CLO 3 | Group presentation | Term project presentation | [1,2] |
| 15 | Review / Questions & Answers | CLO 1, CLO 2 | - Lecture - Class discussion | Homework | |
| FINAL | EXAMINATION | | | Written exam | |

4. Assessment plan

(Hint)

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% | 50% |
| Final examination (40%) | 40% | 40% | 40% | 50% |
| Exercises/ Quiz (30%) | 30% | 30% | 30% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| Grading checklist for Writ | ten Repo | orts | | |
|--|----------------|--------|----------|--|
| Student: | HW/Assignment: | | | |
| Date: | | | •• | |
| | Evalı | iator: | | |
| | ••••• | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |
| Content clearly and logically organized, good | 5 | | | |
| transitions | | | | |
| Presentation (20%) | | | | |
| Correct spelling, grammar, and syntax | 10 | | | |
| Clear and easy to read | 10 | | | |

2. Holistic rubric

| Holis | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|---|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

TOTAL SCORE

10

100

Note: this rubric is also used to evaluate questions in an exam.

Quality of Layout and Graphics (10%)

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | Benchmark |
|----------|-----------|-----------|

| | 4 | 3 | 2 | 1 |
|---|---|---|--|--|
| Explanation of issues | Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding. | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions. | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/ or backgrounds unknown. | Issue/ problem to be considered critically is stated without clarification or description. |
| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question. |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when |

| | presenting a | | assumptions | presenting a |
|--------------------|-----------------------|---------------------|-----------------|-----------------|
| | position. | | than one's | position. |
| | position. | | own (or vice | position. |
| | | | versa). | |
| | Specific position | | versa). | |
| | | | | |
| | (perspective, thesis/ | | | |
| | | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | C::C:::4: | | |
| | complexities of | Specific position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesis) | | |
| | (perspective, | takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | G : C | G : C |
| | acknowledged. | an issue. Others' | Specific | Specific |
| | Others' points of | points of view | position | position |
| | view are | are | (perspective, | (perspective, |
| | synthesized | acknowledged | thesis/ | thesis/ |
| Student's | within position | within position | hypothesis) | hypothesis) is |
| position | (perspective, | (perspective, | acknowledges | stated, but is |
| (perspective, | thesis/ | thesis/ | different sides | simplistic and |
| thesis/hypothesis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | | logically tied | |
| | Conclusions and | | to information | Conclusion is |
| | related outcomes | Conclusion is | (because | inconsistently |
| | (consequences | logically tied to a | information is | tied to some of |
| | and implications) | range of | chosen to fit | the |
| | are logical and | information, | the desired | information |
| | reflect student's | including | conclusion); | discussed; |
| | informed | opposing | some related | related |
| | evaluation and | viewpoints; | outcomes | outcomes |
| | ability to place | related outcomes | (consequences | (consequences |
| Conclusions and | evidence and | (consequences | and | and |
| related outcomes | perspectives | and implications) | implications) | implications) |
| (implications and | discussed in | are identified | are identified | are |
| consequences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Mile | Benchmark | |
|----------|------|-----------|---|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A variety of | | | |
|------------|-----------------|--------------------------|------------------|-------------------|
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | _ | _ | _ | materials |
| | examples, | examples, illustrations, | examples, | |
| | illustrations, | ′ | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Principles of Electrical Engineering I Laboratory

Course Code: IT098IU

1. General information

| 1. General informati | on | | | | |
|----------------------|--|--|--|--|--|
| Course designation | This subject covers the fundamental knowledge of electrical | | | | |
| | engineering laboratory | | | | |
| Semester(s) in | 2 | | | | |
| which the course is | | | | | |
| taught | | | | | |
| Person responsible | Dr. Ly Tu Nga | | | | |
| for the course | | | | | |
| Language | English | | | | |
| Relation to | Compulsory (CE) | | | | |
| curriculum | | | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | | |
| Workload (incl. | Total workload: 60 | | | | |
| contact hours, self- | Contact hours (please specify whether lecture, exercise, | | | | |
| study hours) | laboratory session, etc.): 30 (laboratory) | | | | |
| | Private study including examination preparation, specified in | | | | |
| | hours: 30 | | | | |
| Credit points | Number of credits: 1 | | | | |
| | Lecture: 0 | | | | |
| | Laboratory: 1 | | | | |
| Required and | Calculus 1 | | | | |
| recommended | | | | | |
| prerequisites for | | | | | |
| joining the course | | | | | |
| Course objectives | This course helps students to understand better the course | | | | |
| | Principles of Electrical Engineering I. Experimental exercises in | | | | |
| | use of laboratory instruments. Voltage, current, impedance, frequency, and waveform measurements. Rudiments of circuit | | | | |
| | modeling and design. | | | | |
| C 1 | CLO 1. Understand how to use electric equipment, meters, | | | | |
| Course learning | multi-meters, power supplies, oscilloscopes and counters; To | | | | |
| outcomes | study the behavior of some specified circuits. | | | | |
| | CLO 2. Apply critical and analytic thinking to the principles of | | | | |
| | electrical engineering process; | | | | |
| | CLO 3. Analyze and evaluate creative thinking in the design of | | | | |
| | electrical engineering solutions; | | | | |
| | CLO 4. Have an opportunity to exam case studies to understand | | | | |
| | the professional and ethical responsibility as an engineer. | | | | |
| | Competency level Course learning outcome (CLO) | | | | |
| | Knowledge CLO1 | | | | |

| | | Skill | CLO2,3 | | | |
|------------------------------------|--|--|------------------------|-----------|-----------------------------|--|
| | | Attitude | CLO4 | | | |
| Content | wet We | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Feaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | | Topic | | Weight | Level | |
| | | Introduction | | 1 | I | |
| | | Kirchoff's current an | d voltage laws | 1 | T | |
| | | Frequency and phase | shift measurement | 1 | T,U | |
| | | Thevenin's theorem | | 1 | T | |
| | | Mesh and nodal anal | ysis of AC circuits | 2 | T | |
| | | Operational Amplific | ers | 2 | T | |
| | | Circuits utilizing op- | amps | 1 | T,U | |
| | | Professional and ethi | 1 | T | | |
| Examination forms | Mu | Iltiple-choice question | ns, short-answer que | stions | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsor for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | basis of strongly han | |
| Reading list | | Yasir, Sultan, Princip nual, Book, 2019 | ples of Electrical Eng | gineering | Lab. | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SL | SLO | | | | | | |
|-----|----|-----|----------|---|---|----------|--|--|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 1 | > | > | | | | | | |
| 2 | ✓ | ✓ | | | | | | |
| 3 | | | > | | | > | | |
| 4 | | | √ | | | √ | | |

3. Planned learning activities and teaching methods

| Wool | Tonio | CLO | Tasahing and | A gaagam anta | Додоличае |
|------|-------|-----|--------------|---------------|-----------|
| week | Topic | CLO | Teaching and | Assessments | Resources |
| | | | learning | | |
| | | | activities | | |

| 1 | Introduction | CLO1 | -Lecture -Class discussion | | [1] |
|----|--|----------|-----------------------------------|-----------------|-----|
| 2 | Kirchoff's current and voltage laws | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 3 | Frequency and phase shift measurement | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 5 | Thevenin's theorem | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 6 | Mesh and nodal analysis of AC circuits | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 7 | Operational Amplifiers | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 8 | Circuits utilizing op-amps | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 9 | Professional and ethical case studies | CLO1,2,3 | -Practice -Class discussion | Report | [1] |
| 10 | Final exam | | | Written exam | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|-------------------------|------|------|------|------|
| Lab. Assignments (70%) | 80% | 50% | 50% | 50% |
| Final examination (30%) | 20% | 50% | 50% | 50% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | | |
|---------------------------------------|----------------|--|--|
| Student: | HW/Assignment: | | |
| Date: | ••••• | | |

| Evaluator: | |
|------------|--|
| | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| Holis | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem | Issue/ problem | Issue/ | Issue/ |
| | to be considered | to be considered | problem to | problem to be |
| | critically is | critically is | be | considered |
| | stated clearly | stated, | considered | critically is |
| | and described | described, and | critically is | stated without |
| comprehensivel | | clarified so that | stated but | clarification |
| Explanation of | y, delivering all | understanding is | description | or |
| issues | relevant | not seriously | leaves some | description. |

| | :£ | | 4 | |
|------------------|-----------------|------------------|----------------|-----------------|
| | information | impeded by | terms | |
| | necessary for | omissions. | undefined, | |
| | full | | ambiguities | |
| | understanding. | | unexplored, | |
| | | | boundaries | |
| | | | undetermine | |
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | • | interpretation/ |
| | _ | | synthesis. | evaluation. |
| Selecting and | analysis or | analysis or | Viewpoints | |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| abbumpuons | Position. | Position. | , cibu). | Position. |

| | G .C. | | | |
|------------------|-------------------|-------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | 0 | stone | Benchmark |
|----------|---|-------|-----------|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A variety of | | | |
|------------|-----------------|--------------------------|------------------|-------------------|
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | _ | _ | _ | materials |
| | examples, | examples, illustrations, | examples, | |
| | illustrations, | ′ | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Electronics Devices

Course Code: IT074IU

1. General information

| n |
|---|
| This subject covers the fundamental knowledge of electronics devices |
| 5 |
| Dr. Ly Tu Nga |
| English |
| Compulsory |
| Lecture, lesson, project, seminar. |
| (Estimated) Total workload: 135 |
| Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture). |
| Private study including examination preparation, specified in hours: 90 |
| Number of credits: 3 Lecture: 3 Laboratory: 0 |
| Electronics Devices Laboratory (Co-requisite) |
| Fundamentals of semiconductor devices and microelectronic circuits, characteristics of p-n, Zener diodes, and analog diode circuits. Principles of MOSFET and BJT operation, biasing, transistor analysis at midband frequencies. |
| CLO 1. Understand how to use electric equipment, meters, multi-meters, power supplies, oscilloscopes and counters; To study the behavior of some specified circuits. CLO 2. Apply critical and analytic thinking to the electronics devices process; CLO 3. Analyze and evaluate creative thinking in the design of electronic devices solutions; CLO 4. Have an opportunity to exam case studies to understand the professional and ethical responsibility as an engineer. |
| |

| | | Competency level | Course learning outcome (CLO) |
|---|------|-------------------------|-------------------------------|
| | | Knowledge | CLO1 |
| | | Skill | CLO2,3 |
| | | Attitude | CLO4 |
| G | an i | 1 | 1 11 1 1 1 |

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (3 hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weight | Level |
|---|--------|-------|
| Frequency selective circuits, passive filter design. | 1 | I,T |
| Active filter circuits. | 1 | T |
| Fourier Series. | 1 | T |
| Analog and digital signals, amplifiers, circuit models for amplifiers, network theorems. | 1 | T |
| Operational Amplifiers, Ideal Op Amp, inverting & non-inverting configurations, Op Amp circuits, non-ideal performance. | 1 | T |
| Diodes, Ideal diode, terminal characteristics, analysis of diode circuits, small signal analysis. | 1 | T |
| PN junction under reverse-bias, PN junction under forward bias, zener diodes, Diode applications, diode circuit design. | 1 | T |
| Bipolar Junction Transistors; Physical structures and models of operation, PNP & NPN transistors | 1 | T |
| DC analysis, BJT as an amplifier. | 1 | T |
| Single stage amplifier configurations; BJT in cut-off and saturation; BJT circuit applications and circuit design. | 1 | T |
| Field-Effect Transistors, structure and physical operation of enhancement-type and depletion type MOSFET. | 1 | T |
| FET circuit in DC. | 1 | T,U |
| FET as an amplifier, biasing circuits and biasing design; Basic configuration of single-stage FET amplifiers. | 1 | T,U |

| | Basic configuration of single-stage FET amplifiers; FET circuit design, CMOS and CMOS Applications. | 1 | T,U | |
|-------------------|---|---|-----|--|
| | Pspice simulations. | 1 | T | |
| Examination forms | Multiple-choice questions, short-answer questions | | | |
| Study and | Attendance: A minimum attendance of 80 percent is compulsory | | | |
| examination | for the class sessions. Students will be assessed on the basis of | | | |
| requirements | their class participation. Questions and comments are strongly | | | |
| | encouraged. | | | |
| | Assignments/Examination: Students must have more than | | | |
| | 50/100 points overall to pass this course. | | | |
| Reading list | 1. A. S. Sedra and K. C. Smith, Microelectronic Circuits 6th | | | |
| | 2009 | | | |
| | 2. J. W. Nilsson and S. A. Riedel, Electric Circuits 9th, 2011 | | | |
| | 3. R. C. Dorf and J. A. Svoboda, Introduction to Elec Circuits 9th, 2014 | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | ✓ | ✓ | | | | |
| 2 | > | > | | | | |
| 3 | | | > | | | ✓ |
| 4 | | | > | | | ✓ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Teaching and Learning activities | Assessments | Resources |
|------|--|-----------------------|------------------------------------|-------------|-----------|
| 1 | Frequency selective circuits, passive filter design. | CLO 1 | -Lecture -Class discussion | | [2,3] |
| 2 | Active filter circuits. | CLO 1 | - Lecture - Class discussion | Homework | [2,3] |
| 3 | Fourier Series. | CLO 1, CLO 2 | - Lecture - Class discussion | Quiz 1 | [2,3] |

| | T | | 1 | | |
|----|--|-----------------------|------------------------------------|----------|-----|
| 4 | Analog and digital signals, amplifiers, circuit models for amplifiers, network theorems. | CLO 1 | - Lecture - Class discussion | Homework | [1] |
| 5 | Operational Amplifiers, Ideal Op Amp, inverting & non-inverting configurations, Op Amp circuits, non-ideal performance. | CLO 1, CLO 2 | - Lecture - Class discussion | Quiz 2 | [1] |
| 6 | Diodes, Ideal diode, terminal characteristics, analysis of diode circuits, small signal analysis. | CLO 1 | - Lecture - Class discussion | Homework | [1] |
| 7 | PN junction under reverse- bias, PN junction under forward bias, zener diodes, Diode applications, diode circuit design. | CLO 1 | - Lecture - Class discussion | Homework | [1] |
| 8 | Midterm | | Written exam | | |
| 9 | Bipolar Junction Transistors; Physical structures and models of operation, PNP & NPN transistors | CLO 1,2 | - Lecture - Class discussion | Quiz 3 | [1] |
| 10 | DC analysis, BJT as an amplifier. | | | | [1] |
| 11 | Single stage amplifier configurations; BJT in cutoff and saturation; BJT circuit applications and circuit design. | CLO 1 | - Lecture - Class discussion | | [1] |
| 12 | Field-Effect Transistors, structure and physical operation of enhancement- type and depletion type MOSFET. | CLO 1 | - Lecture - Class discussion | Homework | [1] |
| 13 | FET circuit in DC. | CLO 1 | - Lecture - Class discussion | | [1] |
| 14 | FET as an amplifier, biasing circuits and biasing design; Basic | CLO 1,2 | - Lecture - Class discussion | Quiz 4 | [1] |

| | configuration of single- stage FET amplifiers. | | | | |
|----|---|--------------|------------------------------------|----------|-----|
| 15 | Basic configuration of single-stage FET amplifiers; FET circuit design, CMOS and CMOS Applications. | CLO 1 | - Lecture - Class discussion | Homework | [1] |
| 16 | Pspice simulations. | CLO 1,2,3 | - Lecture - Class discussion | | [1] |
| 17 | Final exam | | Written exam | | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% | 50% |
| Final examination (40%) | 40% | 40% | 40% | 50% |
| Exercises/ Quiz (30%) | 30% | 30% | 30% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | | | | | |
|--|----------------|--------|----------|--|--|--|
| Student: | HW/Assignment: | | | | | |
| Date: | | | •• | | | |
| | Evalu | ıator: | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |

| principal content | | |
|--|----|--|
| Introduction demonstrates thorough knowledge of | 15 | |
| relevant background and prior work | | |
| Analysis and discussion demonstrate good subject | 30 | |
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |

| Content clearly and logically organized, good | 5 | |
|---|-----|--|
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Info | |
|------------------|------------------|----------------------------------|------------------------|-------------------------|
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | 8. | Questions | 1 |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | | |
| | evaluates the | | aware of others' | Begins to identify some |
| | relevance of | assumptions and several relevant | | contexts |
| Influence of | | | assumptions than one's | when |
| Influence of | contexts when | contexts when | | |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | | |
| | position | position | | |
| | (perspective, | (perspective, | Chasicia | |
| | thesis/ | thesis/hypothesi | Specific | Coocie: |
| | hypothesis) is | s) takes into | position | Specific |
| | imaginative, | account the | (perspective, | position |
| C4 | taking into | complexities of | thesis/ | (perspective, |
| Student's | account the | an issue. Others' | hypothesis) | thesis/ |
| position | complexities of | points of view | acknowledge | hypothesis) is |
| (perspective, | an issue. Limits | are | s different | stated, but is |
| thesis/hypothesi | of position | acknowledged | sides of an | simplistic and |
| s) | (perspective, | within position | issue. | obvious. |

| | thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position | (perspective, thesis/ hypothesis). | | |
|-------------------|--|---|--|--|
| | (perspective, thesis/ hypothesis). | | | |
| | Conclusions | | Conclusion is logically tied to | |
| | and related outcomes (consequences and | Conclusion is logically tied to a range of information, | information (because information is chosen to | Conclusion is inconsistently tied to some of the |
| | implications) are logical and reflect student's informed | including opposing viewpoints; related | fit the desired conclusion); some related | information discussed; related outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and implications) | s and | implications) |
| (implications and | perspectives discussed in | implications) are identified | implications) are identified | are oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubric for evaluating presentation tasks: | | | | | | |
|--|-----------------|-----------------|-----------------|---------------------|--|--|
| | Capstone | Mile | stone | Benchmark | | |
| | 4 | 3 | 2 | 1 | | |
| | Organizational | | | | | |
| | pattern | Organizational | | | | |
| | (specific | pattern | Organizational | | | |
| | introduction | (specific | pattern | | | |
| | and conclusion, | introduction | (specific | Organizational | | |
| | sequenced | and conclusion, | introduction | pattern (specific | | |
| | material within | sequenced | and conclusion, | introduction and | | |
| | the body, and | material within | sequenced | conclusion, | | |
| | transitions) is | the body, and | material within | sequenced | | |
| | clearly and | transitions) is | the body, and | material within | | |
| | consistently | clearly and | transitions) is | the body, and | | |
| | observable and | consistently | intermittently | transitions) is not | | |
| | is skillful and | observable | observable | observable | | |
| | makes the | within the | within the | within the | | |
| Organization | content of the | presentation. | presentation. | presentation. | | |

| | presentation | | | |
|------------|-----------------|------------------|------------------|--------------------|
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| | quotations | authorities) | authorities) | relevant |
| | from relevant | make | make | authorities) |
| | authorities) | appropriate | appropriate | make reference |
| | make | reference to | reference to | to information or |
| Supporting | appropriate | information or | information or | analysis that |
| Material | reference to | analysis that | analysis that | minimally |

| | information or analysis that significantly supports the presentation or establishes the presenter's | generally supports the presentation or establishes the presenter's credibility/ authority on | partially supports the presentation or establishes the presenter's credibility/ authority on | supports the presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|---|--|--|---|
| | credibility/ authority on | the topic. | the topic. | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Electronics Devices Laboratory

Course Code: IT101IU

1. General information

| 1. General information | ON . | | |
|---|--|--|--|
| Course designation | This subject covers the f devices | fundamental knowledge of electronics | |
| Semester(s) in which the course is taught | 5 | | |
| Person responsible for the course | Dr. Ly Tu Nga | | |
| Language | English | | |
| Relation to curriculum | Compulsory | | |
| Teaching methods | Lecture, lesson, project, | seminar. | |
| Workload (incl. contact hours, self- study hours) | Total workload: 60 Contact hours: 30 (labor Private study including 6 hours: 30 | ratory) examination preparation, specified in | |
| Credit points | Number of credits: 1 Lecture: 0 Laboratory: 1 | | |
| Required and recommended prerequisites for joining the course | Electronic Devices | | |
| Course objectives | semiconductor devices, Employing a learn-by-de | in microelectronic circuits using including diodes, MOSFETs and BJTs ping approach, emphasizing the handsness and computer simulation. | |
| Course learning outcomes | multi-meters, power sup study the behavior of so CLO 2. Apply critical ar devices process; CLO 3. Analyze and eva electronic devices soluti CLO 4. Have an opportu | nd analytic thinking to the electronics aluate creative thinking in the design of | |
| | Competency level | Course learning outcome (CLO) | |
| | Knowledge | CLO1 | |
| | Skill | CLO2,3 | |
| | Attitude | CLO4 | |
| | | | |

| Content | The description of the contents should clearly weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (1) | | ie | |
|------------------------------------|---|---------|-------|--|
| | Topic | Weight | Level | |
| | Introduction and Laboratory Equipment. | 1 | I,T | |
| | RC Circuits and Operational Amplifier. | 1 | T,U | |
| | Semiconductor Junction Diode. | 2 | T,U | |
| | Bipolar Junction Transistors: I-V Characteristics and Biasing. | 1 | T,U | |
| | Bipolar Junction Transistors: Amplifier Topologies. | 1 | T,U | |
| | MOSFET Transistors. | 2 | T,U | |
| | Professional and ethical case studies | 1 | T,U | |
| | Review. | 1 | | |
| Examination forms | Multiple-choice questions, short-answer quest | ions | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | |
| Reading list | [1] R.ChinnaRao, ELECTRONIC DEVICES A LABORATORY MANUAL, 2019. | AND CIR | CUITS | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SL | O | | | | |
|-----|----|---|----------|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | ✓ | ✓ | | | | |
| 2 | ✓ | ✓ | | | | |
| 3 | | | ✓ | | | \ |
| 4 | | | √ | | | √ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Teaching | Assessments | Resources |
|------|-------|-----|------------|-------------|-----------|
| | | | and | | |
| | | | Learning | | |
| | | | activities | | |

| 1 | Introduction and Laboratory Equipment. | CLO1 | -Lecture -Class discussion | | [1] |
|---|---|----------|-----------------------------------|-----------------|-----|
| 2 | RC Circuits and Operational Amplifier. | CLO1,2,3 | -Practice -Class discussion | -Report | [1] |
| 3 | Semiconductor Junction Diode. | CLO1,2,3 | -Practice -Class discussion | -Report | [1] |
| 4 | Bipolar Junction Transistors: I-V Characteristics and Biasing. | CLO1,2,3 | -Practice -Class discussion | -Report | [1] |
| 5 | Bipolar Junction Transistors: Amplifier Topologies. | CLO1,2,3 | -Practice -Class discussion | -Report | [1] |
| 6 | MOSFET Transistors. | CLO1,2,3 | -Practice -Class discussion | -Report | [1] |
| 7 | Professional and ethical case studies | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 8 | Review. | CLO1,2,3 | -Practice -Class discussion | -Report | [1] |
| 9 | Final exam | | -Practice | Written exam | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|-------------------------|------|------|------|------|
| Lab. Assignments (70%) | 70% | 70% | 70% | 70% |
| Final examination (30%) | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| 8 | | | | | |
|---------------------------------------|-------------|----------|---------------------------------------|--|--|
| Grading checklist for Written Reports | | | | | |
| Student: | HW/A | Assignme | ent: | | |
| Date: | Evaluator: | | | | |
| | • • • • • • | | • • • • • • • • | | |
| | Max. | Score | Comments | | |
| | Student: | Student: | Student: HW/Assignme Date: Evaluator: | | |

| Technical content (60%) | | |
|--|-----|---|
| Abstract clearly identifies purpose and summarizes | 10 | |
| principal content | | |
| Introduction demonstrates thorough knowledge of | 15 | |
| relevant background and prior work | | |
| Analysis and discussion demonstrate good subject | 30 | |
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | - |
| Quality of Layout and Graphics (10%) | 10 | _ |
| TOTAL SCORE | 100 | _ |

2. Holistic rubric

| Score Description Demonstrates complete understanding of the problem. All requirements of task are included in response Demonstrates considerable understanding of the problem. All requirements of task are included. |
|--|
| are included in response 4 Demonstrates considerable understanding of the problem. All requirements o |
| 4 Demonstrates considerable understanding of the problem. All requirements o |
| |
| tools are included |
| task are included. |
| 3 Demonstrates partial understanding of the problem. Most requirements of tasl |
| are included. |
| 2 Demonstrates little understanding of the problem. Many requirements of tasl |
| are missing. |
| 1 Demonstrates no understanding of the problem. |
| 0 No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | Milestone | |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem | | Issue/ | |
| | to be considered | Issue/ problem | problem to | Issue/ |
| | critically is | to be considered | be | problem to be |
| | stated clearly | critically is | considered | considered |
| | and described | stated, | critically is | critically is |
| | comprehensivel | described, and | stated but | stated without |
| | y, delivering all | clarified so that | description | clarification |
| Explanation of | relevant | understanding is | leaves some | or |
| issues | information | not seriously | terms | description. |

| | • | . 1 11 | 1 0 1 | |
|------------------|-----------------|------------------|--------------------------|-----------------|
| | necessary for | impeded by | undefined, | |
| | full | omissions. | ambiguities | |
| | understanding. | | unexplored, | |
| | | | boundaries | |
| | | | undetermine | |
| | | | d, and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using und | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| | _ | _ | | taken as fact, |
| investigate a | experts are | experts are | mostly fact, with little | without |
| point of view or | questioned | subject to | | |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | C1 |
| | | | assumptions. | Shows an |
| | /D1 1.1 | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when . | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |

| | a .c. | | | |
|------------------|-------------------|-------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Milestone | | Benchmark | |
|----------|-----------|---|-----------|--|
| 4 | 3 | 2 | 1 | |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A variety of | | | |
|--------------------|---|--|---|--|
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| TVILLET ILLI | Central | the topic. | the topic. | topic. |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | _ | | | |
| Central | | | | _ · |
| | . | | _ | |
| Central Message | memorable, and strongly supported.) | consistent with the supporting material. | but is not often repeated and is not memorable. | explicitly stated in the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Micro-processing Systems

Course Code: IT128IU

1. General information

| 1. General information | <u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u> |
|------------------------|---|
| Course designation | This subject covers the fundamental knowledge of Micro- |
| | processing system |
| Semester(s) in which | 4 |
| the course is taught | |
| Person responsible | Assoc. Prof. Dinh Duc Anh Vu |
| for the course | |
| Language | English |
| Relation to | Compulsory (CE) |
| curriculum | |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. | Total workload: 135 |
| contact hours, self- | Contact hours (please specify whether lecture, exercise, |
| study hours) | laboratory session, etc.): 45 (lecture) |
| | Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits : 3 |
| Credit points | Lecture: 3 |
| | Laboratory: 0 |
| Required and | Co-requisites: Micro-processing System Laboratory |
| recommended co- | |
| requisites or | |
| prerequisites for | |
| joining the course | |
| Course objectives | This course provides students the fundamentals of microprocessors and microcomputers; data flow; machine programming; assembly languages, architectures and instructions sets; stacks, subroutines, I/O, and interrupts; interfacing fundamentals; designing with microprocessors, and applications of micro-processing systems to some practical problems. |
| Course learning | CLO 1. Understand the operation of a basic computer |
| outcomes | organization. |
| | CLO 2. Apply the assembly language to solve a specific problem. |
| | CLO 3. Design the micro-processing systems for a specific |
| | purpose |
| | CLO 4. Have an opportunity to exam case studies to understand |
| | the professional and ethical responsibility as an engineer. |
| | Competency level Course learning outcome (CLO) |

| | | Knowledge | CLO1 | | | | |
|-------------------|------|---|-------------------------------------|----------------|----------|------|--|
| | | Skill | CLO2,3 | | | | |
| | | Attitude | CLO4 | | | | |
| Content | The | description of the co | ontents should cl | early indic | cate the | | |
| | _ | | hting of the content and the level. | | | | |
| | | ght: lecture session | | . [] /[][4;];; | 70) | | |
| | Teac | eaching levels: I (Introduce); T (Teach); U (Utilize) Topic Weight Le | | | | | |
| | | Orientation | | 1 | I | | |
| | | Introduction | | 1 | Ι | | |
| | | Basic Computer C | Organization | 1 | Т | | |
| | | The Pentium Prod | | 1 | T | | |
| | | Overview of Asse | | 1 | T | | |
| | | Procedures and th | | 2 | T,U | | |
| | | Addressing Mode | | 1 | T,U | | |
| | | Arithmetic Flags | | 1 | T,U | | |
| | | Selection and Iter | | 1 | T,U | | |
| | | Logical and Bit O | perations | 1 | T,U | | |
| | | String Processing | | 1 | T | | |
| | | ASCII and BCD | Arithmetic | 1 | T,U | | |
| | | High-Level Langu | uage Interface | 1 | T,U | | |
| | | Final Exam Revie | ew | 1 | T | | |
| Examination forms | + | tiple-choice question | • | | | | |
| Study and | | ndance: A minimun | | _ | | 1 | |
| examination | l l | pulsory for the class | | | | | |
| requirements | | basis of their class participation. Questions and comments strongly encouraged. | | | | 1115 | |
| | l l | signments/Examination: Students must have more than | | | | | |
| | l l | 100 points overall to pass this course. | | | | | |
| Reading list | 1. | Dandamudi, Introd | duction to Assem | bly Langu | ıage | | |
| | | Programming 2nd | | | | | |
| | 2. | Irvine, Assembly 4th, 2003 | Language for Inte | el-Based (| Compute | rs | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |

| 1 | √ | √ | | | |
|---|----------|----------|----------|--|----------|
| 2 | ✓ | ✓ | | | |
| 3 | | | ✓ | | \ |
| 4 | | | √ | | √ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Teaching and | Assessments | Resources |
|------|--------------------|-----------|----------------------|-------------|-----------|
| | | | learning | | |
| | | | activities | | |
| 1 | Orientation | CLO1 | -Lecture | | [1] |
| | | | -Class discussion | | |
| 2 | Introduction | CLO1 | - Lecture | | [1] |
| | | | - Class | | |
| | | | discussion | | |
| 3 | Basic Computer | CLO1,2 | - Lecture | Homework | [1] |
| | Organization | | - Class | | |
| | | | discussion | | |
| 4 | The Pentium | CLO1,2 | - Lecture | Quiz 1 | [1] |
| | Processor | | - Class | | |
| | | | discussion | | -1- |
| 5 | Overview of | CLO1,2 | - Lecture | | [1] |
| | Assembly | | - Class | | |
| | Language | | discussion | | |
| 6 | Procedures and the | CLO1,2,3 | - Lecture | Homework | [1] |
| | Stack | | - Class | | |
| | | | discussion | | |
| 7 | Midterm | | | Written | |
| | | GI 01.2 | T | exam | F43 |
| 8 | Addressing Modes | CLO1,2 | - Lecture | Quiz 2 | [1] |
| | | | - Class | | |
| | | CI 01 2 2 | discussion | | F13 |
| 9 | Arithmetic Flags | CLO1,2,3 | - Lecture | | [1] |
| | and Instruction | | - Class | | |
| 10 | G 1 .: 1 | CI O2 2 4 | discussion | Homovyouls | F11 |
| 10 | Selection and | CLO2,3,4 | - Lecture - Class | Homework | [1] |
| | Iteration | | | | |
| 11 | Legical or 4 Div | CLO2,3,4 | discussion - Lecture | | Γ11 |
| 11 | Logical and Bit | CLO2,3,4 | - Class | | [1] |
| | Operations | | discussion | | |
| 12 | String Propagains | CLO2,3,4 | - Lecture | Quiz 3 | [1] |
| 12 | String Processing | | - Class | Quiz 3 | [1] |
| | | | discussion | | |
| | 1000 | CLO2,3,4 | - Lecture | | [1] |
| 13 | ASCII and BCD | | | | |

| | | | - Class discussion | | |
|----|-------------------------------------|----------|------------------------------------|-----------------|-----|
| 14 | High-Level Language Interface | CLO2,3,4 | - Lecture - Class discussion | Homework | [1] |
| 15 | Final Exam Review | CLO2,3,4 | - Lecture - Class discussion | | |
| 16 | Final exam | | | Written exam | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% | 40% |
| Exercises/ Quiz (30%) | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ↔

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | | | | | |
|--|----------------|--------|----------|--|--|--|
| Student: | HW/Assignment: | | | | | |
| Date: | | | | | | |
| | Evalı | ıator: | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good | 5 | | | | | |
| transitions | | | | | | |

| Presentation (20%) | | |
|---------------------------------------|-----|--|
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

2. Holistic rubric

| Holi | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Informat' | |
|------------------|------------------|---|-------------------------|-----------------|
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| CONCIUSION | morouginy. | questioning. | Questions | question. |
| | | | _ | |
| | | | some | Shows an |
| | | | assumptions. Identifies | |
| | TP1 1-1 | | | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | - 4 4 4 4 | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | | |
| | position | position | | |
| | (perspective, | (perspective, | | |
| | thesis/ | thesis/hypothesi | Specific | |
| | hypothesis) is | s) takes into | position | Specific |
| | imaginative, | account the | (perspective, | position |
| | taking into | complexities of | thesis/ | (perspective, |
| Student's | account the | an issue. Others' | hypothesis) | thesis/ |
| position | complexities of | points of view | acknowledge | hypothesis) is |
| (perspective, | an issue. Limits | are | s different | stated, but is |
| thesis/hypothesi | of position | acknowledged | sides of an | simplistic and |
| | 1 | 111111111111111111111111111111111111111 | blacs of all | Simplistic time |

| | thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ | (perspective, thesis/ hypothesis). | | |
|---------------|--|---|--|---|
| Conclusions | hypothesis). Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and | Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes | Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communic | anon value rubric | : jor evatuating pr | esemanon tasks. | |
|---------------|-------------------|---------------------|-----------------|---------------------|
| | Capstone | Mile | stone | Benchmark |
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | Organizational | | |
| | (specific | pattern | Organizational | |
| | introduction | (specific | pattern | |
| | and conclusion, | introduction | (specific | Organizational |
| | sequenced | and conclusion, | introduction | pattern (specific |
| | material within | sequenced | and conclusion, | introduction and |
| | the body, and | material within | sequenced | conclusion, |
| | transitions) is | the body, and | material within | sequenced |
| | clearly and | transitions) is | the body, and | material within |
| | consistently | clearly and | transitions) is | the body, and |
| | observable and | consistently | intermittently | transitions) is not |
| | is skillful and | observable | observable | observable |
| | makes the | within the | within the | within the |
| Organization | content of the | presentation. | presentation. | presentation. |

| | T | | | |
|------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | _ | statistics, | | _ |
| | examples, | ' | statistics, | illustrations, |
| | illustrations, statistics, | analogies, | analogies, | statistics, |
| | · · | quotations from relevant | quotations from relevant | analogies, |
| | analogies, | | | quotations from relevant |
| | quotations from relevant | authorities) make | authorities) make | |
| | | | | authorities) make reference |
| | authorities) | appropriate | appropriate | |
| | make | reference to | reference to | to information or |
| C | appropriate | information or | information or | analysis that |
| Supporting | reference to | analysis that | analysis that | minimally |
| Material | information or | generally | partially | supports the |

| | analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | supports the presentation or establishes the presenter's credibility/ authority on the topic. | supports the presentation or establishes the presenter's credibility/ authority on the topic. | presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|---|---|---|---|
| | Central message is | | | |
| | compelling (precisely | | Central | |
| | stated, appropriately | Central message is | message is basically | Central message can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Micro-processing Systems Lab

Course Code: IT129IU

1. General information

| 1. General information | |
|--|---|
| Course designation | This subject covers the fundamental knowledge of Micro- |
| | processing system Laboratory |
| Semester(s) in which the course is taught | 4,6 |
| Person responsible for the course | Assoc. Prof. Dinh Duc Anh Vu |
| Language | English |
| Relation to curriculum | Compulsory (CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. | Total workload: 60 |
| contact hours, self- | Contact hours (please specify whether lecture, exercise, |
| study hours) | laboratory session, etc.): 30 (laboratory) |
| , | Private study including examination preparation, specified in hours: 30 |
| Credit points | Number of credits : 1 |
| | Lecture: 0 |
| | Laboratory: 1 |
| Required and recommended corequisites for joining the course | Micro-processing System |
| Course objectives | In this course the students will study and do experiments with ARM microcontroller development KIT. Student will be able to practice with following topics: assembly languages, architectures and instructions sets; stacks, subroutines, I/O, and interrupts; peripheral interfacing fundamentals; designing with microprocessors, and applications of micro-processing systems to some practical problems. |
| Course learning outcomes | CLO 1. An ability to design and conduct experiments with microcontroller as well as to analyze and interpret data CLO 2. An ability to identify, formulate, and solve engineering problems using microcontroller based solutions CLO 3. Implement assembly language to solve a specific problem CLO 4. Have an opportunity to exam case studies to understand the professional and ethical responsibility as an engineer. |
| | Competency level Course learning outcome (CLO) |
| | Knowledge CLO2 |

| | Skill | CLO1,3 | | | |
|------------------------------------|---|--|-------|-----|--|
| | Attitude | CLO4 | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | Topic Weight Lev | | | | |
| | Introduction to KIT, So devices | 1 | I,T | | |
| | General Input/Output; | SPI interface | 2 | T,U | |
| | | y interfacing, programming: sing modes; UART interfaces | | T,U | |
| | Interrupts and applicat | 1 | T,U | | |
| | Timers and application | ıs | 1 | T,U | |
| | ADC conversion (pollimethod) and application | | 1 | T,U | |
| | Sensors and applicatio | ns | 2 | T,U | |
| | Professional and ethica | 1 | T,U | | |
| Examination forms | Multiple-choice questio | ns, short-answer ques | tions | • | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 | | | | |
| Reading list | | Iazidi and, Sarmad Na Microcontroller and E | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|----------|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | ✓ | ✓ | | | | |
| 2 | ✓ | ✓ | | | | |
| 3 | | | ✓ | | | ✓ |
| 4 | | | √ | | | √ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Teaching | Assessments | Resources |
|------|---|----------|-----------------------------------|------------------|-----------|
| Week | Торіс | CLO | and learning activities | Assessments | Resources |
| 1 | Introduction to KIT, Softs, and installing devices | CLO1 | -Lecture -Class discussion | | [1] |
| 2 | General Input/Output; SPI interface | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 3 | Memory interfacing, programming: addressing modes; UART interfaces | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 4 | Interrupts and applications | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 5 | Timers and applications | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 6 | ADC conversion (polling and interrupt method) and applications | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 7 | Sensors and applications | CLO2,3,4 | -Practice -Class discussion | -Report | [1] |
| 8 | Professional and ethical case studies | CLO4 | -Practice -Class discussion | -Report | [1] |
| 9 | Final exam | | -Practice | -Written exam | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|-------------------------|------|------|------|------|
| Lab. Assignments (70%) | 70% | 70% | 70% | 70% |
| Final examination (30%) | 30% | 30% | 30% | 30% |

Assessment Type

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual

questions to lecturers after the class, all mean that about 60 minutes should be counted. $\stackrel{\smile}{\leftarrow}$

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | |
|---------------------------------------|----------------|--|
| Student: | HW/Assignment: | |
| Date: | | |
| | Evaluator: | |
| | | |

| | | Score | Comments |
|--|-----|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| Holie | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | |
|-------|--|--|--|
| Score | Description | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | |
| | are included in response | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | |
| | task are included. | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | |
| | are included. | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | |
| | are missing. | | |
| 1 | Demonstrates no understanding of the problem. | | |
| 0 | No response/task not attempted | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milest | one | Benchmark |
|--------------|--------|-----|-----------|
| 4 | 3 | 2 | 1 |

| | | | T/ | |
|-----------------------|----------------------------|-------------------|---------------------------|--------------------|
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | _ | described, and | _ | considered |
| | y, delivering all relevant | , | unexplored, boundaries | |
| | | clarified so that | | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using und | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| | _ | • | | |
| conclusion | thoroughly. | questioning. | questioning. | question. Shows an |
| | Th one1-1 | | Questions | |
| | Thoroughly | | some | emerging |
| | (systematically | | assumptions. | awareness of |
| | and | | Identifies | present |
| | methodically) | T1 | several | assumptions |
| | analyzes own | Identifies own | relevant | (sometimes |
| | and others' | and others' | contexts | labels |
| | assumptions | assumptions and | when | assertions as |
| | and carefully | several relevant | presenting a | assumptions). |
| Influence of | evaluates the | contexts when | position. | Begins to |
| context and | relevance of | presenting a | May be more | identify some |
| assumptions | contexts when | position. | aware of | contexts |

| | | | - 41 ! | 1 |
|------------------|-------------------|-------------------|----------------|----------------|
| | presenting a | | others' | when |
| | position. | | assumptions | presenting a |
| | | | than one's | position. |
| | | | own (or vice | |
| | | | versa). | |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | _ | thesis/ | • |
| C4do41a | | are | | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | G 1 : | | is logically | |
| | Conclusions | G 1 : : | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|--------------------|------------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and is | transitions) is | the body, and | material within |
| | skillful and | clearly and | transitions) is | the body, and |
| | makes the content | consistently | intermittently | transitions) is not |
| | of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | | | Language | |
| | | Language | choices are | |
| | Language choices | choices are | mundane and | Language |
| | are imaginative, | thoughtful and | commonplace | choices are |
| | memorable, and | generally | and partially | unclear and |
| | compelling, and | support the | support the | minimally |
| | enhance the | effectiveness | effectiveness of | support the |
| | effectiveness of | of the | the | effectiveness of |
| | the presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | | Delivery | Delivery | |
| | Delivery | techniques | techniques | Delivery |
| | techniques | (posture, | (posture, | techniques |
| | (posture, gesture, | gesture, eye | gesture, eye | (posture, gesture, |
| | eye contact, and | contact, and | contact, and | eye contact, and |
| | vocal | vocal | vocal | vocal |
| | expressiveness) | expressiveness) | expressiveness) | expressiveness) |
| | make the | make the | make the | detract from the |
| | presentation | presentation | presentation | understandability |
| | compelling, and | interesting, and | understandable, | of the |
| | speaker appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |

| | A variety of types | Supporting | Supporting | |
|------------|--------------------|-----------------|------------------|-------------------|
| | of supporting | materials | materials | Insufficient |
| | materials | (explanations, | (explanations, | supporting |
| | (explanations, | examples, | examples, | materials |
| | examples, | illustrations, | illustrations, | (explanations, |
| | illustrations, | statistics, | statistics, | examples, |
| | statistics, | analogies, | analogies, | illustrations, |
| | analogies, | quotations | quotations | statistics, |
| | quotations from | from relevant | from relevant | analogies, |
| | relevant | authorities) | authorities) | quotations from |
| | authorities) make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on | authority on | authority on the |
| Material | topic. | the topic. | the topic. | topic. |
| | Central message | | | |
| | is compelling | | Central | |
| | (precisely stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, and | consistent with | but is not often | explicitly stated |
| Central | strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Digital System Design

Course Code: IT105IU

1. General information

| Course designation | This course introduces methodology and techniques to design digital systems |
|---|---|
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Assoc. Prof. Vo Thi Luu Phuong |
| Language | English |
| Relation to curriculum | Compulsory (CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 135 Contact hours: 45 (lecture) Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits: 3 Lecture: 3 Laboratory: 0 |
| Required and recommended prerequisites for joining the course | Digital Logic Design |
| Parallel course | Digital System Design Lab |
| Course objectives | This course introduces methodology and techniques to design digital systems. The topics including the basic concepts, analysis, and system design with hardware description languages (HDL). The course provides an insight of the design of asynchronous sequential circuits and complex synchronous systems. Design process is introduced by concepts, documents, and simulation. |
| Course learning outcomes | CLO 1. An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. CLO 2. An ability to understand the different switching algebra theorems and apply them for logic functions. CLO 3. An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions. CLO 4. An ability to understand sequential circuits, such as counters and shift registers, and to perform simple projects using standard logic and integrated chips. |

| | CLO 5. An ability to analyze and design asynchronous sequential | | | |
|-------------------|--|------------------------|--------------|----------|
| | digital elements CLO 6. An ability to analyze and design synchronous digital | | | |
| | elements | | | |
| | CLO 7. An ability to write and verify synthesizable VHDL models | | | |
| | CLO 8. An ability to effectively use VHDL simulator | | | |
| | Competency level Course learning outcome (CLO) | | (O) | |
| | Knowledge CLO 1, 2, 3 | | | |
| | Skill | CLO 4, 5, 6 | | |
| | Attitude | CLO 7, 8 | | |
| Content | The description of the co | · · | ndicate the | e. |
| | weighting of the content | | | |
| | Weight: lecture session (| (3 hours) | | |
| | Teaching levels: I (Intro | duce); T (Teach); U (U | tilize) | 1 |
| | Topic | | Weight | Level |
| | Number systems, Binar | y and Hexadecimal | 1 | I |
| | Number systems, Binar | y and Hexadecimal | 1 | I |
| | Switching algebra, The | orems, Standard | 1 | T |
| | representation of logic functions. | | | |
| | Boolean algebra, Comb | oinational circuits, | 1 | T |
| | Truth table, Karnaugh | maps, Minimization | | |
| | techniques. | | 1 | |
| | Binary and Hexadecim | | 1 | T |
| | Synchronous Sequentia | l Logic. | 2 | T,U |
| | Asynchronous Sequential Logic. | | 1 | T,U |
| | Counters: serial and parallel, Design 1 T,U | | T,U | |
| | examples, Shift registers. | | | |
| | Asynchronous State Machines 1 T,U | | | |
| | Multiple Clock Domains 1 T,U | | T,U | |
| | Hardward Description | Languages | 1 | T |
| | Guidelines for VHDL-based Design 1 T,U | | T,U | |
| | Programmable Device | Technologies and | 1 | T,U |
| | Introduction to the Alte | era FPGA | | |
| Examination forms | Multiple-choice questions, short-answer questions | | | |
| Study and | Attendance: A minimum attendance of 80 percent is compulsory | | | |
| examination | for the class sessions. St | | | |
| requirements | their class participation. encouraged. | Questions and comme | nts are stro | ongry |
| | | on: Students must have | more than | 50/100 |
| | Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | 2 2. 200 |
| Reading list | [1] M.M. Mano and M.D. Ciletti, Digital Design 4th, 2007 | | | |

| [2] Zwolinski M, Digital System Design with VHDL 2nd, 2004 |
|---|
| [3] R.J Tocci and N.S. Widner, Digital Systems - Principles and |
| Applications 8th, 2001 |
| [4] J.F. Wakerly, Digital Design Principles & Practices 4th, 2004 |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-8) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | > | | | | |
| 2 | | > | | | | |
| 3 | | > | | | | |
| 4 | | > | | | | |
| 5 | | > | | | | > |
| 6 | | > | | | | > |
| 7 | | | | | | \ |
| 8 | | | | | | \ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|------------|-----------------|----------------------------------|-----------|
| 1 | Number systems, Binary and Hexadecimal | CLO1 | Homework | -Lecture -Class discussion | [1] |
| 2 | Number systems, Binary and Hexadecimal | CLO1, 2 | Homework | -Lecture -Class discussion | [1] |
| 3 | Switching algebra, Theorems, Standard representation of logic functions. | CLO3, | Homework | -Lecture -Class discussion | [1] |
| 4 | Boolean algebra, Combinational circuits, Truth table, Karnaugh maps, Minimization techniques. | CLO3, | Homework | -Lecture -Class discussion | [1] |
| 5 | Binary and Hexadecimal arithmetic | CLO3, | Homework | -Lecture -Class discussion | [1] |
| 6 | Midterm | | Written exam | | |

| 7 | Synchronous Sequential Logic. | CLO5, | Homework | -Lecture -Class discussion | [1] |
|----|---|------------|-----------------|----------------------------------|-----|
| 8 | Asynchronous Sequential Logic. | CLO5, | Homework | -Lecture -Class discussion | [1] |
| 9 | Counters: serial and parallel, Design examples, Shift registers. | CLO5, 6 | Homework | -Lecture -Class discussion | [1] |
| 10 | Asynchronous State Machines | CLO7, 8 | Homework | -Lecture -Class discussion | [1] |
| 11 | Multiple Clock Domains | CLO5, | Homework | -Lecture -Class discussion | [1] |
| 12 | Hardward Description Languages | CLO7, 8 | Homework | -Lecture -Class discussion | [1] |
| 13 | Guidelines for VHDL- based Design | CLO7, 8 | Homework | -Lecture -Class discussion | [1] |
| 14 | Programmable Device Technologies and Introduction to the Altera FPGA | CLO7, 8 | Homework | -Lecture -Class discussion | [1] |
| 15 | Final exam | | Written exam | | |

4. Assessment plan

Assessment Type

| Assessment Type | CL01 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 | CLO7 | CLO8 |
|---------------------------|------|------|------|------|------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% |
| Exercises/ Quiz (30%) | 30% | 30% | 30% | 30% | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| 01 www | |
|---------------------------|----------------|
| Grading checklist for Wri | tten Reports |
| Student: | HW/Assignment: |
| Date: | |
| | Evaluator: |
| | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | 1 | | Ι | |
|------------------|-------------------|-------------------|----------------|-----------------|
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | | | Issue/ |
| | | critically is | undefined, | |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | * | * | coherent | |
| | evaluation to | evaluation to | | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | Shows an |
| | Thoroughly | | some | emerging |
| | (systematically | | assumptions. | awareness of |
| | and | | Identifies | present |
| | methodically) | | several | assumptions |
| | analyzes own | Identifies own | relevant | (sometimes |
| | and others' | and others' | contexts | labels |
| | assumptions | assumptions and | when | assertions as |
| | and carefully | several relevant | presenting a | assumptions). |
| Influence of | evaluates the | | | _ |
| | | contexts when | position. | Begins to |
| context and | relevance of | presenting a | May be more | identify some |
| assumptions | contexts when | position. | aware of | contexts |

| | | | .1 1 | 1 |
|------------------|-------------------|-------------------|----------------|----------------|
| | presenting a | | others' | when |
| | position. | | assumptions | presenting a |
| | | | than one's | position. |
| | | | own (or vice | |
| | | | versa). | |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| 5) | | | Conclusion | 33,130,51 |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |
| | of American Colle | | | u. |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|------------------|------------------|---------------------|
| | 4_ | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | | Delivery | Delivery | |
| | Delivery | techniques | techniques | Delivery |
| | techniques | (posture, | (posture, | techniques |
| | (posture, | gesture, eye | gesture, eye | (posture, gesture, |
| | gesture, eye | contact, and | contact, and | eye contact, and |
| | contact, and | vocal | vocal | vocal |
| | vocal | expressiveness) | expressiveness) | expressiveness) |
| | expressiveness) | make the | make the | detract from the |
| | make the | presentation | presentation | understandability |
| | presentation | interesting, and | understandable, | of the |
| | compelling, | speaker | and speaker | presentation, and |
| . | and speaker | appears | appears | speaker appears |
| Delivery | appears | comfortable. | tentative. | uncomfortable. |

| | polished and | | | |
|-------------|-----------------|-------------------|------------------|-------------------|
| | confident. | | | |
| | confident. | | | |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| 1/14/01 141 | Central | die topie. | die topie. | topic. |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |
| <u></u> | | Collogos and Univ | | prosentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Digital System Design Lab

Course Code: IT106IU

1. General information

| 1. General information | |
|---|--|
| Course designation | This course introduces methodology and techniques to design digital systems |
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Assoc. Prof. Vo Thi Luu Phuong |
| Language | English |
| Relation to curriculum | Compulsory (CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 60 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 30 (laboratory) Private study including examination preparation, specified in hours: 30 |
| Credit points | Number of credits : 1 Lecture: 0 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Digital Logic Design Digital Logic Design Lab |
| Parallel course | Digital System Design |
| Course objectives | This lab helps students understand better about techniques to design digital systems. This lab includes software and hardware topics: Introduction to Maxplus II software, Counter, Introduction to VHDL in Maxplus II, Digital Clock. |
| Course learning outcomes | CLO 1. Ability to describe a digital system in VHDL |
| | CLO 2. Ability to simulate and debug a digital system described in VHDL |
| | CLO 3. Ability to interface electronic components with custom hardware. |
| | CLO 4. Ability to implement logic on an FPGA |
| | CLO 5. Ability to analyze timing of digital systems, including cross-boundary, asynchronous timing |

| | Competency level | Course learning ou | tcome (C | LO) |
|------------------------------------|---|-------------------------|-------------|---------|
| | Knowledge | CLO1, 2 | | |
| | Skill | CLO3, 4 | | |
| | Attitude | CLO5 | | |
| Content | The description of the co | ontents should clearly | indicate t | he |
| | weighting of the content | | | |
| | Weight: lecture session | | Titilian) | |
| | Teaching levels: I (Intro | duce); I (Teach); U (| | Level |
| | Topic D: | 111 1 1 | Weight 1 | I, T |
| | Number systems, Bina | • | <u> </u> | |
| | Switching algebra, The representation of logic | | 1 | I, T |
| | Boolean algebra, Comb Truth table, Karnaugh techniques. | 1 | I, T | |
| | Counters: serial and pa examples, Shift registe | _ | 1 | T, U |
| | Asynchronous State M | achines | 1 | T, U |
| | Multiple Clock Domai | ns | 1 | T, U |
| | Hardward Description | Languages | 1 | T, U |
| | Guidelines for VHDL- | based Design | 1 | T, U |
| | Programmable Device Introduction to the Alto | U | 1 | T, U |
| Examination forms | Report | | 1 | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed the basis of their class participation. Questions and comment are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | ments |
| Reading list | 1. M.M. Mano and N | A.D. Ciletti, Digital D | esign 4th, | 2007 |
| | 2. Zwolinski M, Digital System Design with VHDL 2nd, 2004 | | | 2nd, |
| | 3. R.J Tocci and N.S and Applications 8 | • | tems - Prir | nciples |
| | 4. J.F. Wakerly, Digital 2004 | ital Design Principles | & Practice | es 4th, |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | > | | | | |
| 2 | | ✓ | | | | |
| 3 | | ✓ | | | | ✓ |
| 4 | | ✓ | | | | ✓ |
| 5 | | | | | | ✓ |

3. Planned learning activities and teaching methods

| | Tamed learning activities at | | | T | D |
|------|---|-------|-------------|-----------------------------------|-----------|
| Week | Topic | CLO | Assessments | Learning activities | Resources |
| 1 | Number systems, Binary and Hexadecimal | CLO1 | -Report | -Practice -Class discussion | [1] |
| 2 | Switching algebra, Theorems, Standard representation of logic functions. | CLO1 | -Report | -Practice -Class discussion | [1] |
| 3 | Boolean algebra, Combinational circuits, Truth table, Karnaugh maps, Minimization techniques. | CLO2 | -Report | -Practice -Class discussion | [1] |
| 4 | Counters: serial and parallel, Design examples, Shift registers. | CLO3 | -Report | -Practice -Class discussion | [1] |
| 5 | Asynchronous State Machines | CLO4 | -Report | -Practice -Class discussion | [1] |
| 6 | Multiple Clock Domains | CLO4 | -Report | -Practice -Class discussion | [1] |
| 7 | Hardward Description Languages | CLO3, | -Report | -Practice -Class discussion | [1] |
| 8 | Guidelines for VHDL- based Design | CLO5 | -Report | -Practice -Class discussion | [1] |

| 9 | Programmable Device | CLO5 | -Report | -Practice | [1] |
|---|----------------------------|------|---------|------------|-----|
| | Technologies and | | | -Class | |
| | Introduction to the Altera | | | discussion | |
| | FPGA | | | | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 |
|-------------------------|------|------|------|------|------|
| Lab. Assignments (70%) | 70% | 70% | 70% | 70% | 70% |
| Final examination (30%) | 30% | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

1. Grading checklist

| Grading checklist for Writt | en Repo | rts | |
|--|---------|----------|-----------------|
| Student: | HW/A | Assignme | ent: |
| Date: | | | •• |
| | Evalu | ıator: | |
| | | | • • • • • • • • |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

2. Holistic rubric

| Holis | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|---|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

| | Capstone | Milest | | Benchmark |
|------------------|-------------------|-------------------|----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is | Information is | Information | Information is |
| | taken from | taken from | is taken from | taken from |
| Evidence | source(s) with | source(s) with | source(s) | source(s) |
| Selecting and | enough | enough | with some | without any |
| using | interpretation/ | interpretation/ | interpretation | interpretation/ |
| information to | evaluation to | evaluation to | / evaluation, | evaluation. |
| investigate a | develop a | develop a | but not | Viewpoints of |
| point of view or | comprehensive | coherent | enough to | experts are |
| conclusion | analysis or | analysis or | develop a | taken as fact, |

| | synthesis. Viewpoints of experts are questioned thoroughly. | synthesis. Viewpoints of experts are subject to questioning. | coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. | without question. |
|---|---|---|---|---|
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
| Student's position (perspective, thesis/hypothesis) | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/hypothesis). | Specific position (perspective, thesis/ hypothesis) acknowledge s different sides of an issue. | Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and obvious. |

| | thesis/ | | | |
|---------------|-------------------|-------------------|----------------|----------------|
| | hypothesis). | | | |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | | stone | Benchmark |
|--------------|-----------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| Language | and | support the | and partially | support the |

| | 11' | - CC1. | 41 | - CC4: C |
|------------------------|-----------------|------------------|------------------|----------------------------------|
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| | the | presentation. | the . | Language in |
| | effectiveness | Language in | presentation. | presentation is |
| | of the | presentation is | Language in | not appropriate |
| | presentation. | appropriate to | presentation is | to audience. |
| | Language in | audience. | appropriate to | |
| | presentation is | | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Benvery | A variety of | Supporting | Supporting | dicomortable. |
| | types of | materials | materials | Insufficient |
| | supporting | (explanations, | (explanations, | supporting |
| | materials | examples, | examples, | materials |
| | (explanations, | illustrations, | illustrations, | (explanations, |
| | examples, | statistics, | statistics, | examples, |
| | illustrations, | analogies, | analogies, | illustrations, |
| | statistics, | quotations | quotations | statistics, |
| | analogies, | from relevant | from relevant | analogies, |
| | quotations | authorities) | authorities) | quotations from |
| | from relevant | make | make | relevant |
| | authorities) | appropriate | appropriate | authorities) |
| | make | reference to | reference to | make reference |
| | appropriate | information or | information or | to information or |
| | reference to | analysis that | analysis that | analysis that |
| | information or | generally | partially | minimally |
| | analysis that | supports the | supports the | supports the |
| | significantly | presentation or | presentation or | presentation or |
| | supports the | establishes the | establishes the | establishes the |
| | presentation or | presenter's | presenter's | presenter's |
| | establishes the | _ | _ | ^ |
| Supporting | | credibility/ | credibility/ | credibility/ authority on the |
| Supporting Material | presenter's | authority on | authority on | • |
| Material | credibility/ | the topic. | the topic. | topic. |

| | authority on the topic. | | | |
|---------|-------------------------|-----------------|------------------|-------------------|
| | the topic. | | | |
| | | | | |
| | | | | |
| | | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Embedded Systems

Course Code: IT115IU

1. General information

| Course designation | This course addresses the considerations in designing real-time embedded systems, both from a hardware and software perspective. |
|---|--|
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Dr. Nguyen Toan Van |
| Language | English |
| Relation to curriculum | Compulsory (CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 135 Contact hours: 45 (lecture) Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits: 3 Lecture: 2 Mini project: 1 |
| Required and recommended prerequisites for joining the course | Digital Logic Design Micro-processing Systems |
| Course objectives | This course addresses the considerations in designing real-time embedded systems, both from a hardware and software perspective. The primary emphasis is on real-time processing for communications and signal processing systems. Programming projects in a high level language like C/C++ will be an essential component of the course, as well as hardware design with modern design tools. |
| Course learning outcomes | CLO 1. An ability to understand the "big ideas" in embedded systems CLO 2. An ability to obtain direct hands-on experience on both hardware and software elements commonly used in embedded system design. CLO 3. An ability to understand basic real-time resource management theory |

| | CLO 4. An ability to unde | | nbedded s | ystem | | |
|------------------------------------|--|--|-----------|-------|--|--|
| | application concepts such as signal processing. Competency level Course learning outcome (CLO) | | | | | |
| | Competency level | | come (CL | (O) | | |
| | Knowledge | CLO1, 2 | | | | |
| | Skill | CLO1, 2 | | | | |
| | Attitude | CLO3, 4 | | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
| | Topic | | Weight | Level | | |
| | Introduction to Embedde | ed systems | 1 | I, T | | |
| | Hardware/software func | tional partitioning | 1 | T, U | | |
| | System architectures | | 1 | T, U | | |
| | Pipelining, interrupt serv | vice routines | 1 | T, U | | |
| | Software structures: | | 1 | T, U | | |
| | Evaluating system perfo | Evaluating system performance correctness, | | | | |
| | Continuation of system j | performance | 1 | T, U | | |
| | Profiling system perforn | nance | 1 | T, U | | |
| | Continuation of perform | ance profiling | 1 | T, U | | |
| | Embedded systems Proje from industry) | ect (2nd presentation | 1 | U | | |
| | Performance optimization | on | 1 | T, U | | |
| | Mini Project demo and p | presenation | 1 | U | | |
| Examination forms | Multiple-choice questions | s, short-answer questic | ons | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of | | | | | |
| requirements | their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 | | | | | |
| | points overall to pass this course. | | | | | |
| Reading list | [1] Amos, B. (2020). Han | | | | | |
| | Building real-time embed MCUs, and SEGGER deb | - | | TM32 | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | ✓ | | | | |
| 2 | | ✓ | | | | |
| 3 | | | | | | ✓ |
| 4 | | | | | | ✓ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|-------|--|------------|--------------|------------------------------------|-----------|
| 1 | Introduction to Embedded systems | CLO1 | Homework | - Lecture - Class discussion | [1] |
| 2 | Hardware/software functional partitioning | CLO1 | Homework | - Lecture - Class discussion | [1] |
| 3 | System architectures | CLO1, 2 | Homework | - Lecture - Class discussion | [1] |
| 4 | Pipelining, interrupt service routines | CLO1, 2 | Homework | - Lecture - Class discussion | [1] |
| 5 & 6 | Industrial applications of Embedded systems | CLO1, 2 | Homework | - Lecture, - Group work | |
| | Midterm | | Written exam | | |
| 7 | Software structures: | CLO3 | Homework | - Lecture - Class discussion | [1] |
| 8 | Evaluating system performance correctness, speed | CLO3 | Homework | - Lecture - Class discussion | [1] |
| 9 | Continuation of system performance evaluation | CLO3 | Homework | - Lecture - Class discussion | [1] |
| 10 | Profiling system performance | CLO3, | Homework | - Lecture | [1] |

| | | | | - Class discussion | |
|------------|---|-------|--------------|------------------------------------|-----|
| 11 | Continuation of performance profiling | CLO3, | Homework | - Lecture - Class discussion | [1] |
| 12 | Performance optimization | CLO4 | Homework | - Lecture - Class discussion | [1] |
| 13 & 14 | Industrial applications of Embedded systems | CLO3, | Homework | - Lecture, - Group work | |
| 15 | Mini project demo and Presentation | CLO3, | Homework | - Class discussion | |
| | Final exam | | Written exam | | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% | 40% |
| Exercises/ Quiz (30%) | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|----------------|--------|----------|--|
| Student: | HW/Assignment: | | | |
| Date: | | | •• | |
| | Evalı | ıator: | | |
| | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |

| Distinct introduction, body, conclusions | 5 | |
|---|-----|--|
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

Analytic rubric

| | Capstone | Milest | one | Benchmark |
|-----------------------|--------------------|--------------------|---------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem to | leaves some | |
| | critically is | be considered | terms | |
| | stated clearly and | critically is | undefined, | |
| | described | stated, described, | ambiguities | Issue/ problem |
| | comprehensively, | and clarified so | unexplored, | to be |
| | delivering all | that | boundaries | considered |
| | relevant | understanding is | undetermined, | critically is |
| | information | not seriously | and/ or | stated without |
| Explanation of | necessary for full | impeded by | backgrounds | clarification or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Information is | |
|--------------------|-------------------|--------------------|-----------------|-----------------|
| | | | | |
| | | | taken from | |
| | | | source(s) with | |
| | | | some | |
| | Information is | | interpretation/ | |
| | taken from | Information is | evaluation, | |
| | source(s) with | taken from | but not | |
| | enough | source(s) with | enough to | Information is |
| | interpretation/ | enough | develop a | taken from |
| | evaluation to | interpretation/ | coherent | source(s) |
| | develop a | evaluation to | analysis or | without any |
| | comprehensive | develop a | synthesis. | interpretation/ |
| Evidence | analysis or | coherent analysis | Viewpoints of | evaluation. |
| Selecting and | synthesis. | or synthesis. | experts are | Viewpoints of |
| using information | Viewpoints of | Viewpoints of | taken as | experts are |
| to investigate a | experts are | experts are | mostly fact, | taken as fact, |
| <u> </u> | _ | _ | with little | without |
| point of view or | questioned | subject to | | |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | G1 |
| | | | assumptions. | Shows an |
| | Thoroughly | | Identifies | emerging |
| | (systematically | | several | awareness of |
| | and | | relevant | present |
| | methodically) | | contexts when | assumptions |
| | analyzes own | | presenting a | (sometimes |
| | and others' | | position. May | labels |
| | assumptions and | Identifies own | be more | assertions as |
| | carefully | and others' | aware of | assumptions). |
| | evaluates the | assumptions and | others' | Begins to |
| | relevance of | several relevant | assumptions | identify some |
| Influence of | contexts when | contexts when | than one's | contexts when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| * | Specific position | Specific position | / | ^ |
| | (perspective, | (perspective, | | |
| | thesis/ | thesis/hypothesis) | Specific | Specific |
| | hypothesis) is | takes into | position | position |
| | imaginative, | account the | (perspective, | (perspective, |
| | taking into | complexities of | thesis/ | thesis/ |
| Student's | account the | an issue. Others' | hypothesis) | hypothesis) is |
| position | complexities of | points of view | acknowledges | stated, but is |
| (perspective, | an issue. Limits | are | different sides | simplistic and |
| thesis/hypothesis) | of position | acknowledged | of an issue. | obvious. |
| mesis/nypotnesis) | or hosinon | acknownedged | or an issue. | ouvious. |

| | (perspective, | within position | | |
|-------------------|-------------------|---------------------|----------------|-----------------|
| | thesis/ | (perspective, | | |
| | hypothesis) are | thesis/ | | |
| | acknowledged. | hypothesis). | | |
| | Others' points of | | | |
| | view are | | | |
| | synthesized | | | |
| | within position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | | |
| | | | Conclusion is | |
| | | | logically tied | |
| | Conclusions and | | to information | Conclusion is |
| | related outcomes | Conclusion is | (because | inconsistently |
| | (consequences | logically tied to a | information is | tied to some of |
| | and implications) | range of | chosen to fit | the |
| | are logical and | information, | the desired | information |
| | reflect student's | including | conclusion); | discussed; |
| | informed | opposing | some related | related |
| | evaluation and | viewpoints; | outcomes | outcomes |
| | ability to place | related outcomes | (consequences | (consequences |
| Conclusions and | evidence and | (consequences | and | and |
| related outcomes | perspectives | and implications) | implications) | implications) |
| (implications and | discussed in | are identified | are identified | are |
| consequences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubric for evaluating presentation tasks: | | | | | | |
|--|-----------------|-----------------|-----------------|---------------------|--|--|
| | Capstone | Mile | stone | Benchmark | | |
| | 4 | 3 | 2 | 1 | | |
| | Organizational | | Organizational | | | |
| | pattern | Organizational | pattern | | | |
| | (specific | pattern | (specific | Organizational | | |
| | introduction | (specific | introduction | pattern (specific | | |
| | and conclusion, | introduction | and conclusion, | introduction and | | |
| | sequenced | and conclusion, | sequenced | conclusion, | | |
| | material within | sequenced | material within | sequenced | | |
| | the body, and | material within | the body, and | material within | | |
| | transitions) is | the body, and | transitions) is | the body, and | | |
| | clearly and | transitions) is | intermittently | transitions) is not | | |
| | consistently | clearly and | observable | observable | | |
| | observable and | consistently | within the | within the | | |
| Organization | is skillful and | observable | presentation. | presentation. | | |

| | makes the | within the | | |
|-------------------|---------------------|----------------------|----------------------|----------------------|
| | content of the | presentation. | | |
| | presentation | presentation. | | |
| | cohesive. | | | |
| | conesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness of | effectiveness of | effectiveness of | support the |
| | the | the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | | expressiveness) | |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| D.P. | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting materials | Supporting materials | Insufficient |
| | types of supporting | (explanations, | (explanations, | supporting materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| Supporting | analogies, | from relevant | from relevant | quotations from |
| Material Material | quotations | authorities) | authorities) | relevant |
| 141atC11a1 | quotations | addiornesj | aumornics | 1 CIC valit |

| | from relevant | make | make | authorities) |
|---------|-----------------|-----------------|------------------|-------------------|
| | authorities) | appropriate | appropriate | make reference |
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Embedded Systems Laboratory

Course Code: IT127IU

1. General information

| Course designation | This course integrates n | nicroprocessors into digital systems. | | | | | |
|---|--|---|--|--|--|--|--|
| Semester(s) in which the course is taught | | | | | | | |
| Person responsible for the course | Assoc. Prof. Vo Thi Lui | ı Phuong, | | | | | |
| Language | English | glish | | | | | |
| Relation to curriculum | Compulsory (CE) | ompulsory (CE) | | | | | |
| Teaching methods | Lecture, lesson, project, | seminar. | | | | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 60 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 30 (laboratory) Private study including examination preparation, specified in hours: 30 | | | | | | |
| Credit points | Number of credits : 1 Lecture: 0 Laboratory: 1 | | | | | | |
| Required and recommended prerequisites for joining the course | Digital Logic Design Micro-processing Systems | | | | | | |
| Course objectives | course includes hardwar peripheral systems, emb | nicroprocessors into digital systems. The re interfacing, bus protocols and redded and real-time operating systems, stworking, and memory system. | | | | | |
| Course learning outcomes | CLO 1. An ability to design complex electronic systems interfacing multiple integrated circuits. CLO 2. An ability to design and conduct experiments, as well as analyze and interpret data. CLO 3. An ability to identify, formulate, and solve engineering problems in designing and implementing embedded systems. CLO 4. An ability to use the techniques, skills, and modern engineering tools necessary for implementing embedded systems. | | | | | | |
| | Competency level Course learning outcome (CLO) | | | | | | |
| | Knowledge | CLO1, 2 | | | | | |
| | Skill | CLO1, 2 | | | | | |
| | Attitude | CLO3, 4 | | | | | |
| | | | | | | | |

| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
|-------------------|---|------------------------------------|-------------|-----------|---------|--|
| | 1000111 | Topic | Weight | Level | | |
| | Hardware/software codesign | | 1 | T, U | | |
| | Polled I/O | | 1 | T, U | | |
| | | Interrupt-driven I/O | 1 | T, U | | |
| | | Bus Arbitration | 1 | T, U | | |
| | Bus Saturation | | 1 | T, U | | |
| | | Memory system operation and | 1 | T, U | | |
| | | Multitasking on one CPU | 1 | T, U | | |
| | | Multiprocessing | 1 | T, U | | |
| | | Real-time performance | 1 | T, U | | |
| Examination forms | Multip | le-choice questions, short-answer | r questions | S | | |
| Study and | Attend | ance: A minimum attendance of | 80 percent | t is comp | oulsory | |
| examination | for the | class sessions. Students will be a | issessed or | n the bas | sis of | |
| requirements | their cl | ass participation. Questions and | comments | are stro | ngly | |
| | encouraged. | | | | | |
| | Assignments/Examination: Students must have more than | | | | | |
| | | points overall to pass this course | | | | |
| Reading list | | | | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|----------|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | ✓ | | | | |
| 2 | | ✓ | | | | |
| 3 | | | | | | √ |
| 4 | | | | | | √ |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|----------------------------|------|-------------|-----------------------------------|-----------|
| 1 | Hardware/software codesign | CLO1 | -Report | -Practice -Class discussion | [1] |
| 2 | Polled I/O | CLO1 | -Report | -Practice | [1] |

| | | | | -Class discussion | |
|----|--------------------------------|------------|---------|-----------------------------------|-----|
| 3 | Interrupt-driven I/O | CLO1, 2 | -Report | -Practice -Class discussion | [1] |
| 5 | Bus Arbitration | CLO1, 2 | -Report | -Practice -Class discussion | [1] |
| 6 | Bus Saturation | CLO1, 2 | -Report | -Practice -Class discussion | [1] |
| 7 | Memory system operation and | CLO3 | -Report | -Practice -Class discussion | [1] |
| 8 | Multitasking on one CPU | CLO3 | -Report | -Practice -Class discussion | [1] |
| 9 | Multiprocessing using multiple | CLO3, | -Report | -Practice -Class discussion | [1] |
| 10 | Real-time performance | CLO3, | -Report | -Practice -Class discussion | [1] |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|-------------------------|------|------|------|------|
| Final examination (30%) | 30% | 30% | 30% | 30% |
| Exercises/ Quiz (70%) | 70% | 70% | 70% | 70% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

| 1 | l. (| Gr | ad | lin | g | ch | ec | k | lis | t |
|---|------|----|----|-----|---|----|----|---|-----|---|
| | | | | | | | | | | |

| •• | Grading encernist | |
|----|----------------------|--------------------|
| | Grading checklist fo | or Written Reports |
| | Student: | HW/Assignment: |
| | Date: | ••••• |

| Evaluator: | | | | | |
|--|------|-------|----------|--|--|
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

2. Holistic rubric

| _ | | | | | | | | |
|-------|--|--|--|--|--|--|--|--|
| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | | | |
| Score | Description | | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | | | | |
| | are included in response | | | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | | | | |
| | task are included. | | | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | | | | |
| | are included. | | | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | | | | |
| | are missing. | | | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | | | |
| 0 | No response/task not attempted | | | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | | | T/ | |
|-----------------------|----------------------------|-------------------|---------------------------|--------------------|
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | _ | described, and | _ | considered |
| | y, delivering all relevant | , | unexplored, boundaries | |
| | | clarified so that | | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using und | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| | _ | • | | |
| conclusion | thoroughly. | questioning. | questioning. | question. Shows an |
| | Th one1-1 | | Questions | |
| | Thoroughly | | some | emerging |
| | (systematically | | assumptions. | awareness of |
| | and | | Identifies | present |
| | methodically) | T1 | several | assumptions |
| | analyzes own | Identifies own | relevant | (sometimes |
| | and others' | and others' | contexts | labels |
| | assumptions | assumptions and | when | assertions as |
| | and carefully | several relevant | presenting a | assumptions). |
| Influence of | evaluates the | contexts when | position. | Begins to |
| context and | relevance of | presenting a | May be more | identify some |
| assumptions | contexts when | position. | aware of | contexts |

| | | | .1 1 | 1 |
|------------------|-------------------|-------------------|----------------|----------------|
| | presenting a | | others' | when |
| | position. | | assumptions | presenting a |
| | | | than one's | position. |
| | | | own (or vice | |
| | | | versa). | |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| 3) | hypothesis). | nypoutesis). | Conclusion | obvious. |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |
| consequences, | Priority order. | cicuity. | Jicurry. | ٠. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Miles | stone | Benchmark |
|--------------|--|--|--|---|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the |
| Organization | presentation cohesive. | presentation. | presentation. | presentation. |
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears |
| Delivery | appears | comfortable. | tentative. | uncomfortable. |

| | polished and | | | |
|------------|-----------------|---------------------------|--------------------------------|--------------------------|
| | confident. | | | |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central . | | | |
| | message is | | | |
| | compelling | | C t 1 | |
| | (precisely | C1 | Central | C |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically understandable | can be deduced |
| | repeated, | clear and consistent with | | but is not |
| Central | memorable, | | but is not often | explicitly stated in the |
| | and strongly | the supporting material. | repeated and is not memorable. | presentation. |
| Message | supported.) | material. | | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Concepts in VLSI Design

Course Code: IT110IU

1. General information

| General information | |
|---|---|
| Course designation | This subject covers the fundamental knowledge of concepts in VLSI design |
| Semester(s) in which the course is taught | 7 |
| Person responsible for the course | Dr. Nguyễn Toàn Văn |
| Language | English |
| Relation to curriculum | Compulsory (CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 135 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) Private study including examination preparation, specified in hours: 90 |
| Credit points | Number of credits : 3 Lecture: 3 Laboratory: 0 |
| Required and recommended prerequisites for joining the course | Digital Logic Design Electronics Device |
| Course objectives | This course introduces the digital VLSI chip design based on CMOS technology and including dynamic clocked logic, analog MOSFET timing analysis, and layout design rules. The course also develops the use of computer-aided design software tools and cell library construction as well as an understanding of elementary circuit testing. |
| Course learning outcomes | CLO design logic circuit layouts for both static CMOS and dynamic clocked CMOS circuits CLO analyze VLSI circuit timing using Logic Effort CLO describe the sources and effects of clock skew |
| | CLO assemble an entire chip and add the appropriate pads to a layout |

| | Competency level | Course learning or | utcome (C | CLO) | |
|-------------------|---|--|-------------|-----------|--|
| | Knowledge | CLO1,4 | | | |
| | Skill | CLO9 | | | |
| | Attitude | CLO6 | | | |
| Content | The description of the co | ntents should clearly | indicate t | he | |
| | weighting of the content Weight: lecture session (Teaching levels: I (Introd | and the level. 3 hours) | | | |
| | Cont | tent | Weight | Level | |
| | Introduction and Over | rview to Fabrication | 1 | I | |
| | Circuits and Layout | | 3 | I | |
| | Microprocessor Exam | | 1 | I | |
| | CMOS Transistor The | | 3 | T,U | |
| | DC and Transient Res | sponse | 3 | I | |
| | Logical Effort | | 3 | T,U | |
| | Power | | 3 | I | |
| | Combinational Circui | t Design | 3 | T,U | |
| | Circuit Families | | 3 | I | |
| | Sequential Circuit De | sign | 3 | T,U | |
| | Adders | | 1 | I | |
| | Design for Testability | | 3 | T,U | |
| Examination forms | Multiple-choice question | | | 1 | |
| Study and | Attendance: A minimum | | | | |
| examination | for the class sessions. Stu | | | | |
| requirements | their class participation. | Questions and commi | ents are st | longry | |
| | encouraged. Assignments/Examination | on: Students must hav | e more the | an 50/100 | |
| | points overall to pass this | | c more the | an 30/100 | |
| Reading list | 1. Neil W este and D | | /I SI Desi | σn· Δ | |
| Troubing not | | ns Perspective, 4th ed | | • | |
| | 2. Sung-Mo Kang ar | nd Yusuf Leblebici, C , 3rd edition, McGrav | _ | | |
| | 3. Jan M. Rabaey, A Nikolic, Digital Int | nantha Chandrakasar egrated Circuits, 2nd | n and Bori | voje | |
| | Hall, 2002David A. Patterson and John L. Hennessy, Computer Organization and Design, 5th edition, Morgan Kaufmann, | | | | |
| | 2014 5. Michael L. Bushne | - | grawal, E | ssentials | |

| Signal VLSI Circuits, 2nd edition, Kluwer Academic |
|--|
| Publishers, 2002 |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | X | | | | |
| 3 | | | X | | | |
| 4 | X | X | X | | | X |

3. Planned learning activities and teaching methods

| J. | | | | | | D |
|-----------|----------------|--------|----------|--------------|-----------------|-------------|
| | | | _ | and Learning | Assessment | Resources |
| Week | Content | CLOs | Act | ivities | Activities | |
| | | | Lecturer | Student | Activities | |
| | Introduction | | Lecture | • Class | | [1,2,3,4,5] |
| 1 | and Overview | CLO 1 | | discussion | | |
| | to Fabrication | | | | | |
| 2 | Circuits and | CLO 1 | Lecture | • Class | Quiz1 | [1,2,3,4,5] |
| _ | Layout | CLO 1 | | discussion | QuiZi | |
| 3 | Microprocessor | CLO 1 | Lecture | • Class | Homework | [1,2,3,4,5] |
| | Example | | _ | discussion | | |
| | CMOS | GT O 1 | Lecture | • Class | | [1,2,3,4,5] |
| 4 | Transistor | CLO 1 | | discussion | Homework | |
| | Theory | | _ | ~- | | |
| _ | DC and | ~ | Lecture | • Class | | [1,2,3,4,5] |
| 5 | Transient | CLO 2 | | discussion | Homework | |
| | Response | | | | | |
| 6 | Logical Effort | CLO 2 | Lecture | • Class | Quiz2 | [1,2,3,4,5] |
| | 8 | | T . | discussion | | F1 0 0 4 71 |
| 7 | Power | CLO 2 | Lecture | • Class | Homework | [1,2,3,4,5] |
| | | | | discussion | | [1 0 2 4 5] |
| Midteri | m examination | CLO 1 | | Written | Quiz3 | [1,2,3,4,5] |
| | 0 1: :: 1 | | т , | exam | | |
| 8&9 | Combinational | CLO 2 | Lecture | • Class | Homework | |
| | Circuit Design | | _ | discussion | | 54.0.0.4.55 |
| 10&11 | Circuit | CLO | Lecture | • Class | Homework | [1,2,3,4,5] |
| | Families | 2,3 | | discussion | 1101110 ;; 0111 | |
| 12 | Sequential | CLO 3 | Lecture | • Class | Quiz4 | [1,2,3,4,5] |
| | Circuit Design | | | discussion | Zuiz | |

| 13 | Adders | CLO 4 | Lecture | • Class discussion | Homework | [1,2,3,4,5] |
|----------|------------------------|----------------|---------------|--------------------|----------|-------------|
| 14&15 | Design for Testability | CLO 4 | Lecture | • Class discussion | Homework | [1,2,3,4,5] |
| Final Pr | oject | CLO 1,2,3,4 | Group Project | | | [1,2,3,4,5] |
| Final ex | xamination | CLO 1,2,3,4 | Written exam | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% | 40% |
| Exercises/ Quiz (30%) | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

1. Grading checklist

| Grading encember for write | ch Kepe |)1 LS | | | |
|--|-----------------|-------|----|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | | | •• | | |
| | Evalı | | | | |
| | | | | | |
| | Max. Score Comn | | | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |
| | | | | | |

2. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|--|-------------|--|--|--|--|
| Score | Description | | | | |

| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
|---|---|
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

| | Capstone | Milestone | | Benchmark |
|---|---|--|---|--|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described | Issue/ problem to be considered critically is stated, described, | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities | Issue/ problem |
| | comprehensively, delivering all relevant information | and clarified so that understanding is not seriously | unexplored, boundaries undetermined, and/ or | to be considered critically is stated without |
| Explanation of issues | necessary for full understanding. | impeded by omissions. | backgrounds unknown. | clarification or description. |
| Issues | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a | Information is taken from source(s) without any interpretation/ |
| Evidence Selecting and using information to investigate a point of view or conclusion | analysis or synthesis. Viewpoints of experts are questioned thoroughly. | coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | coherent analysis or synthesis. Viewpoints of experts are taken as | evaluation. Viewpoints of experts are taken as fact, without question. |

| | T | T | 1 6 . | 1 |
|------------------------|-------------------|---------------------|-----------------|-----------------|
| | | | mostly fact, | |
| | | | with little | |
| | | | questioning. | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | Thoroughly | | Identifies | emerging |
| | (systematically | | several | awareness of |
| | and | | relevant | present |
| | methodically) | | contexts when | assumptions |
| | analyzes own | | presenting a | (sometimes |
| | and others' | | position. May | labels |
| | assumptions and | Identifies own | be more | assertions as |
| | carefully | and others' | aware of | assumptions). |
| | evaluates the | assumptions and | others' | Begins to |
| | relevance of | several relevant | assumptions | identify some |
| Influence of | contexts when | contexts when | than one's | contexts when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | | | |
| | complexities of | Specific position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesis) | | |
| | (perspective, | takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | | |
| | acknowledged. | an issue. Others' | Specific | Specific |
| | Others' points of | points of view | position | position |
| | view are | are | (perspective, | (perspective, |
| | synthesized | acknowledged | thesis/ | thesis/ |
| Student's | within position | within position | hypothesis) | hypothesis) is |
| position | (perspective, | (perspective, | acknowledges | stated, but is |
| (perspective, | thesis/ | thesis/ | different sides | simplistic and |
| thesis/hypothesis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | Conclusions and | Conclusion is | Conclusion is | Conclusion is |
| | related outcomes | logically tied to a | logically tied | inconsistently |
| | (consequences | range of | to information | tied to some of |
| Conclusions and | and implications) | information, | (because | the |
| related outcomes | are logical and | including | information is | information |
| (implications and | reflect student's | opposing | chosen to fit | discussed; |
| consequences) | informed | viewpoints; | the desired | related |

| evaluation and | related outcomes | conclusion); | outcomes |
|------------------|-------------------|----------------|-----------------|
| ability to place | (consequences | some related | (consequences |
| evidence and | and implications) | outcomes | and |
| perspectives | are identified | (consequences | implications) |
| discussed in | clearly. | and | are |
| priority order. | | implications) | oversimplified. |
| | | are identified | - |
| | | clearly. | |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone | | Milestone | Benchmark |
|--------------|-------------------------|-----------------------|---------------------------|----------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | | |
| | sequenced | (specific | | |
| | material within | introduction | | Organizational |
| | the body, and | and conclusion, | | pattern (specific |
| | transitions) is | sequenced | | introduction and |
| | clearly and | material within | Organizational pattern | conclusion, |
| | consistently | the body, and | (specific introduction | sequenced |
| | observable and | transitions) is | and conclusion, | material within |
| | is skillful and | clearly and | sequenced material | the body, and |
| | makes the | consistently | within the body, and | transitions) is not |
| | content of the | observable | transitions) is | observable |
| | presentation | within the | intermittently observable | within the |
| Organization | cohesive. | presentation. | within the presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | T | | |
| | memorable, | Language | | T |
| | and | choices are | | Language choices are |
| | compelling, and enhance | thoughtful and | | unclear and |
| | the | generally support the | Language choices are | minimally |
| | effectiveness | effectiveness | mundane and | support the |
| | of the | of the | commonplace and | effectiveness of |
| | presentation. | presentation. | partially support the | the presentation. |
| | Language in | Language in | effectiveness of the | Language in |
| | presentation is | presentation is | presentation. Language | presentation is |
| | appropriate to | appropriate to | in presentation is | not appropriate |
| Language | audience. | audience. | appropriate to audience. | to audience. |

| | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability |
|------------------------|--|--|--|---|
| | and speaker appears | interesting, and speaker | presentation understandable, and | of the presentation, and |
| - · | polished and | appears | speaker appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Supporting Material | A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic. |
| | message is | | | |
| | compelling | Central | | Central message |
| | (precisely stated, | message is clear and | Central message is | can be deduced but is not |
| | appropriately | consistent with | basically understandable | explicitly stated |
| Central | repeated, | the supporting | but is not often repeated | in the |
| Message | memorable, | material. | and is not memorable. | presentation. |

| and strongly supported.) | 7 | |
|--------------------------|---|--|
| | | |

Source: Association of American Colleges and Universities

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Concepts in VLSI Design Laboratory

Course Code: IT126IU

1. General information

| 1. General informat | | | | | |
|---|---|--|--|--|--|
| Course designation | This laboratory provides an introduction to digital VLSI chip design based on the use of VLSI design tools to design a MIPS microprocessor chip. | | | | |
| Semester(s) in which the course is taught | 7 | | | | |
| Person responsible for the course | Dr. Nguyễn Toàn Văn | | | | |
| Language | English | | | | |
| Relation to curriculum | Compulsory | | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 60 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 30 (laboratory) Private study including examination preparation, specified in hours: 30 | | | | |
| Credit points | Number of credits: 1 Lecture: 0 Laboratory: 1 | | | | |
| Required and recommended prerequisites for joining the course | Digital Logic Design Electronics Devices | | | | |
| Course objectives | This laboratory provides an introduction to digital VLSI chip design based on the use of VLSI design tools to design a MIPS microprocessor chip. The laboratory employs a learning-by-doing approach, emphasizing hands-on practical design experiences and computer simulations. | | | | |
| Course learning outcomes | CLO1 use the Electric VLSI design tool to build an 8-bit MIPS microprocessor including schematic entry, layout, transistor-level cell design, gate-level logic design, hierarchical design | | | | |
| | CLO2 use the Electric VLSI design tool to build an 8-bit MIPS microprocessor including switch-level simulation (IRSIM and ModelSim), Design Rule Checking (DRC), Electrical Rule Checking (ERC), | | | | |

| | Network Consistency Checking (NCC), HDL design (Verilog), pad frame generation and routing, pre-tape-out verification CLO4 design functional units such as adders, multipliers, | | | | |
|-------------------|--|--|--|--------------|-------------|
| | CLO4 design functional units such as adders, multipliers, and PLAs | | | | |
| | CLOS | CLO5 describe and avoid common CMOS circuit pitfalls | | | |
| | Co | mpetency level | Course learning out | come (CL | (O) |
| | Kn | owledge | CLO1,2 | | |
| | Ski | ill | CLO4 | | |
| | Att | itude | CLO5 | | |
| Content | | _ | ntents should clearly i | ndicate th | е |
| | _ | ng of the content | | | |
| | _ | lecture session (| ₃ nours) duce); T (Teach); U (U | (tilize) | |
| | Topic | ig ieveis. I (intro | duce), I (Ieden), O (O | Weight | Level |
| | Schematic Entry and Switch-Level 1 | | | | I |
| | Simula | • | | | |
| | Buildin | ng a Standard Ce | ll Library | 1 | T,U |
| | MIPS | Processor HDL S | Simulation | 1 | T,U |
| | Datapa | th Design | | 2 | T,U |
| | Design | of ALU Decode | er Control Logic | 1 | T,U |
| | Contro | ller Synthesis | | 1 | T,U |
| | MIPS | Processor Layout | | 1 | T,U |
| | Pad Fr | ame Assembly | | 1 | I |
| Examination forms | Multiple | e-choice question | ıs, short-answer questio | ons | |
| Study and | | | attendance of 80 perce | | |
| examination | | | udents will be assessed | | |
| requirements | encoura | | Questions and commen | nts are stro | ongry |
| | | • | on: Students must have | more than | 1 |
| | | points overall to | | | |
| Reading list | | avid A. Patterson rganization and I | and John L. Hennessy Design 5th, 2013 | , Compute | er |
| | | . H. E. Weste and d, 2005 | D. M. Harris, CMOS | VLSI Des | sign |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO |
|--|-----|
|--|-----|

| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
|-----|---|---|---|---|---|---|
| 1 | X | X | | | | |
| 2 | X | X | | | | |
| 4 | | X | X | | | X |
| 5 | | | X | | | |

3. Planned learning activities and teaching methods

| Week | Content | CLOs (Gx.x) | Teaching and Learning Activities | Assessment | Resources |
|---------|--|----------------|--|------------|-----------|
| 1 | Schematic Entry and Switch-Level Simulation | CLO 1 | LectureClass discussionPratice | Report | [1,2] |
| 2 | Building a Standard Cell Library | CLO 1 | LectureClass discussionPratice | Report | [1,2] |
| 3 | MIPS Processor HDL Simulation | CLO 1,2 | LectureClass discussionPratice | Report | [1,2] |
| 4 | Datapath Design | CLO 1,2 | LectureClassdiscussionPratice | Report | [1,2] |
| 5 | Design of ALU Decoder Control Logic | CLO 3 | LectureClass discussionPratice | Report | [1,2] |
| 6 | Controller Synthesis | CLO 3 | LectureClass discussionPratice | Report | [1,2] |
| 7 | MIPS Processor Layout and Pad Frame Assembly | CLO 3 | LectureClassdiscussionPratice | Report | [1,2] |
| Final P | roject | CLO 4,5 | Group Project Design report | Report | [1,2] |
| Final e | xamination | CLO 1,2,3,4 | Written exam | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 |
|-------------------------|------|------|------|------|------|
| Lab. Assignments (70%) | 70% | 70% | 70% | 70% | 70% |
| Final examination (30%) | 30% | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

1. Grading checklist

| Grading checklist for Written Reports | | | | | | |
|--|-------|----------------|----------|--|--|--|
| Student: | HW/A | HW/Assignment: | | | | |
| Date: | | •• | | | | |
| | Evalu | Evaluator: | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good | 5 | | | | | |
| transitions | | | | | | |
| Presentation (20%) | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | |
| Clear and easy to read | 10 | | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | | |
| TOTAL SCORE | 100 | | | | | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |

| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
|---|--|
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical thinking va | Capstone | Milest | | Benchmark |
|-----------------------------|--|--|--|---|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensivel y, delivering all relevant | Issue/ problem to be considered critically is stated, described, and clarified so that | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries | Issue/ problem to be considered critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/ | Information is taken from source(s) with enough interpretation/ | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a | Information is taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or conclusion | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |

| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
|--|--|---|---|---|
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of | Specific position (perspective, thesis/hypothesi s) takes into account the complexities of an issue. Others' points of view | Specific position (perspective, | Specific position |
| Student's position (perspective, thesis/hypothesi | view are synthesized within position (perspective, thesis/ | are acknowledged within position (perspective, thesis/ | thesis/ hypothesis) acknowledge s different sides of an | (perspective, thesis/ hypothesis) is stated, but is simplistic and |
| Conclusions and related outcomes (implications and consequences) | hypothesis). Conclusions and related outcomes (consequences and implications) are logical and reflect student's | hypothesis). Conclusion is logically tied to a range of information, including opposing viewpoints; related | Conclusion is logically tied to information (because information is chosen to fit the | obvious. Conclusion is inconsistently tied to some of the information discussed; related outcomes |

| informed | outcomes | desired | (consequence |
|------------------|----------------|----------------|---------------|
| evaluation and | (consequences | conclusion); | s and |
| ability to place | and | some related | implications) |
| evidence and | implications) | outcomes | are |
| perspectives | are identified | (consequence | oversimplifie |
| discussed in | clearly. | s and | d. |
| priority order. | - | implications) | |
| | | are identified | |
| | | clearly. | |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |

| | Delivery | | | |
|------------|-----------------|------------------|------------------|--------------------|
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Benvery | A variety of | connortable. | tentuti ve. | dicomortable. |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | Central | |
| | compelling | Central | message is | Central message |
| | (precisely | message is | basically | can be deduced |
| | stated, | clear and | understandable | but is not |
| | appropriately | consistent with | but is not often | explicitly stated |
| Central | repeated, | the supporting | repeated and is | in the |
| Message | memorable, | material. | not memorable. | presentation. |

| and strongly supported.) | | |
|--------------------------|--|--|
| our results | | |

Source: Association of American Colleges and Universities

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Digital Signal Processing

Course Code: IT103IU

1. General information

| 1. General informat | |
|---|---|
| Course designation | This subject covers the fundamental knowledge of digital signal processing |
| Semester(s) in which the course is taught | |
| Person responsible for the course | Assoc. Prof. Dinh Duc Anh Vu |
| Language | English |
| Relation to curriculum | Compulsory (CE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours: 45 (lecture) + 30(laboratory). Private study including examination preparation, specified in |
| study nours) | hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | |
| Course objectives | This course is an introduction to the basic principles, methods, and applications of digital signal processing, emphasizing its algorithmic, computational, and programming aspects. In particular, the students will learn the conversion from analog to digital, the concepts of discrete time linear systems, filtering, spectral analysis of discrete time signals and filter design. |
| Course learning outcomes | CLO Know the analysis of discrete time signals, demonstrate understanding of FIR filter design CLO Understand the theory behind interpolators, decimators, and sampling rate converters CLO Study the modern digital signal processing algorithms and applications. Apply the algorithms for wide area of recent applications such as image processing, wireless communication, biomedical engineering, speech processing, video processing, etc., which are appropriate for external, societal and environmental applications |

| | Competency level | Course learning out | tcome (Cl | LO) | |
|-------------------|---|-----------------------------------|-------------|----------|--|
| | Knowledge | CLO1,2 | | | |
| | Skill | CLO4 | | | |
| | Attitude | CLO3 | | | |
| Content | The description of the co | = | indicate th | ie e | |
| | weighting of the content | | | | |
| | Weight: lecture session (| | Itiliza) | | |
| | Teaching levels: I (Introd Cont | | Weight | Level | |
| | Introduction to sampling | | 1 | I | |
| | Quantization | is and reconstruction | 1 | T | |
| | | | | | |
| | Discrete-time systems | Discrete-time systems 2 T,U | | | |
| | FIR filtering and convo | FIR filtering and convolution 1 T | | | |
| | Z - transform | Z - transform 2 T,U | | | |
| | Transfer function | Transfer function 1 T | | | |
| | Digital filter realization | n | 1 | Т | |
| | DFT/FFT algorithms | | 2 | T,U | |
| | Signal processing appli | ications | 2 | Т | |
| | Filter design technique | Filter design techniques 3 T | | | |
| Examination forms | Multiple-choice questions, short-answer questions | | | <u> </u> | |
| Study and | Attendance: A minimum attendance of 80 percent is compulsory | | | | |
| examination | for the class sessions. Students will be assessed on the basis of | | | | |
| requirements | their class participation. | Questions and comme | nts are str | ongly | |
| | encouraged. | | | | |
| | Assignments/Examination | | more that | n 50/100 | |
| D 11 11 - (| points overall to pass this | | | 1.400: | |
| Reading list | 1. S. J. Orfanidis, Intr | oduction to Signal Pro | ocessing 2 | nd, 1996 | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | X | X | | | | |

| 3 | X | X | | | |
|---|---|---|---|--|---|
| 4 | | X | X | | X |

3. Planned learning activities and teaching methods

| 3. P | lanned learning activ | | Teaching and | | Resources |
|---------|---|---------------------------|--|---------------------|-----------|
| Week | Content | CLO | Learning Activities | Assessment | |
| 1 | Introduction to sampling and reconstruction Introduction of signal | CLO 2 | LectureClass discussion | Homework | [1] |
| 2 | Quantization Linear Time Invariant System Properties | CLO 3 | LectureClass discussion | Homework | [1] |
| 3 | Discrete-time systems Discrete time and Continuous time Convolution methods | CLO 3 | LectureClass discussion | Quiz 1 | [1] |
| 4&5 | FIR filtering and convolution | CLO 1 | LectureClass discussion | Homework | [1] |
| 6&7 | Fourier Series and Fourier Transforms Z - transform | CLO 3 | LectureClass discussion | Homework, Quiz 2 | [1] |
| 8 | Transfer function | CLO 3 | LectureClass discussion | Homework | [1] |
| Midteri | m examination | CLO 1, CLO 2, CLO 3 | -Written exam | | |
| 9&10 | Digital filter realization | CLO 3, CLO 4 | LectureClass discussion | Homework | [1] |
| 11&12 | DFT/FFT algorithms | CLO 3 | • Lecture | Quiz 3 | [1] |

| | | | Class discussion | |
|-------------------|--------------------------------|-------------------------------------|---|-----|
| 13&14 | Signal processing applications | CLO 4 | Lecture Class discussion Class project Homework | [1] |
| 15 | Filter design techniques | CLO 4 | Lecture Class discussion Homework | [1] |
| Final examination | | CLO 1, CLO 2, CLO 3, CLO 4 | -Written exam | |

4. Assessment plan

| ii iibbebbiiieiit piaii | | | | |
|---------------------------|------|------|------|------|
| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
| Midterm examination (30%) | 30% | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% | 40% |
| Exercises/ Quiz (10%) | 10% | 10% | 10% | 10% |
| Labs (20%) | 20% | 20% | 20% | 20% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

1. Grading checklist

| i. Graung checklist | | | |
|--|-----------|----------|----------|
| Grading checklist for Write | tten Repo | rts | |
| Student: | HW/A | Assignme | ent: |
| Date: | | | . • |
| | Evalu | ator: | |
| | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |

| Analysis and discussion demonstrate good subject | 30 | |
|--|-----|--|
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|----------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | Issue/ problem | | considered | |
| | to be considered | | critically is | |
| | critically is | Issue/ problem | stated but | |
| | stated clearly | to be considered | description | |
| | and described | critically is | leaves some | Issue/ |
| | comprehensivel | stated, | terms | problem to be |
| | y, delivering all | described, and | undefined, | considered |
| | relevant | clarified so that | ambiguities | critically is |
| | information | understanding is | unexplored, | stated without |
| | necessary for | not seriously | boundaries | clarification |
| Explanation of | full | impeded by | undetermine | or |
| issues | understanding. | omissions. | d, and/ or | description. |

| | | | backgrounds unknown. | |
|--|---|---|--|---|
| Evidence Selecting and using information to investigate a point of view or | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | questioning. Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
| Student's position (perspective, thesis/hypothesis) | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of | Specific position (perspective, thesis/hypothesi s) takes into account the complexities of an issue. Others' points of view | Specific position (perspective, thesis/ hypothesis) acknowledge s different sides of an issue. | Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and obvious. |

| | an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ | are acknowledged within position (perspective, thesis/ hypothesis). | | |
|---------------|---|---|----------------|----------------|
| | hypothesis). | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubite for evaluating presentation tasks. | | | | | |
|--|-----------------|-----------------|-----------------|---------------------|--|
| | Capstone | Mile | stone | Benchmark | |
| | 4 | 3 | 2 | 1 | |
| | Organizational | Organizational | | | |
| | pattern | pattern | Organizational | Organizational | |
| | (specific | (specific | pattern | pattern (specific | |
| | introduction | introduction | (specific | introduction and | |
| | and conclusion, | and conclusion, | introduction | conclusion, | |
| | sequenced | sequenced | and conclusion, | sequenced | |
| | material within | material within | sequenced | material within | |
| | the body, and | the body, and | material within | the body, and | |
| | transitions) is | transitions) is | the body, and | transitions) is not | |
| | clearly and | clearly and | transitions) is | observable | |
| | consistently | consistently | intermittently | within the | |
| Organization | observable and | observable | observable | presentation. | |

| | is skillful and makes the content of the presentation cohesive. | within the presentation. | within the presentation. | |
|------------------------|--|---|--|--|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |
| | A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) | Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant |
| Supporting Material | from relevant authorities) | make appropriate | make appropriate | authorities) make reference |

| | make | reference to | reference to | to information or |
|---------|-----------------|-----------------|------------------|-------------------|
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Source: Association of American Colleges and Universities

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Computer Graphics

Course Code: IT024IU

1. General information

| Course designation | This subject introduces the students to principles and algorithms of computer graphics and requirements of creating graphical applications. |
|---|--|
| Semester(s) in which the course is taught | |
| Person responsible for the course | Assoc.Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | Elective course (CS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming |
| Course objectives | This course provides students the fundamentals of computer graphics concepts, methodologies, and processes. It develop an understanding of the algorithms and fundamental techniques for generating and modifying pictures/objects with a digital computer, including the handling of color, and the generation of visible-surface projections of three dimensional scenes, for applications in science, engineering, and the entertainment world (i.e. connect to the VR & AR application; Games industry and Images processing). |
| Course learning outcomes | CLO 1. Understand and apply the algorithms and fundamental techniques for generating and modifying pictures, 2D/3D objects with a digital computer. CLO 2. Understand and apply the handling of color, and the generation of visible-surface projections of 3D scenes, for applications in science, engineering and the entertainment world. |

| | prog obje CLC | CLO 3. Apply knowledge of mathematics and ability in graphical programming to develop games, construct and reconstruct 2D/3D objects, process images, VR & AR, etc. CLO 4. Work in a team to ready build a computer graphics application | | | | |
|------------------------------------|---|--|---|-----------------------------|-------------|--|
| | wpp. | Competency level Course learning outcome (CLO) | | | | |
| | | Knowledge | CLO1 | | | |
| | | Skill CLO2, CLO3 | | | | |
| | | Attitude | CLO4 | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 teaching hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
| | To | pic | | Weight | Level | |
| | | ek 1: Introduction to thematics Foundation | * | 3 | I,T | |
| | We | ek 2: Bessenham algo | orithms | 3 | I,T,U | |
| | We | ek 3: Line clipping | | 3 | I,T,U | |
| | We | ek 4: Polygon clippir | ng | 3 | I,T,U | |
| | We | ek 5: Transformation | and Perspective | 3 | I,T | |
| | We | ek 6: Transformation | (cont.) | 3 | I,T,U | |
| | We | ek 7: Introduction to | OpenGL programing | 3 | I,T,U | |
| | We | ek 8: View Transforr | nation + Midterm | 3 | I,T,U | |
| | We | ek 9: 3D clipping | | 3 | I,T,U | |
| | We | ek 10: Visual Surface | e Determination | 3 | I,T,U | |
| | We | ek 11: Color Models | | 3 | I,T,U | |
| | We | ek 12: Image Render | ing and Generation | 3 | I,T,U | |
| | We | ek 13: Ray Tracing | & Texture Mapping | 3 | I,T,U | |
| | | ek 14: Bezier Curve a | and Surface | 3 | I,T,U | |
| | We | | hics application; final | 3 | I,T,U | |
| Examination forms | | tiple-choice questions raming) | s, short-answer question | ns (compu | ting and | |
| Study and examination requirements | for their enco | he class sessions. Stu class participation. (ouraged. | attendance of 80 percendents will be assessed of Questions and commentant: Students must have recourse. | on the basi as are stron | s of gly | |

| Reading list | 1. Steve Marschner and Peter Shirley, Fundamentals of Computer Graphics 5 th , by A K Peters/CRC Press ISBN: 9780367505035, 2021. |
|--------------|--|
| | 2. Frank Klawonn, Introduction to Computer Graphics Using Java 2D and 3D, 2nd Edition, Springer 2012. |
| | 3. Sumanta Guha, Computer Graphics Through OpenGL From Theory to Experiments Third Edition (AIT), CRC Press, 2019. |
| | 4. John Vince, Mathematics for Computer Graphics, 5th Edition, Springer 2017. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | X | | | | |
| 3 | | X | | | | X |
| 4 | | | | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|------|----------------------------|---|-----------|
| 1 | Introduction to Computer Graphics, Mathematics Foundation | 1 | Quiz | Lecture, | [1, 4] |
| 2 | Bessenham algorithms | 1, 2 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 3 | Line clipping | 1, 2 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 4 | Polygon clipping | 1, 2 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 5 | Transformation and Perspective | 2, 3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |

| 6 | Transformation (cont.) | 2, 3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
|----|---|-------|----------------------------|--|-----------|
| 7 | Introduction to OpenGL | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 8 | Midterm | | | | |
| 9 | View Transformation | 2, 3 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 10 | 3D clipping | 2, 3 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 11 | Visual Surface Determination | 2, 3 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 12 | Color Models | 2, 3 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 13 | Image Rendering and Generation | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 14 | Ray Tracing & Texture Mapping | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 15 | Bezier Curve and Surface processing | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 16 | Building graphics application; final review | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, Homework | [1, 2, 3] |
| 17 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|-----------------|------|------|------|------|
| Labs (20%) | | 30% | 30% | 40% |

| Midterm examination (30%) | 40% | 60% | | |
|---------------------------|-----|-----|-----|--|
| Final examination (40%) | | 50% | 50% | |
| Exercises/ Quiz (10%) | 30% | 40% | 30% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|--------|----------------|-------------|--|
| Student: | HW/As | HW/Assignment: | | |
| Date: | | | | |
| | Evalua | tor: | | |
| | | | • • • • • • | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |
| Content clearly and logically organized, good | 5 | | | |
| transitions | | | | |
| Presentation (20%) | | | | |
| Correct spelling, grammar, and syntax | 10 | | | |
| Clear and easy to read | 10 | | | |
| Quality of Layout and Graphics (10%) | 10 | | | |
| TOTAL SCORE | 100 | | | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical thinking va | Capstone | uating questions u Milest | | Benchmark |
|-----------------------------|------------------------|------------------------------|------------------------|--------------------|
| | 4 | 3 | 2 | 1 |
| | '' | 3 | Issue/ | 1 |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or conclusion | questioned | subject to | with little | without |
| Conclusion | thoroughly. Thoroughly | questioning. | questioning. Questions | question. Shows an |
| | (systematically | | some | emerging |
| | and | Identifies own | assumptions. | awareness of |
| | methodically) | and others' | Identifies | present |
| | analyzes own | assumptions and | several | assumptions |
| | and others' | several relevant | relevant | (sometimes |
| Influence of | assumptions | contexts when | contexts | labels |
| context and | and carefully | presenting a | when | assertions as |
| assumptions | evaluates the | position. | presenting a | assumptions). |

| | relevance of contexts when presenting a position. | | position. May be more aware of others' assumptions | Begins to identify some contexts when presenting a |
|---|---|---|--|---|
| | | | than one's own (or vice versa). | position. |
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the | Specific | | |
| | complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are | position (perspective, thesis/hypothesi s) takes into account the complexities of | Specific | |
| | acknowledged. Others' points of view are | an issue. Others' points of view are | position (perspective, thesis/ | Specific position (perspective, |
| Student's position (perspective, thesis/hypothesis) | synthesized within position (perspective, thesis/ hypothesis). | acknowledged within position (perspective, thesis/ hypothesis). | hypothesis) acknowledge s different sides of an issue. | thesis/ hypothesis) is stated, but is simplistic and obvious. |
| | Conclusions and related | Conclusion is | Conclusion is logically tied to information | Conclusion is |
| | outcomes (consequences and implications) | logically tied to a range of information, including | (because information is chosen to fit the | inconsistently tied to some of the information |
| Conclusions | are logical and reflect student's informed evaluation and | opposing viewpoints; related outcomes | desired conclusion); some related outcomes | discussed; related outcomes (consequence |
| and related outcomes (implications | ability to place evidence and perspectives | (consequences and implications) | (consequence s and implications) | s and implications) are |
| and consequences) | discussed in priority order. | are identified clearly. | are identified clearly. | oversimplifie d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | ric for evaluating presentation tasks: Milestone Benchmark | | | | |
|--------------|-------------------|---|--------------------|---------------------|--|--|
| | 2 | 3 | 2 | 1 | | |
| | • | 3 | <u> </u> | 1 | | |
| | Organizational | | | | | |
| | pattern (specific | 0 | | | | |
| | introduction | Organizational | | | | |
| | and conclusion, | pattern | | | | |
| | sequenced | (specific | | | | |
| | material within | introduction | Organizational | Organizational | | |
| | the body, and | and conclusion, | pattern (specific | pattern (specific | | |
| | transitions) is | sequenced | introduction and | introduction and | | |
| | clearly and | material within | conclusion, | conclusion, | | |
| | consistently | the body, and | sequenced | sequenced | | |
| | observable and | transitions) is | material within | material within | | |
| | is skillful and | clearly and | the body, and | the body, and | | |
| | makes the | consistently | transitions) is | transitions) is not | | |
| | content of the | observable | intermittently | observable | | |
| | presentation | within the | observable within | within the | | |
| Organization | cohesive. | presentation. | the presentation. | presentation. | | |
| | Language | | | | | |
| | choices are | Language | | | | |
| | imaginative, | choices are | Language choices | Language | | |
| | memorable, and | thoughtful and | are mundane and | choices are | | |
| | compelling, and | generally | commonplace | unclear and | | |
| | enhance the | support the | and partially | minimally | | |
| | effectiveness of | effectiveness | support the | support the | | |
| | the | of the | effectiveness of | effectiveness of | | |
| | presentation. | presentation. | the presentation. | the presentation. | | |
| | Language in | Language in | Language in | Language in | | |
| | presentation is | presentation is | presentation is | presentation is | | |
| | appropriate to | appropriate to | appropriate to | not appropriate | | |
| Language | audience. | audience. | audience. | to audience. | | |
| | Delivery | Delivery | | | | |
| | techniques | techniques | | Delivery | | |
| | (posture, | (posture, | Delivery | techniques | | |
| | gesture, eye | gesture, eye | techniques | (posture, gesture, | | |
| | contact, and | contact, and | (posture, gesture, | eye contact, and | | |
| | vocal | vocal | eye contact, and | vocal | | |
| | expressiveness) | expressiveness) | vocal | expressiveness) | | |
| | make the | make the | expressiveness) | detract from the | | |
| | presentation | presentation | make the | understandability | | |
| | compelling, and | interesting, and | presentation | of the | | |
| | speaker appears | speaker | understandable, | presentation, and | | |
| | polished and | appears | and speaker | speaker appears | | |
| Delivery | confident. | comfortable. | appears tentative. | uncomfortable. | | |

| | A variety of | | | |
|------------|------------------|-----------------|--------------------|-------------------|
| | types of | | | |
| | supporting | Supporting | | |
| | materials | materials | | Insufficient |
| | (explanations, | (explanations, | Supporting | supporting |
| | examples, | examples, | materials | materials |
| | illustrations, | illustrations, | (explanations, | (explanations, |
| | statistics, | statistics, | examples, | examples, |
| | analogies, | analogies, | illustrations, | illustrations, |
| | quotations from | quotations | statistics, | statistics, |
| | relevant | from relevant | analogies, | analogies, |
| | authorities) | authorities) | quotations from | quotations from |
| | make | make | relevant | relevant |
| | appropriate | appropriate | authorities) make | authorities) |
| | reference to | reference to | appropriate | make reference |
| | information or | information or | reference to | to information or |
| | analysis that | analysis that | information or | analysis that |
| | significantly | generally | analysis that | minimally |
| | supports the | supports the | partially supports | supports the |
| | presentation or | presentation or | the presentation | presentation or |
| | establishes the | establishes the | or establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on | authority on the | authority on the |
| Material | topic. | the topic. | topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | ~ . | | ~ . |
| | stated, | Central . | Central message | Central message |
| | appropriately | message is | is basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, and | consistent with | but is not often | explicitly stated |
| Central | strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Source: Association of American Colleges and Universities

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Deep Learning

Course Code: IT157IU

1. General information

| Course designation | This course helps students understand the capabilities, challenges, and consequences of deep learning and prepare students to participate in the development of leading-edge AI technology |
|---|---|
| Semester(s) in which the course is taught | |
| Person responsible for the course | Dr. Mai Hoang Bao An |
| Language | English |
| Relation to curriculum | Elective (CS, DS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | none |
| Course objectives | This course helps students understand the capabilities, challenges, and consequences of deep learning and prepare students to participate in the development of leading-edge AI technology. In this course, students will build and train neural network architectures such as Convolutional Neural Networks, Recurrent Neural Networks, Transformers, and learn how to make them better with strategies such as Dropout, BatchNorm, and more. Get ready to master theoretical concepts and their industry applications using Python and PyTorch and tackle real-world cases. |
| Course learning outcomes | CLO 1. Understand fundamental concepts of Deep Learning. Get familiar with some popular algorithms used in deep learning models. Understand and be able to use of popular libraries such as NumPy, PyTorch. CLO 2. Neural Networks for regression and classification. The concept of Multilayer Perceptrons. The essential networks: |

Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN).

CLO 3. Build, train, and deploy different types of Deep Architectures from traditional to modern Architectures. CLO 4. Understand and be able to apply deep learning techniques to real-world scenarios: Computer Vision, Natural Language Processing.

| Competency level | Course learning outcome (CLO) |
|-------------------------|-------------------------------|
| Knowledge | CLO 1, CLO 2, CLO 3, CLO 4 |
| Skill | CLO 3, CLO 4 |
| Attitude | CLO 3, CLO 4 |

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (3 hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weight | Level |
|--|--------|-------|
| Introduction to Deep Learning | 1 | I, U |
| Some demos on the applications of Deep | | |
| Learning | | |
| Linear Classifiers, Optimization and | 1 | I, T |
| Gradient Descent | | |
| Backpropagation Algorithm | | |
| Introduction to PyTorch library | | |
| Linear Neural Networks for Regression | 1 | T, U |
| Linear Neural Networks for Classification | | |
| Multilayer Perceptrons | 1 | T, U |
| Advances in PyTorch library | 1 | T, U |
| Convolutional Neural Networks (CNN) | 1 | T, U |
| Recurrent Neural Networks (RNN) | 1 | T, U |
| Modern CNN: | 2 | T, U |
| Networks Using Blocks (VGG) | | |
| Multi-Branch Networks (GoogLeNet) | | |
| Residual Neural Network (Resnet)MobileNet | | |
| Modern RNN: | 2 | T, U |
| Gated Recurrent Units (GRU) | | |
| Long Short-Term Memory (LSTM) | | |
| Bidirectional RNN | | |
| Encoder-Decoder Architecture | | |
| Optimization Algorithms used in Deep | 1 | I, T |
| Learning | | |

| | Generative Adversarial Network (GAN) & | 1 | T, U | | | |
|-------------------|--|--------------|----------|--|--|--|
| | Deep Convolution GAN | | | | | |
| | Deep Learning in Computer Vision | 1 | T, U | | | |
| | Deep Learning in Natural Language | 1 | T, U | | | |
| | Processing | | | | | |
| Examination forms | Short-answer questions, Long-answer questions questions | s, program | ming | | | |
| Study and | Attendance: A minimum attendance of 80 perce | | | | | |
| examination | for the class sessions. Students will be assessed | | | | | |
| requirements | their class participation. Questions and comment encouraged. | its are stro | ongly | | | |
| | Assignments/Examination: Students must have | more ther | 50/100 | | | |
| | points overall to pass this course. | more mai | 1 30/100 | | | |
| Reading list | points overail to pass this course. | | | | | |
| Reading fist | [1] Ian Goodfellow, Yoshua Bengio and Aaron | Courville | , Deep | | | |
| | Learning, The MIT Press 2021, ISBN: 978-026 | 2035613. | - | | | |
| | [2] Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. | | | | | |
| | Smola., Dive Into Deep Learning. | | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| | 1 | X | | | | | |
| Ī | 2 | | X | X | | | |
| ſ | 3 | | | X | X | | X |
| | 4 | | | | X | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-----|-------------|-----------------------------------|---------------------|
| 1 | Introduction to Deep Learning Some demos on the applications of Deep Learning | 1 | | Lecture, Discussion | [1, 2] Chapter 1 |
| 2 | Linear Classifiers, Optimization and Gradient Descent Backpropagation Algorithm | 1 | Exercises | Lecture, In-class exercises | [1, 2] Chapter 2 |

| | Introduction to PyTorch library | | | | |
|-------|--|------|-----------|------------------------------------|-------------------|
| 3 | Linear Neural Networks for Regression Linear Neural Networks for Classification | 1, 2 | Exercises | Lecture, In-class exercises | [2] Chapter 3, 4 |
| 4 | Multilayer Perceptrons | 2 | Exercises | Lecture, In-class exercises | [2] Chapter 5 |
| 5 | Advances in PyTorch library | 1, 2 | Exercises | Lecture, In-class exercises | [2] Chapter 6 |
| 6 | Convolutional Neural Networks (CNN) | 2 | Exercises | Lecture, In-class exercises | [2] Chapter 7 |
| 7 | Recurrent Neural Networks (RNN) | 2 | Quiz | Lecture, In-class quiz | [2] Chapter 9 |
| 8-9 | Modern CNN: • Networks Using Blocks (VGG) • Multi-Branch Networks (GoogLeNet) • Residual Neural Network (Resnet) • MobileNet | 2, 3 | Exercises | Lecture, In-class exercises | [2] Chapter 8 |
| 10 | Midterm | | | | |
| 11-12 | Modern RNN: • Gated Recurrent Units (GRU) • Long Short-Term Memory (LSTM) • Bidirectional RNN • Encoder-Decoder Architecture | 2, 3 | Exercises | Lecture, In-class exercises | [2] Chapter 10 |
| 13 | Optimization Algorithms used in Deep Learning | 1, 4 | Seminar | Lecture, Discussion | [2] Chapter 12 |
| 14 | Generative Adversarial Network (GAN) & Deep Convolution GAN | 3, 4 | Seminar | Lecture, Discussion | [2] Chapter 18 |
| 15 | Deep Learning in Computer Vision | 4 | Seminar | Lecture, Student presentaion | [2] Chapter 14 |

| 16 | Deep Learning in Natural Language Processing | 4 | Seminar | Lecture, Student presentaion | [2] Chapter 15 |
|----|---|---|---------|------------------------------------|-------------------|
| 17 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------------------|------|------|------|------|
| Quiz (5%) | 10% | | 20% | 20% |
| Labs (10%) | 30% | 30% | | |
| Midterm examination (30%) | 50% | 40% | | |
| Projects/Presentations/ Report (15%) | 10% | | 30% | 30% |
| Final examination (40%) | | 30% | 50% | 50% |

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------------|-----------------|----------|--|--|
| Student: | HW/A | HW/Assignment: | | | |
| Date: | • • • • • • | | | | |
| | Evalu | ıator: | | | |
| | • • • • • • | • • • • • • • • | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | |
|--|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |

| 4 | Demonstrates considerable understanding of the problem. All requirements of |
|---|--|
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical inthiting va | Capstone | Milest | | Benchmark |
|--|--|---|---|--|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensivel y, delivering all relevant information necessary for | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermine d, and/ or | Issue/ problem to be considered critically is stated without clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a | Information is taken from source(s) without any |
| Evidence Selecting and using information to investigate a point of view or | comprehensive analysis or synthesis. Viewpoints of experts are questioned | coherent analysis or synthesis. Viewpoints of experts are subject to | coherent analysis or synthesis. Viewpoints of experts are taken as | interpretation/ evaluation. Viewpoints of experts are taken as fact, without |
| conclusion | thoroughly. | questioning. | mostly fact, | question. |

| | | | with little | |
|------------------|-------------------|-------------------|---------------|----------------|
| | | | questioning. | |
| | | | questioning. | |
| | | | | |
| | | | | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| • | Specific | • | , | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| $ s\rangle$ | hypothesis). | hypothesis). | issue. | obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| Language | the | presentation. | the | Language in |

| | effectiveness | Languaga | progentation | progentation |
|-------------|-----------------|------------------|-----------------|--------------------|
| | of the | Language in | presentation. | presentation is |
| | | presentation is | Language in | not appropriate |
| | presentation. | appropriate to | presentation is | to audience. |
| | Language in | audience. | appropriate to | |
| | presentation is | | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | | Commontable. | tentative. | unconnortable. |
| | A variety of | | | |
| | types of | C | C | |
| | supporting | Supporting | Supporting | T 00' ' |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| 11111111111 | are topic. | are topic. | and topic. | i copie. |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Security Technology and Implementation Course Code: IT165IU

1. General information

| 1. General inf | บาแลนบน |
|---|---|
| Course designation | The course will concentrate on security technologies that can be employed to safeguard and maintain a network. The course will also cover risk management, business continuity and recovery planning, operations security, access control systems, and software development security. |
| Semester(s) in which the course is taught | |
| Person responsible for the course | Dr. Le Hai Duong |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self- study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Computer Networks |
| Course objectives | This course introduces students to information security principles, cryptography systems (symmetric and public key encryptions), risk management, security architecture and design, business continuity operations security, access control systems, protecting TCP/IP network, firewalls, virtual private network, IPSec, software development security. |
| Course learning outcomes | CLO 1. Gain understanding of information security and the cryptography concepts including symmetric key encryption, hash function, message authentication code, public key encryption, digital signature and digital envelope; |

| | CLO 2. Apply the conce implementing secure sy CLO 3. Analyze and ever CLO 4. Understand and CLO 5. Apply security to | stems and networks; aluate security risk and apply software develop | security d | lesign; |
|------------------------------------|---|---|-----------------------|-----------------|
| | Competency level | tcome | | |
| | Knowledge | CLO1, CLO2, CLO4 | 4, CLO5 | |
| | Skill | CLO2, CLO3, CLO4 | 4, CLO6 | |
| | Attitude | | | |
| Content | The description of the coweighting of the content Weight: lecture session Teaching levels: I (Intro | and the level. (3 hours) | (tilize) | |
| | Topic | | Weigh t | Leve |
| | I. C | | | |
| | Information security j | 1 | T,U | |
| | Governance and risk | 1 | T | |
| | Security architecture and design; Business continuity and disaster recovery planning; | | | |
| | Operation security; | | 2 | T,U |
| | Access control system | ns and methodology; | 1 | T |
| | Cryptography; | <u> </u> | 2 | T,U |
| | Overview network an security; | d telecommunications | 1 | T,U |
| | Basic security infrastr | ructures and routers; | 1 | Т |
| | Firewalls | | 1 | T,U |
| | Intrusion detection sy protection systems | stems and intrusion | 1 | Т |
| | Virtual private netwo | rk and IPSec; | 1 | T |
| | Software Developmen | | 1 | T,U |
| Examination forms | Multiple-choice questio | · · · · · · · · · · · · · · · · · · · | ons | |
| Study and examination requirements | Attendance: A minimum for the class sessions. So their class participation. encouraged. Assignments/Examinati points overall to pass the | cudents will be assessed Questions and commeron: Students must have | on the bants are stro | sis of ongly |

| Reading list | 2. | William Stallings and Lawrence Brown, Computer |
|--------------|----|--|
| | | Security - Principles and Practice 4th edition, 2018 |
| | 3. | Mark S. Merkow and Jim Breithaupt, Information |
| | | Security: Principles and Practices, 2nd edition, 2014. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | X | X | | |
| 2 | | X | | | | |
| 3 | X | | | | | |
| 4 | X | | | | | |
| 5 | X | | | | | |
| 6 | X | | | | | |

3. Planned learning activities and teaching methods

| Wee k | Topic | CLO | Assessments | Learning activities | Resour ces |
|----------|---|-----|-------------|-------------------------------|---------------|
| 1 | Information security principles | 1 | Quiz, Exam | Lecture, Exercises, Lab | [1,2] |
| 2 | Governance and risk management; | | Quiz, Exam | Lecture, Lab | [2] |
| 3 | Security architecture and design; | 3 | Quiz, Exam | Lecture, Lab | [2] |
| 4 | Business continuity and disaster recovery planning; | 3 | Quiz, Exam | Lecture, Lab | [2] |
| 5,6 | Operation security; | 5 | Quiz, Exam | Lecture, Lab | [2] |
| 7 | Access control systems and methodology; | 2 | | Lecture, Lab | |
| | Midterm exam | | | | |
| 8, 9 | Cryptography; | 1 | Quiz, Exam | Lecture | [1] |
| 10 | Overview network and telecommunications; | 5 | Quiz, Exam | Lecture, Lab | [2] |
| 11 | Basic security infrastructures and routers; | 5 | Quiz, Exam | Lecture, Lab | [2] |

| 12 | Firewalls | 5 | Quiz, Exam | Lecture, Exercises, | [1,2] |
|----|--|---|------------|------------------------|-------|
| 13 | Intrusion detection systems and intrusion protection systems | 5 | Quiz, Exam | Lecture, Exercises, | [1,2] |
| 14 | Virtual private network and IPSec; | 5 | Quiz, Exam | Lecture, Lab | [1,2] |
| 15 | Software Development security. | 4 | Quiz, Exam | Lecture | [2] |
| | Final exam | | | | |

4. Assessment plan

| ribbebbilient plan | | | | | |
|---------------------------|------|------|------|------|------|
| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 |
| Midterm examination (30%) | 30% | 80% | 55% | | 10% |
| Final examination (40%) | 40% | | | 75% | 60% |
| Exercises/ Quiz (30%) | 30% | 20% | 45% | 25% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

2. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ↩

5. Rubrics (optional)

5.4. Grading checklist

| Grading checklist for Written Reports | | | | | |
|---------------------------------------|--------------|------|-------|-----------|--|
| Student: HW/Assignment: | | | | | |
| | Evaluator: | | | • • • • • | |
| Date: | | | | | |
| | | | | | |
| | | Max. | Score | Comments | |
| Technical content (| (60%) | | | | |
| Abstract clearly identifies purpose | and | 10 | | | |
| summarizes principal content | | | | | |
| Introduction demonstrates thoroug | gh knowledge | 15 | | | |
| of relevant background and prior v | work | | | | |
| Analysis and discussion demonstra | ate good | 30 | | | |
| subject mastery | | | | | |
| | | | | | |

| Summary and conclusions appropriate and | 5 | |
|---|-----|--|
| complete | | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.5. Holistic rubric

| H | Holistic rubric for evaluating the entire document, e.g., | | | | | |
|-------|---|--|--|--|--|--|
| | exercises/quizzes/HW | | | | | |
| Score | Description | | | | | |
| 5 | Demonstrates complete understanding of the problem. All | | | | | |
| | requirements of task are included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All | | | | | |
| | requirements of task are included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most | | | | | |
| | requirements of task are included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many | | | | | |
| | requirements of task are missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.6. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | | Benchmark |
|--------|----------------------|-------------------|----------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | Issue/ problem to | | to be | |
| | be considered | Issue/ problem | considered | |
| | critically is stated | to be considered | critically is | |
| | clearly and | critically is | stated but | |
| | described | stated, | description | Issue/ problem |
| | comprehensively, | described, and | leaves some | to be |
| | delivering all | clarified so that | terms | considered |
| Explan | relevant | understanding is | undefined, | critically is |
| ation | information | not seriously | ambiguities | stated without |
| of | necessary for full | impeded by | unexplored, | clarification or |
| issues | understanding. | omissions. | boundaries | description. |

| | | | undetermined, and/ or | |
|--------------------|-------------------------------------|-----------------------------------|----------------------------|-----------------------------|
| | | | backgrounds unknown. | |
| | | | Information is taken from | |
| | | | source(s) with | |
| Eviden | Information is taken from | Information is taken from | some interpretation/ | |
| ce | source(s) with | source(s) with | evaluation, but | |
| Selectin | enough | enough | not enough to | Information is |
| g and | interpretation/ | interpretation/ | develop a | taken from |
| using | evaluation to | evaluation to | coherent | source(s) |
| informa tion to | develop a | develop a coherent | analysis or | without any interpretation/ |
| investig | comprehensive analysis or | analysis or | synthesis. Viewpoints of | evaluation. |
| ate a | synthesis. | synthesis. | experts are | Viewpoints of |
| point of | Viewpoints of | Viewpoints of | taken as | experts are |
| view or | experts are | experts are | mostly fact, | taken as fact, |
| conclus | questioned | subject to | with little | without |
| ion | thoroughly. | questioning. | questioning. Questions | question. Shows an |
| | | | some | emerging |
| | | | assumptions. | awareness of |
| | Thoroughly | | Identifies | present |
| | (systematically and | | several | assumptions |
| | methodically) analyzes own and | | relevant contexts when | (sometimes labels |
| | others' | Identifies own | presenting a | assertions as |
| Influen | assumptions and | and others' | position. May | assumptions). |
| ce of | carefully evaluates | assumptions and | be more aware | Begins to |
| context | the relevance of | several relevant | of others' | identify some |
| and | contexts when | contexts when | assumptions than one's own | contexts when |
| assump tions | presenting a position. | presenting a position. | (or vice versa). | presenting a position. |
| | Specific position | Specific | (32 . 123 . 1223) | P |
| | (perspective, | position | | |
| Studen | thesis/ hypothesis) | (perspective, | G | G .c. |
| t's positio | is imaginative, taking into account | thesis/hypothesi s) takes into | Specific position | Specific position |
| n | the complexities of | account the | (perspective, | (perspective, |
| (perspe | an issue. Limits of | complexities of | thesis/ | thesis/ |
| ctive, | position | an issue. Others' | hypothesis) | hypothesis) is |
| thesis/h | (perspective, | points of view | acknowledges | stated, but is |
| ypothe | thesis/ hypothesis) | are | different sides | simplistic and |
| sis) | are acknowledged. | acknowledged | of an issue. | obvious. |

| | Others' points of view are synthesized within position (perspective, thesis/ hypothesis). | within position (perspective, thesis/ hypothesis). | | |
|---------|---|---|----------------|-----------------|
| | | | Conclusion is | |
| | | Conclusion is | logically tied | |
| | | logically tied to | to information | |
| | Conclusions and | a range of | (because | Conclusion is |
| Conclu | related outcomes | information, | information is | inconsistently |
| sions | (consequences and | including | chosen to fit | tied to some of |
| and | implications) are | opposing | the desired | the information |
| related | logical and reflect | viewpoints; | conclusion); | discussed; |
| outcom | student's informed | related | some related | related |
| es | evaluation and | outcomes | outcomes | outcomes |
| (implic | ability to place | (consequences | (consequences | (consequences |
| ations | evidence and | and | and | and |
| and | perspectives | implications) | implications) | implications) |
| conseq | discussed in | are identified | are identified | are |
| uences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | <u> </u> | stone | Benchmark |
|--------|-------------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | |
| | the body, and | and conclusion, | introduction | Organizational |
| | transitions) is | sequenced | and conclusion, | pattern (specific |
| | clearly and | material within | sequenced | introduction and |
| | consistently | the body, and | material within | conclusion, |
| | observable and | transitions) is | the body, and | sequenced |
| | is skillful and | clearly and | transitions) is | material within |
| | makes the | consistently | intermittently | the body, and |
| | content of the | observable | observable | transitions) is not |
| Organi | presentation | within the | within the | observable within |
| zation | cohesive. | presentation. | presentation. | the presentation. |
| | Language | Language | Language | Language choices |
| | choices are | choices are | choices are | are unclear and |
| | imaginative, | thoughtful and | mundane and | minimally support |
| Langu | memorable, and | generally | commonplace | the effectiveness |
| age | compelling, and | support the | and partially | of the |

| enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears y Deliver A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, analogies, quotation srot audience. Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation comfident. A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate to audience. Delivery techniques (posture, techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears spolished and speaker appears spolished and comfident. A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the esta | | | | | |
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| ting credibility/ credibility/ credibility/ credibility/ | | * | * | * | * |
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| al topic. topic. topic. | al | • | • | - | · · |

| | Central message is compelling | | | |
|--------|-------------------------------|-----------------|------------------|-------------------|
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| Centra | repeated, | clear and | understandable | but is not |
| l | memorable, and | consistent with | but is not often | explicitly stated |
| Messag | strongly | the supporting | repeated and is | in the |
| e | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Software Quality Verification and Validation

Course Code: IT166IU

1. General information

| Course designation | | | | |
|---|---|---|--|---------------------|
| Semester(s) in which the course is taught | | | | |
| Person responsible for the course | Tran Tha | anh Tung, Dr. | | |
| Language | English | | | |
| Relation to curriculum | Elective | | | |
| Teaching methods | Lecture, | lesson, project, se | minar. | |
| Workload (incl. contact hours, self-study hours) | specify v etc.): Pri preparati responsil 8 hours p should be | whether lecture, exvate study including on, specified in hobility: Students are per week for self – | ours: Student e expected to spend studying. This tin ing, working on ex | session, d at least |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | |
| Required and recommended prerequisites for joining the course | Object-C | Oriented Programn | ning | |
| Course objectives | testing. S | Strategies and tech | erification, validati niques are present for planning softwa | ed for |
| Course learning outcomes | CLO 1. Describe and explain how testing activities involve within software development process. CLO 2. Understand and apply best practices for software testing. CLO 3. Create test cases based on system requirement | | | |
| | | Competency level Knowledge | Course learning outcome (CLO) CLO1, CLO2 | |
| | | Skill | CLO2, CLO3 | - |
| | | Attitude | CLO2 | - |
| | | 1 Ittitude | _ | |

| Content | The description of the c | | • | | | |
|-----------------------|--|--|-------------|--|--|--|
| | indicate the weighting of the content and the level. | | | | | |
| | Weight: lecture session | | II (II4:1:) | | | |
| | Teaching levels: I (Introduce); T (Teach); U (Utilize) Topic Weight Level | | | | | |
| | Software Testing O | | I | | | |
| | Software Testing O | 3 | T | | | |
| | Foundations | | | | | |
| | Software Testing A | ctivities 3 | T | | | |
| | Model-Driven Test | Design 3 | T, U | | | |
| | Test Automation | 3 | T, U | | | |
| | Testing First Approx | ach 3 | T | | | |
| | Criteria-Based Test Design 3 T | | | | | |
| | Input Space Partitioning 3 T | | | | | |
| | Graph Coverage | 3 | T | | | |
| | Logic Coverage | 3 | T | | | |
| | Writing Test Plans | 3 | T, U | | | |
| | Test implementation | a 3 | T, U | | | |
| Examination forms | Short-answer questions | | | | | |
| Study and examination | Attendance: A minimum | | | | | |
| requirements | compulsory for the class assessed on the basis of | | | | | |
| | Questions and commen | | | | | |
| | Assignments/Examinat | | _ | | | |
| | than 50/100 points overall to pass this course. | | | | | |
| Reading list | 1. Paul Ammann, Jeff Offutt; Introduction to Software Testing, 2nd, 2017 | | | | | |
| | 2. James A. Whittaker; Exploratory Software Testing, 2009. | | | | | |
| | 3. Glendford J. My | vers, Tom Badgett, of Software Testir | • | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|-----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | XX | | | | | |
| 2 | | XXX | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessment s | Learning activities | Resources |
|------|---|-----|-----------------------|---|-----------|
| 1 | Software Testing Overview | 1 | Quiz | Lecture | |
| 2 | Software Testing Foundations | 1 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 3 | Software Testing Activities | 2 | Quiz | Lecture, Discussion | [2] |
| 4 | Model- Driven Test Design | 1,2 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 5 | Test Automation | 2,3 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 6 | Test Automation – Tools | 1,2 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 7 | Testing First Approach | 2,3 | Lab, Quiz, Midterm | Lecture, Discussion | |
| 8 | Criteria- Based Test Design | 2,3 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 9 | Midterm | | | | |
| 10 | Input Space Partitioning – Part 1 | 1,2 | Lab, Quiz, Final | Lecture, Discussion, In class exercises | [1,3] |
| 11 | Input Space Partitioning – Part 2 | 2,3 | Lab, Quiz, Final | Lecture, Discussion | [1,2,3] |
| 12 | Graph Coverage | 1,2 | Lab, Quiz, Final | Lecture, Discussion, In class exercises | [1,3] |
| 13 | Logic Coverage | 2,3 | Lab, Quiz, Final | Lecture, Discussion | [1,3] |

| 14 | Writing Test Plans | 1,2 | Lab, Quiz, Final | Lecture, Discussion, In class exercises | [2,3] |
|----|----------------------------|-----|---------------------|---|-------|
| 15 | Test implementat ion | 2,3 | Lab, Quiz, Final | Lecture, Discussion | [2,3] |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--|------|------|------|
| Quiz (5%) | X | X | |
| Labs (20%) | | X | |
| Midterm examination (30%) | X | X | X |
| Projects/Presentati ons/ Report (10%) | | X | X |
| Final examination (40%) | X | X | X |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|----------------|-----------------|-------|----------|
| Student: | HW/Assignment: | | | |
| | Evaluator: | • • • • • • • • | | ••••• |
| Date: | | | | |
| | | | | |
| | | Max. | Score | Comments |
| Technical content (| 60%) | | | |
| Abstract clearly identifies purpose | and | 10 | | |
| summarizes principal content | | | | |
| Introduction demonstrates thorough | n knowledge | 15 | | |
| of relevant background and prior w | ork | | | |
| Analysis and discussion demonstrate good | | | | |
| subject mastery | | | | |

| Summary and conclusions appropriate and | 5 | |
|---|-----|--|
| complete | | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | tic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|---|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|---------|----------------------|-------------------|----------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | Issue/ problem to | | considered | |
| | be considered | Issue/ problem | critically is | |
| | critically is stated | to be considered | stated but | |
| | clearly and | critically is | description | |
| | described | stated, | leaves some | |
| | comprehensively, | described, and | terms | Issue/ problem |
| | delivering all | clarified so that | undefined, | to be considered |
| | relevant | understanding is | ambiguities | critically is |
| Explana | information | not seriously | unexplored, | stated without |
| tion of | necessary for full | impeded by | boundaries | clarification or |
| issues | understanding. | omissions. | undetermined, | description. |

| | | | and/ or | |
|---------------------|-----------------------------------|------------------------|--------------------------|------------------------------------|
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is | Information is | some | |
| Evidenc | taken from | taken from | interpretation/ | |
| e | source(s) with | source(s) with | evaluation, but | |
| Selecting | enough | enough | not enough to | |
| and | interpretation/ | interpretation/ | develop a | Information is |
| using | evaluation to | evaluation to | coherent | taken from |
| informati | develop a | develop a | analysis or | source(s) |
| on to | comprehensive | coherent | synthesis. | without any |
| investiga | analysis or | analysis or | Viewpoints of | interpretation/ |
| te a | synthesis. | synthesis. | experts are | evaluation. |
| point of | Viewpoints of | Viewpoints of | taken as | Viewpoints of |
| view or conclusi | experts are questioned | experts are subject to | mostly fact, with little | experts are taken as fact, without |
| on | thoroughly. | questioning. | questioning. | question. |
| On | thoroughry. | questioning. | Questions | question. |
| | | | some | Shows an |
| | | | assumptions. | emerging |
| | Thoroughly | | Identifies | awareness of |
| | (systematically and | | several | present |
| | methodically) | | relevant | assumptions |
| | analyzes own and | | contexts when | (sometimes |
| | others' | Identifies own | presenting a | labels assertions |
| Influenc | assumptions and | and others' | position. May | as assumptions). |
| e of | carefully evaluates | assumptions and | be more aware | Begins to |
| context | the relevance of | several relevant | of others' | identify some |
| and | contexts when | contexts when | assumptions | contexts when |
| assumpt | presenting a | presenting a | than one's own | presenting a |
| ions | position. | position. Specific | (or vice versa). | position. |
| | Specific position | * | | |
| | (perspective, thesis/ hypothesis) | position (perspective, | | |
| | is imaginative, | thesis/hypothesi | | |
| Student' | taking into account | s) takes into | Specific | |
| S | the complexities of | account the | position | Specific position |
| position | an issue. Limits of | complexities of | (perspective, | (perspective, |
| (perspec | position | an issue. Others' | thesis/ | thesis/ |
| tive, | (perspective, | points of view | hypothesis) | hypothesis) is |
| thesis/hy | thesis/ hypothesis) | are | acknowledges | stated, but is |
| pothesis | are acknowledged. | acknowledged | different sides | simplistic and |
|) | Others' points of | within position | of an issue. | obvious. |

| | view are | (perspective, | | |
|----------|----------------------|-------------------|----------------|-------------------|
| | synthesized within | thesis/ | | |
| | position | hypothesis). | | |
| | (perspective, | | | |
| | thesis/ hypothesis). | | | |
| | | | Conclusion is | |
| | | Conclusion is | logically tied | |
| | | logically tied to | to information | |
| | Conclusions and | a range of | (because | |
| | related outcomes | information, | information is | |
| Conclusi | (consequences and | including | chosen to fit | Conclusion is |
| ons and | implications) are | opposing | the desired | inconsistently |
| related | logical and reflect | viewpoints; | conclusion); | tied to some of |
| outcome | student's informed | related | some related | the information |
| S | evaluation and | outcomes | outcomes | discussed; |
| (implica | ability to place | (consequences | (consequences | related outcomes |
| tions | evidence and | and | and | (consequences |
| and | perspectives | implications) | implications) | and |
| consequ | discussed in | are identified | are identified | implications) are |
| ences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | <u> </u> | stone | Benchmark |
|---------|-------------------|-----------------|-----------------|----------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | |
| | the body, and | and conclusion, | introduction | Organizational |
| | transitions) is | sequenced | and conclusion, | pattern (specific |
| | clearly and | material within | sequenced | introduction and |
| | consistently | the body, and | material within | conclusion, |
| | observable and | transitions) is | the body, and | sequenced material |
| | is skillful and | clearly and | transitions) is | within the body, |
| | makes the | consistently | intermittently | and transitions) is |
| | content of the | observable | observable | not observable |
| Organiz | presentation | within the | within the | within the |
| ation | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language choices |
| | choices are | choices are | choices are | are unclear and |
| | imaginative, | thoughtful and | mundane and | minimally support |
| Languag | memorable, and | generally | commonplace | the effectiveness of |
| e | compelling, and | support the | and partially | the presentation. |

| | 1 41 | -cc | | T |
|----------------------------|--|--|---|--|
| | enhance the | effectiveness of | support the | Language in |
| | effectiveness of | the . | effectiveness of | presentation is not |
| | the presentation. | presentation. | the | appropriate to |
| | Language in | Language in | presentation. | audience. |
| | presentation is | presentation is | Language in | |
| | appropriate to | appropriate to | presentation is | |
| | audience. | audience. | appropriate to | |
| | | | audience. | |
| | Delivery | | Delivery | |
| | techniques | Delivery | techniques | Delivery |
| | (posture, | techniques | (posture, | techniques |
| | gesture, eye | (posture, | gesture, eye | (posture, gesture, |
| | contact, and | gesture, eye | contact, and | eye contact, and |
| | vocal | contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | | make the | detract from the |
| | | expressiveness) make the | | |
| | presentation | | presentation | understandability |
| | compelling, and | presentation | understandable, | of the presentation, |
| | speaker appears | interesting, and | and speaker | and speaker |
| | polished and | speaker appears | appears | appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | |
| | (explanations, | (explanations, | (explanations, | Insufficient |
| | examples, | examples, | examples, | supporting |
| | illustrations, | illustrations, | illustrations, | materials |
| | statistics, | statistics, | statistics, | (explanations, |
| | · · | | building, | (CAPIananons, |
| | analogies, | analogies, | · · · · · · · · · · · · · · · · · · · | |
| | analogies, quotations from | analogies, quotations from | analogies, | examples, |
| | quotations from | analogies, quotations from relevant | analogies, quotations from | examples, illustrations, |
| | quotations from relevant | quotations from relevant | analogies, quotations from relevant | examples, illustrations, statistics, |
| | quotations from | quotations from | analogies, quotations from | examples, illustrations, statistics, analogies, |
| | quotations from relevant authorities) make | quotations from relevant authorities) make | analogies, quotations from relevant authorities) make | examples, illustrations, statistics, analogies, quotations from |
| | quotations from relevant authorities) make appropriate | quotations from relevant authorities) make appropriate | analogies, quotations from relevant authorities) make appropriate | examples, illustrations, statistics, analogies, quotations from relevant |
| | quotations from relevant authorities) make appropriate reference to | quotations from relevant authorities) make appropriate reference to | analogies, quotations from relevant authorities) make appropriate reference to | examples, illustrations, statistics, analogies, quotations from relevant authorities) make |
| | quotations from relevant authorities) make appropriate reference to information or | quotations from relevant authorities) make appropriate reference to information or | analogies, quotations from relevant authorities) make appropriate reference to information or | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to |
| | quotations from relevant authorities) make appropriate reference to information or analysis that | quotations from relevant authorities) make appropriate reference to information or analysis that | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or |
| | quotations from relevant authorities) make appropriate reference to information or analysis that significantly | quotations from relevant authorities) make appropriate reference to information or analysis that generally | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that |
| | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports |
| | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or |
| | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the |
| S | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's |
| Supporti | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ |
| Supporti ng Material | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's | examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's |

| | Central message is compelling | | | |
|---------|-------------------------------|-----------------|------------------|--------------------|
| | (precisely | | Central | |
| | stated, | Central | message is | |
| | appropriately | message is | basically | Central message |
| | repeated, | clear and | understandable | can be deduced but |
| | memorable, and | consistent with | but is not often | is not explicitly |
| Central | strongly | the supporting | repeated and is | stated in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: August 29th, 2023

Ho Chi Minh City, 29/08/2023 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Blockchain

Course Code: IT150IU

1. General information

| Course designation | Introduction to Blockchain technology |
|---|---|
| Semester(s) in which the course is taught | |
| Person responsible for the course | Tran Thanh Tung, Dr. |
| Language | English |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | None |
| Course objectives | This subject introduces the students the foundation of blockchain technology and its applications. Students will study blockchain concepts and principles how it works. This course covers relevant topics blockchain space. The course starts with the basics of blockchain, cryptography, fundamental understanding of bitcoins. Then, the applications of blockchain technology is introduced in different areas of finance, healthcare, supply chain, etc. A complete picture of the ecosystem surrounding blockchain technology and development trends are also discussed. |
| Course learning outcomes | CLO 1. Understand basic contents of blockchain technology. CLO 2. Explain different types of blockchain development: Ethereum, smart contract security, bitcoin CLO 3. Apply blockchain techniques to setup the development environment to writing and deploying smart contracts, the workhorse of blockchain applications, integrating cryptocurrency micropayments into web apps CLO 4. Work in a team to build a blockchain application project. |

| | Competency level | Course learning ou | itcome (C | (LO) | |
|-------------------|---|---|-------------|------------|--|
| | Knowledge | CLO1, CLO1 | | | |
| | Skill | CLO3, CLO4 | | | |
| | Attitude | CLO2 | | | |
| Content | The description of the co | ontents should clearly indicate the | | | |
| | | ighting of the content and the level. | | | |
| | | Veight: lecture session (3 hours) eaching levels: I (Introduce); T (Teach); U (Utilize) | | | |
| | Top | | Weight | Level | |
| | Introduction | | 3 | I | |
| | Cryptography & crypt | ocurrencies | 3 | Т | |
| | How Bitcoin achieve of | | 3 | I, T | |
| | Mechanics of Bitcoin | | 3 | T, U | |
| | How to store and use l | Ritcoin | 3 | T, U | |
| | Bitcoin mining | Bitcom | 3 | T | |
| | Bitcoin and Anonymit | V | 3 | T | |
| | Ethereum | · <u>y</u> | 3 | I, T | |
| | Solidity | | 3 | T, U | |
| | Token | | 3 | I, T | |
| | Oracle | | 3 | I, T | |
| | Decentralized Applica | tions (Danns) | 3 | T, U | |
| | | _ | 3 | T T | |
| | Design pattern for bloom | | 3 | | |
| Examination forms | Real-world application Multiple-choice question | | | I, T | |
| Study and | Attendance: A minimum | | | nnulsorv | |
| examination | for the class sessions. Stu | - | | • | |
| requirements | their class participation. | Questions and comme | ents are st | rongly | |
| | encouraged. | C 1 1 1 1 1 1 1 | .1 | 50/100 | |
| | Assignments/Examination points overall to pass this | | e more tha | an 50/100 | |
| Reading list | | n, Joseph Bonneau, E | dward Fel | ten. | |
| reading not | Andrew Miller, and Stev | _ | | , | |
| | Cryptocurrency Technolo | ogies: A Comprehens | ive Introd | uction. | |
| | Princeton, 2016 | | | | |
| | | nopoulos, and Gavin | | | |
| | Mastering Ethereum: But | ilding Smart Contract | ts and DA | pps. | |
| | O'Reilly Media, 2018 [3] Xiwei Xu, Ingo W | eber, and Mark Stap | les Archit | ecture for | |
| | Blockchain Applications | _ | 1 1101111 | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | X | X | | | | |
| 3 | | X | | | | X |
| 4 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--------------------------------------|------|-----------------------------|---|-----------|
| 1 | Introduction | 1 | Quiz | Teaching, Presentation | |
| 2 | Cryptography & cryptocurrencies | 1 | Quiz, In-class exercises | Teaching, Presentation | |
| 3 | How Bitcoin achieve decentralization | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 4 | Mechanics of Bitcoin | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 5 | How to store and use Bitcoin | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 6 | Bitcoin mining | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 7 | Bitcoin and Anonymity | 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 8 | Midterm | | | | |
| 9 | Ethereum | 2,3 | Project | Teaching, Presentation | |
| 10 | Solidity | 2,3 | Project | Teaching, Presentation | |
| 11 | Token | 3,4 | Quiz, In-class exercises | Teaching, Presentation | |
| 12 | Oracle | 2,3 | Quiz, In-class exercises | Teaching, Presentation Group discussion | |
| 13 | Decentralized Applications (Dapps) | 3,4 | Quiz, In-class exercises | Teaching, Presentation | |

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-----|-----------------------------|--|-----------|
| 14 | Design pattern for blockchain applications | 3,4 | Quiz, In-class exercises | Teaching, Presentation, In-class reading | |
| 15 | Real-world applications | 3,4 | Presentation | Teaching, Presentation Group discussion | |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (20%) | | | X | X |
| Midterm examination (30%) | X | X | | |
| Final examination (40%) | | X | X | |
| Exercises/ Quiz (10%) | X | | | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

1. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for written Reports | | | | | |
|--|----------------|--------|----------|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | | | | | |
| | Evalu | iator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |

| Distinct introduction, body, conclusions | 5 | |
|---|-----|--|
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|----------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | Issue/ problem | | considered | |
| | to be considered | | critically is | |
| | critically is | Issue/ problem | stated but | |
| | stated clearly | to be considered | description | |
| | and described | critically is | leaves some | Issue/ |
| | comprehensivel | stated, | terms | problem to be |
| | y, delivering all | described, and | undefined, | considered |
| | relevant | clarified so that | ambiguities | critically is |
| | information | understanding is | unexplored, | stated without |
| | necessary for | not seriously | boundaries | clarification |
| Explanation of | full | impeded by | undetermine | or |
| issues | understanding. | omissions. | d, and/ or | description. |

| | | | backgrounds | |
|------------|-----------------------------|----------------------------|----------------------------|--------------------------------|
| | | | unknown. | |
| | | | | |
| | | | T.C. | |
| | | | Information is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, but not | |
| | source(s) with enough | source(s) with enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| I I | develop a | develop a | analysis or | without any |
| | comprehensive analysis or | coherent analysis or | synthesis. Viewpoints | interpretation/ evaluation. |
| _ | synthesis. | synthesis. | of experts are | Viewpoints of |
| U | Viewpoints of | Viewpoints of | taken as | experts are |
| _ | experts are | experts are | mostly fact, | taken as fact, |
| | questioned | subject to | with little | without |
| Conclusion | thoroughly. | questioning. | questioning. Questions | question. |
| | | | some | |
| | | | assumptions. | Shows an |
| | 7D1 1.1 | | Identifies | emerging |
| I I | Thoroughly (systematically | | several relevant | awareness of present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | Idontifica | position. | assertions as |
| | assumptions and carefully | Identifies own and others' | May be more aware of | assumptions). Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| | contexts when | contexts when | than one's | when |
| | presenting a position. | presenting a position. | own (or vice versa). | presenting a position. |
| - | Specific | Specific | Specific | position. |
| | position | position | position | Specific |
| | (perspective, | (perspective, | (perspective, | position |
| 1 | thesis/ | thesis/hypothesi | thesis/ | (perspective, |
| | hypothesis) is imaginative, | s) takes into account the | hypothesis) acknowledge | thesis/ hypothesis) is |
| | taking into | complexities of | s different | stated, but is |

| | account the complexities of an issue. Limits of position (perspective, thesis/ | an issue. Others' points of view are acknowledged within position (perspective, | sides of an issue. | simplistic and obvious. |
|---------------|--|---|---------------------|-------------------------|
| | hypothesis) are | thesis/ | | |
| | acknowledged. Others' points of | hypothesis). | | |
| | view are | | | |
| | synthesized | | | |
| | within position (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | | |
| | | | Conclusion | |
| | C1 | | is logically | |
| | Conclusions and related | Conclusion is | tied to information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | | a range of | information | tied to some |
| | (consequences and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | Organizational | Organizational | |
| | pattern | pattern | pattern | Organizational |
| | (specific | (specific | (specific | pattern (specific |
| | introduction | introduction | introduction | introduction and |
| | and conclusion, | and conclusion, | and conclusion, | conclusion, |
| | sequenced | sequenced | sequenced | sequenced |
| | material within | material within | material within | material within |
| | the body, and | the body, and | the body, and | the body, and |
| | transitions) is | transitions) is | transitions) is | transitions) is not |
| Organization | clearly and | clearly and | intermittently | observable |

| | consistently | consistently | observable | within the |
|------------|------------------|------------------|------------------|--------------------|
| | observable and | observable | within the | presentation. |
| | is skillful and | within the | presentation. | presentation. |
| | makes the | presentation. | presentation. | |
| | | presentation. | | |
| | content of the | | | |
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| • | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| Supporting | quotations | authorities) | authorities) | relevant |
| Material | from relevant | make | make | authorities) |
| Mattial | 110111 Televalit | make | make | aumornics) |

| | authorities) | appropriate | appropriate | make reference |
|---------|-----------------|-----------------|------------------|-------------------|
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Game Development

Course Code: IT167IU

1. General information

| Course designation | This course is an introduction to the theory and practice of the process of designing games and playful experiences. |
|---|---|
| Semester(s) in which the course is taught | 7,9 |
| Person responsible for the course | Dr. Le Duy Tan |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | Total workload: 182.5 hours Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Lecture: 37.5 hours + Laboratory: 25 hours. Private study including examination preparation, specified in hours: 120 hours. |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object Oriented Programming |
| Course objectives | This course is an introduction to the theory and practice of the process of designing games and playful experiences. Students are familiarized with methods, concepts, techniques, and literature used in the design of games. The strategy is process-oriented, focusing on aspects such as: Rapid prototyping, play testing, and design iteration using a player-centered approach. |
| Course learning outcomes | CLO 1. Understand the emergence of the academic study of design methods and game design. CLO 2. Able to structure and conduct a game design project from conceptualization to playable prototype. CLO 3. Solve a real-world problem using game design knowledge through group collaboration. |

| | Competency level | Course learning o | utcome | |
|------------------------------------|---|---|------------|------------------------|
| | Knowledge | 1 | | |
| | Skill | 2, 3 | | |
| | Attitude | 3 | | |
| Content | The description of the content and Weight: lecture session (3 h Teaching levels: I (Introduction) | d the level. lours) | | |
| | Topic | | Weigh | Level |
| | | | t | |
| | Introduction to Game Dev | elopment | 1 | I |
| | Platforms and Publishing | | 3 | T |
| | Game Development Cycle |), | 3 | T, U |
| | Principles of Game Design | 1 | 3 | T, U |
| | Trade-Offs in Game Design | gn | 2 | T, U |
| | Game Engines, Game Sys Map and Level Editors | tems and Elements; | 2 | Т |
| | Games Marketing and Dis | tribution | 1 | T |
| Examination forms | Short-answer questions, Pro | ogramming exercises | | |
| Study and examination requirements | Attendance: A minimum att the class sessions. Students class participation. Ques encouraged. Assignments/Examination: points overall to pass this co | s will be assessed on stions and comments. Students must have n | the basis | s of their strongly |
| Reading list | | me programming pat | terns. Gei | never |
| | 3. Gregory, Jason. Gan | ne engine architecture | crc Pres | s, 2018. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SL | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|---|-----|---|---|---|---|
| OT | | | | | | |
| 1 | X | | | | | |
| 2 | | XXX | | | | |
| 3 | | | | | | X |

5. Planned learning activities and teaching methods

| Wee k | Topic 5. Planned led | CLO | Assessment s | Learning activities | Resour ces |
|----------|---------------------------------------|------|-----------------------|--|------------|
| 1 | Introduction to Game Development | 1 | Quiz | Lecture | 1 |
| 2 | Platforms and Publishing – Part 1 | 1 | Quiz | Lecture | 1 |
| 3 | Platforms and Publishing – Part 2 | 1 | Quiz | Lecture, Discussion , In-class Exercise | 2 |
| 4 | Platforms and Publishing – Part 3 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 5 | Game Development Cycle – Part 1 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 6 | Game Development Cycle – Part 2 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 2 |
| 7 | Game Development Cycle – Part 3 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 8 | Principles of Game Design – Part 1 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| Midte | erm | | | | |
| 9 | Principles of Game Design – Part 2 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 10 | Principles of Game Design – Part 3 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 11 | Trade-Offs in Game Design – Part 1 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |

| 12 | Trade-Offs in Game Design – Part 2 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
|-------|---|------|---------------------|--|------|
| 13 | Game Engines, Game Systems and Elements; Map and Level Editors – Part 1 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1, 2 |
| 14 | Game Engines, Game Systems and Elements; Map and Level Editors – Part 2 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| 15 | Games Marketing and Distribution | 2, 3 | Quiz, Lab, Final | Lecture, Discussion , In-class Exercise | 1 |
| Final | | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Quiz / Assigment (10%) | 50% | 10% | 10% |
| Labs (20%) | 10% | 30% | 30% |
| Midterm examination (30%) | 30% | 30% | 30% |
| Final examination (40%) | 10% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.4. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|------|-------|----------|--|
| Student: HW/Assignment: | | | | |
| Date: Evaluator: | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |

| Distinct introduction, body, conclusions | 5 | |
|---|-----|--|
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.5. Holistic rubric

| ITal | ation with mine four explications the aution document of a convenience (switzers /IIXX) | | | | | |
|------|---|--|--|--|--|--|
| Holl | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
| Scor | Description | | | | | |
| e | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | | |
| | are included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | | |
| | task are included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | | |
| | are included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | | |
| | are missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.6. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|-------------|----------------------|-------------------|----------------|---------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem | leaves some | Issue/ |
| | critically is stated | to be considered | terms | problem to |
| | clearly and | critically is | undefined, | be |
| | described | stated, | ambiguities | considered |
| | comprehensively, | described, and | unexplored, | critically is |
| | delivering all | clarified so that | boundaries | stated |
| | relevant | understanding is | undetermined, | without |
| | information | not seriously | and/ or | clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |

| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. | Information is taken from source(s) without any interpretatio n/ evaluation. Viewpoints of experts are taken as fact, without question. Shows an |
|---|--|---|--|---|
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
| Student's position (perspective, thesis/hypot hesis) | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, | Specific position (perspective, thesis/ hypothesis) acknowledges different sides of an issue. | Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and obvious. |

| | position (perspective, thesis/ hypothesis). | thesis/ hypothesis). | | |
|--------------|---|--|---|---|
| Conclusions | Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed | Conclusion is logically tied to a range of information, including opposing viewpoints; related | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related | Conclusion is inconsistentl y tied to some of the information discussed; related outcomes |
| and related | evaluation and | outcomes | outcomes | (consequenc |
| outcomes | ability to place | (consequences | (consequences | es and |
| (implication | evidence and | and | and | implications |
| s and | perspectives | implications) | implications) |) are |
| consequence | discussed in | are identified | are identified | oversimplifi |
| s) | priority order. | clearly. | clearly. | ed. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|-------------|-------------------|-----------------------------|------------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | Organizational |
| | material within | introduction | (specific | pattern |
| | the body, and | and conclusion, | introduction | (specific |
| | transitions) is | sequenced | and conclusion, | introduction |
| | clearly and | material within | sequenced | and conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently intermittently | | transitions) is |
| | content of the | observable | observable | not observable |
| Organizatio | presentation | within the | within the | within the |
| n | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, and | generally | commonplace | minimally |
| | compelling, and | support the | and partially | support the |
| | enhance the | effectiveness of | support the | effectiveness |
| Language | effectiveness of | the | effectiveness of | of the |

| | the presentation. Language in presentation is appropriate to audience. | | the presentation. Language in presentation is appropriate to audience. | presentation. Language in presentation is not appropriate to audience. |
|------------------------|---|---|---|--|
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandabili ty of the presentation, and speaker appears uncomfortable. |
| | A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's | Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's |
| Supporting Material | credibility/ authority on the topic. | credibility/ authority on the topic. | credibility/ authority on the topic. | credibility/ authority on the topic. |

| | Central message is compelling | | | |
|---------|-------------------------------|-----------------|------------------|----------------|
| | (precisely | | Central | |
| | stated, | Central | message is | Central |
| | appropriately | message is | basically | message can be |
| | repeated, | clear and | understandable | deduced but is |
| | memorable, and | consistent with | but is not often | not explicitly |
| Central | strongly | the supporting | repeated and is | stated in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: August 28, 2023

Ho Chi Minh City, 28/08/2023 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Development and Operations (DevOps)

Course Code: IT156IU

1. General information

| 11 3011014 | |
|---|---|
| Course designation | This course is an introduction to DevOps to help students understand its principles and practices. Key concepts and terminology will be covered with real-life case studies, examples and practical exercises. Common and popular tools to achieve DevOps models will be introduced as well. |
| Semester(s) in which the course is taught | 7,8 |
| Person responsible for the course | Tran Thanh Tung, PhD. |
| Language | English |
| Relation to curriculum | Elective (NE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | None |
| Course objectives | This course is an introduction to DevOps to help students understand its principles and practices. Key concepts and terminology will be covered with real-life case studies, example and practical exercises. Common and popular tools to achieve DevOps models will be introduced as well. |
| Course learning outcomes | CLO 1. Define and discuss the key concepts and principles of DevOps CLO 2 Explain the benefit of DevOps and continuous delivery CLO 3 Understand infrastructure automation, build and deployment automation, the transformation to DevOps models CLO 4. Work with common and popular DevOps tools |

| | | Competency level | Course learning out | tcome (CI | .O) |
|------------------------------------|---|--|---|-------------|-------------|
| | | Knowledge | 1,2 | | |
| | | Skill | 3,4 | | |
| | | Attitude | 4 | | |
| Content | The | description of the co | ontents should clearly i | indicate th | e |
| | | ghting of the content | | | |
| | | ight: lecture session (| | T4:1:) | |
| | | opic | duce); T (Teach); U (U | Weight | Level |
| | | | | 3 | I |
| | | troduction to DevOps | | 3 | I |
| | | troduction to Cloud C | | 3 | |
| | | nux Basics and Shell | 1 0 | | T,U |
| | | ersioning and Build T | | 3 | T |
| | | ntomation: Continuou ontinuous Deploymen | | 3 | T |
| | Co | onfiguration Manager | nent | 3 | I,T |
| | Co | ontainers, Container v | s Virtual Machine | 3 | I,T |
| | De | eployment pipeline | | 3 | I,T |
| | Po | st production | | 3 | I,T |
| | | saster recovery | | 3 | I |
| | | ontinuous Monitoring | for DevOps | 3 | I,T |
| | | frastructure and deplo | | 3 | I |
| Examination forms | _ | rt-answer questions | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | [1] Jeffery D.Smith, Operations Anti-Patterns, DevOps Solutions, Manning Publications 2020 | | | | |
| | [2] Nicole Forsgren, Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations, IT Revolution Press 2018 | | | | |
| | Sof | [3] Jez Humble and David Farley. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, Addison-Wesley Professional, 2010 | | | |
| | | | ve Matyas, Andrew G Software Quality and | | |

| Addison-Wesley Professional, 2007Len Bass and John Klein | n. |
|--|----|
| Deployment and Operations for Software Engineers, 2019. | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | X | | | | | |
| 2 | X | | | | | |
| 3 | | X | | | | |
| 4 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Lagraina | Resources |
|---------|---|-----|-------------|---------------------|-----------|
| vveek | Торіс | CLO | Assessments | Learning activities | Resources |
| 1 | Introduction to DevOps | | | | |
| 2,3 | Introduction to Cloud Computing | | | | |
| 4,5 | Linux Basics and Shell Scripting | | | | |
| 6 | Versioning and Build Tool | | | | |
| 7 | Automation: Continuous Integration, Continuous Deployment | | | | |
| 8 | Configuration Management | | | | |
| Midter | m exam | | | | |
| 9,10 | Containers, Container vs Virtual Machine | | | | |
| 11 | Deployment pipeline | | | | |
| 12 | Post production | | | | |
| 13 | Disaster recovery | | | | |
| 14 | Continuous Monitoring for DevOps | | | | |
| 15 | Infrastructure and deployment security | | | | |
| Final e | xam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------------------|------|------|------|------|
| Quiz (5%) | 10% | | 20% | 20% |
| Labs (10%) | 30% | 30% | | |
| Midterm examination (30%) | 50% | 40% | | |
| Projects/Presentations/ Report (15%) | 10% | | 30% | 30% |
| Final examination (40%) | | 30% | 50% | 50% |

5. Rubrics (optional)5.1. Grading checklist

| Grading checklist for Writt | en Repo | orts | |
|--|---------|--------|----------|
| Student: | | | ent: |
| Date: | | | •• |
| | Evalı | ıator: | |
| | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |

| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
|---|--|
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical thinking vi | Capstone | Milestone | | Benchmark |
|----------------------|-------------------|-------------------|----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |

| | | | 0 | |
|------------------|-----------------------------|------------------------------|-------------------------|----------------|
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | | others' | identify some |
| | | assumptions and | | • |
| T (9) | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when . |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | | | | thesis/ |
| position | synthesized within position | acknowledged within position | hypothesis) acknowledge | |
| _ | • | * | s different | hypothesis) is |
| (perspective, | (perspective, | (perspective, | sides of an | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | Conclusions | Conclusion is | Conclusion | Conclusion is |
| Complete | and related | logically tied to | is logically | inconsistently |
| Conclusions | outcomes | a range of | tied to | tied to some |
| and related | (consequences | information, | information | of the |
| outcomes | and | including | (because | information |
| (implications | implications) | opposing | information | discussed; |
| and | are logical and | viewpoints; | is chosen to | related |
| consequences) | reflect student's | related | fit the | outcomes |

| informed | outcomes | desired | (consequence |
|------------------|----------------|----------------|---------------|
| evaluation and | (consequences | conclusion); | s and |
| ability to place | and | some related | implications) |
| evidence and | implications) | outcomes | are |
| perspectives | are identified | (consequence | oversimplifie |
| discussed in | clearly. | s and | d. |
| priority order. | | implications) | |
| | | are identified | |
| | | clearly. | |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | | stone | Benchmark |
|--------------|---|--|---|---|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and | Organizational pattern (specific introduction and conclusion, sequenced material within | Organizational pattern (specific introduction and conclusion, sequenced | Organizational pattern (specific introduction and conclusion, |
| Organization | consistently observable and is skillful and makes the content of the presentation cohesive. | the body, and transitions) is clearly and consistently observable within the presentation. | material within the body, and transitions) is intermittently observable within the presentation. | sequenced material within the body, and transitions) is not observable within the presentation. |
| | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is |
| Language | appropriate to audience. | appropriate to audience. | appropriate to audience. | not appropriate to audience. |

| | D-1: | | | |
|------------|-----------------|------------------|------------------|--------------------|
| | Delivery | D 1' | D 1' | |
| | techniques | Delivery | Delivery | D 11 |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | | | | |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| C | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central . | | | |
| | message is | | Central . | |
| | compelling | Central . | message is | Central message |
| | (precisely | message is | basically | can be deduced |
| | stated, | clear and | understandable | but is not |
| | appropriately | consistent with | but is not often | explicitly stated |
| Central | repeated, | the supporting | repeated and is | in the |
| Message | memorable, | material. | not memorable. | presentation. |

| and strongly supported.) | |
|--------------------------|--|
|--------------------------|--|

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Data Science and Visualization

Course Code: IT138IU

1. General information

| 1. General information | | | | | |
|--|--|--------------------------------------|--|--|--|
| Course designation | | | | | |
| Semester(s) in | | | | | |
| which the course is | | | | | |
| taught | m m 1 m 5 | | | | |
| Person responsible for the course | Tran Thanh Tung, Dr. | | | | |
| Language | English | | | | |
| Relation to | | acialization Names of other study | | | |
| curriculum | Compulsory / elective / specialisation Names of other study programmes with which the module is shared | | | | |
| Teaching methods | Lecture, lesson, project, se | eminar. | | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. | | | | |
| Credit points | Number of credits: 4 | | | | |
| | Lecture: 3 | | | | |
| D 1 1 | Laboratory: 1 | | | | |
| Required and recommended | none | | | | |
| prerequisites for | | | | | |
| joining the course | | | | | |
| Course objectives | The goal of this course is to introduce students to the key principles, methods, and techniques for effective visual analysis of data. The course begins with aims and key principles of data visualization. The course continues with different aspects of visualization including techniques and method for presenting different data types, and for discussing and analyzing visualizations. Thorough the course, students will be introduced to many visualization systems and visual tools via hand-on exercises. | | | | |
| Course learning | _ | inciples of data and graphic design. | | | |
| outcomes | CLO 2. Create well-designed data visualizations with appropriate tools. | | | | |
| | CLO 3. Evaluate a visualiz | zation design. | | | |
| | | Course learning outcome (CLO) | | | |
| | Knowledge | | | | |
| | Skill | | | | |
| I | | | | | |

| | Attitude | | | | |
|-------------------|---|-------------|----------|--|--|
| Content | The description of the contents should clearly indicate the | | | | |
| | weighting of the content and the level. | | | | |
| | Weight: lecture session (3 hours) | | | | |
| | Teaching levels: I (Introduce); T (Teach); U (| (Utilize) | 1 | | |
| | Торіс | Weight | Level | | |
| | Visualization design principles | | | | |
| | Perception, Cognition, Color | | | | |
| | Data abstraction, data types | | | | |
| | Visual encoding with marks and channels | | | | |
| | Tasks and Interactivity | | | | |
| | Validation and visualization | | | | |
| | Arrange text and sets | | | | |
| | Arrange spatial data | | | | |
| | Arrange tree and graphs/networks | | | | |
| | Facets and views | | | | |
| | Focus+Context | | | | |
| | Filtering and Aggregation | | | | |
| Examination forms | Multiple-choice questions, short-answer ques | tions | | | |
| Study and | Attendance: A minimum attendance of 80 per | rcent is co | mpulsory | | |
| examination | for the class sessions. Students will be assessed on the basis of | | | | |
| requirements | their class participation. Questions and comments are strongly | | | | |
| | encouraged. | | | | |
| | Assignments/Examination: Students must have more than 50/100 | | | | |
| D 11 11 | points overall to pass this course. | | | | |
| Reading list | | | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-----|-------------|---------------------|-----------|
| 1 | Visualization design principles | | | | |
| 2 | Perception, Cognition, Color | | | | |
| 3 | Data abstraction, data types | | | | |
| 4 | Visual encoding with marks and channels | | | | |
| 5 | Tasks and Interactivity | | | | |
| 6 | Midterm | | | | |
| 7 | Validation and visualization | | | | |
| 8 | Arrange text and sets | | | | |
| 9 | Arrange spatial data | | | | |
| 10 | Arrange tree and graphs/networks | | | | |
| 11 | Facets and views | | | | |
| 12 | Focus+Context | | | | |
| 13 | Filtering and Aggregation | | | | |
| 14 | Final exam | | | | |

4. Assessment plan

| ciit pian | | | |
|---------------------------|------|------|------|
| Assessment Type | CLO1 | CLO2 | CLO3 |
| Labs (20%) | | X | X |
| Midterm examination (30%) | X | X | |
| Final examination (40%) | | X | X |
| Exercises/ Quiz (10%) | X | X | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

5. Rubrics (optional)

5.1. Grading checklist

| 5.1. Grading checklist | | | | | | |
|--|----------------|-------|----------|--|--|--|
| Grading checklist for Written Reports | | | | | | |
| Student: | HW/Assignment: | | | | | |
| Date: | | | | | | |
| | Evalu | ator: | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good | 5 | | | | | |
| transitions | | | | | | |
| Presentation (20%) | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | |
| Clear and easy to read | 10 | | | | | |

10

100

5.2. Holistic rubric

Quality of Layout and Graphics (10%)

| Holi | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | |
|-------|---|--|--|--|
| Score | Description | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | |
| 1 | Demonstrates no understanding of the problem. | | | |
| 0 | No response/task not attempted | | | |

TOTAL SCORE

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|------------------|---|--|---|---|
| | 4 | 3 | 2 | 1 |
| Explanation of | Issue/ problem to be considered critically is stated clearly and described comprehensivel y, delivering all relevant information necessary for full | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermine d, and/ or backgrounds | Issue/ problem to be considered critically is stated without clarification or |
| Explanation of | | • | * | |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent analysis or | Information is taken from source(s) without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using und | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |

| | | | 0 | |
|------------------|-------------------|------------------------------|----------------------------|----------------|
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | | others' | • |
| | | assumptions and | | identify some |
| T (9) | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when . |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | | | thesis/ |
| position | within position | acknowledged within position | hypothesis) acknowledge | |
| _ | • | * | s different | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different sides of an | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | Conclusions | Conclusion is | Conclusion | Conclusion is |
| Complete | and related | logically tied to | is logically | inconsistently |
| Conclusions | outcomes | a range of | tied to | tied to some |
| and related | (consequences | information, | information | of the |
| outcomes | and | including | (because | information |
| (implications | implications) | opposing | information | discussed; |
| and | are logical and | viewpoints; | is chosen to | related |
| consequences) | reflect student's | related | fit the | outcomes |

| informed | outcomes | desired | (consequence |
|------------------|----------------|----------------|---------------|
| evaluation and | (consequences | conclusion); | s and |
| ability to place | and | some related | implications) |
| evidence and | implications) | outcomes | are |
| perspectives | are identified | (consequence | oversimplifie |
| discussed in | clearly. | s and | d. |
| priority order. | | implications) | |
| | | are identified | |
| | | clearly. | |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Miles | stone | Benchmark |
|--------------|------------------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | | |
| | choices are | | т | |
| | imaginative, | т | Language | |
| | memorable, | Language | choices are | т |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| T | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |

| | Delivery | | | |
|------------|-----------------------|--|--------------------|--------------------------------|
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| 2011,013 | | Comorcia de la comorc | contact vo. | |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make . | make . | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| C | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. Central | the topic. | the topic. Central | topic. |
| | | Central | message is | Central massage |
| | message is compelling | message is | basically | Central message can be deduced |
| | (precisely | clear and | understandable | but is not |
| | stated, | consistent with | but is not often | explicitly stated |
| Central | appropriately | the supporting | repeated and is | in the |
| Message | repeated, | material. | not memorable. | presentation. |
| Message | repeated, | maichal. | not memorable. | presentation. |

| memorable, and strongly | |
|-------------------------|--|
| supported.) | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Digital Image Processing

Course Code: IT130IU

1. General information

| Course designation | This course provides students fundamental knowledge image processing | ge of digital | | | |
|---|---|-------------------------------------|--|--|--|
| Semester(s) in which the course is taught | | | | | |
| Person responsible for the course | Dr. Ha Viet Uyen Synh | | | | |
| Language | English | | | | |
| Relation to curriculum | Elective (All programs) | | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | | |
| Workload (incl. contact hours, self- study hours) | Total workload: 195 Contact hours: 45 (lecture) + 30 (laboratory) Private study including examination preparation, spe hours: 120 | ecified in | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | |
| Required and recommended prerequisites for joining the course | | | | | |
| Course objectives | This course helps students discuss digital image proc fundamentals; review of Digital Signal Processing al such as Discrete Fourier Transform; intensity transfor frequency domain filtering; image restoration and re- color image processing; multiresolution processing; compression; morphological image processing. | Igorithms orms, construction; | | | |
| Course learning outcomes | CLO 1. Understand bases of digital image formation CLO 2. Understand the color image foundations. CLO 3. Apply special-domain image filtering. | • | | | |
| | Competency level Course learning outcome | e (CLO) | | | |
| | Knowledge 1,2 | | | | |
| | Skill 3 | | | | |
| | Attitude | | | | |
| Content | The description of the contents should clearly indical weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |

| | Topic | Weight | Level | | |
|-------------------|--|-------------|-------|--|--|
| | Chapter 1: Introduction | 3 | I, T | | |
| | Chapter 2: Digital Image Fundamentals | 6 | I, T | | |
| | Chapter 3: Intensity Transformations and Spatial Filtering (part 1) | 3 | T, U | | |
| | Chapter 3: Intensity Transformations and Spatial Filtering (part 2) | 6 | T, U | | |
| | Chapter 4: Filtering in the frequency domain | 6 | T, U | | |
| | Chapter 5: Image restoration and reconstruction | 3 | T, U | | |
| | Chapter 6: Color Image processing | 3 | T, U | | |
| | Chapter 7: Wavelets and multiresolution processing (part 1) | 3 | T, U | | |
| | Chapter 7: Wavelets and multiresolution processing (part 2) | 3 | T, U | | |
| | Chapter 8: Image compression | 3 | T, U | | |
| | Chapter 9: Morphological image processing | 3 | T, U | | |
| | Chapter 10: Image segmentation | 3 | T, U | | |
| | Chapter 11: Representation and description | 3 | T, U | | |
| | Chapter 12: Object recognition | 3 | T, U | | |
| | Revision Application Design and Development | 3 | | | |
| Examination forms | Multiple-choice questions, short-answer question | ons | | | |
| Study and | Attendance: A minimum attendance of 80 perce | - | . • | | |
| examination | for the class sessions. Students will be assessed | | | | |
| requirements | their class participation. Questions and comments are strongly | | | | |
| | encouraged. Assignments/Evamination: Students must have more than 50/100. | | | | |
| | Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | 1. Rafael C. Gonzalez, Richard E. Woods, D. Processing 3rd, 2008 | Digital Ima | ge | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | X | | | | |

| 3 | | | X |
|---|--|--|----|
| 5 | | | 4. |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-------|--------------------|-------------------------------|-----------|
| 1 | Chapter 1: Introduction | 1,2 | Quiz, Lab, Exam | lecture, exercises | |
| 2 | Chapter 2: Digital Image Fundamentals | 1,2 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 3 | Chapter 3: Intensity Transformations and Spatial Filtering (part 1) | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 4 | Chapter 3: Intensity Transformations and Spatial Filtering (part 2) | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 5 | Chapter 4: Filtering in the frequency domain | 1,2 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 6 | Chapter 5: Image restoration and reconstruction | 1,2 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 7 | Chapter 6: Color Image processing | 1,2 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 8 | Midterm | | | | |
| 9 | Chapter 7: Wavelets and multiresolution processing (part 1) | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 10 | Chapter 7: Wavelets and multiresolution processing (part 2) | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 11 | Chapter 8: Image compression | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 12 | Chapter 9: Morphological image processing | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 13 | Chapter 10: Image segmentation | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 14 | Chapter 11: Representation and description | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |

| 15 | Chapter 12: Object recognition | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
|----|---|-------|--------------------|-------------------------|--|
| 16 | Revision Application Design and Development | 1,2,3 | | | |
| 17 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Labs (20%) | 20% | 20% | 20% |
| Midterm examination (30%) | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% |
| Exercises/ Quiz (10%) | 10% | 10% | 10% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|---|-------|----------------|----------|--|--|
| Student: | HW/ | HW/Assignment: | | | |
| Date: | | | ••• | | |
| | Evalı | uator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| Holi | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|---|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|--|--|---|--|---|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all | Issue/ problem to be considered critically is stated, described, and clarified so that | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries | Issue/ problem to be considered |
| | relevant information | understanding is not seriously | undetermined, and/ or | critically is stated without |
| Explanation of issues | necessary for full understanding. | impeded by omissions. | backgrounds unknown. | clarification or description. |
| | Information is taken from source(s) with enough interpretation/ | Information is taken from source(s) with enough interpretation/ | Information is taken from source(s) with some interpretation/ | Information is taken from source(s) without any interpretation/ |
| Evidence Selecting and using information | evaluation to develop a comprehensive | evaluation to develop a coherent analysis | evaluation, but not enough to | evaluation. Viewpoints of experts are |
| to investigate a point of view or conclusion | analysis or synthesis. Viewpoints of | or synthesis. Viewpoints of experts are | develop a coherent analysis or | taken as fact, without question. |

| | avenanta ana | auhiaat ta | aventle a si a | |
|--------------------|-------------------|--------------------|-----------------|----------------|
| | experts are | subject to | synthesis. | |
| | questioned | questioning. | Viewpoints of | |
| | thoroughly. | | experts are | |
| | | | taken as | |
| | | | mostly fact, | |
| | | | with little | |
| | | | questioning. | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | Thoroughly | | Identifies | emerging |
| | (systematically | | several | awareness of |
| | and | | relevant | present |
| | methodically) | | contexts when | assumptions |
| | analyzes own | | presenting a | (sometimes |
| | and others' | | position. May | labels |
| | assumptions and | Identifies own | be more | assertions as |
| | carefully | and others' | aware of | assumptions). |
| | evaluates the | assumptions and | others' | Begins to |
| | relevance of | several relevant | assumptions | identify some |
| Influence of | contexts when | contexts when | than one's | contexts when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| assumptions | Specific position | position. | versa). | position. |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | · · | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | G .C | | |
| | complexities of | Specific position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesis) | | |
| | (perspective, | takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | G :C | d ; c. |
| | acknowledged. | an issue. Others' | Specific | Specific |
| | Others' points of | points of view | position | position |
| | view are | are | (perspective, | (perspective, |
| G(1 4) | synthesized | acknowledged | thesis/ | thesis/ |
| Student's | within position | within position | hypothesis) | hypothesis) is |
| position | (perspective, | (perspective, | acknowledges | stated, but is |
| (perspective, | thesis/ | thesis/ | different sides | simplistic and |
| thesis/hypothesis) | hypothesis). | hypothesis). | of an issue. | obvious. |

| | | | Conclusion is | |
|-------------------|-------------------|---------------------|----------------|-----------------|
| | | | logically tied | |
| | Conclusions and | | to information | Conclusion is |
| | related outcomes | Conclusion is | (because | inconsistently |
| | (consequences | logically tied to a | information is | tied to some of |
| | and implications) | range of | chosen to fit | the |
| | are logical and | information, | the desired | information |
| | reflect student's | including | conclusion); | discussed; |
| | informed | opposing | some related | related |
| | evaluation and | viewpoints; | outcomes | outcomes |
| | ability to place | related outcomes | (consequences | (consequences |
| Conclusions and | evidence and | (consequences | and | and |
| related outcomes | perspectives | and implications) | implications) | implications) |
| (implications and | discussed in | are identified | are identified | are |
| consequences) | priority order. | clearly. | clearly. | oversimplified. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|------------------|------------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | | Language | Language |
| | choices are | Language | choices are | choices are |
| | imaginative, | choices are | mundane and | unclear and |
| | memorable, | thoughtful and | commonplace | minimally |
| | and | generally | and partially | support the |
| | compelling, | support the | support the | effectiveness of |
| | and enhance | effectiveness of | effectiveness of | the presentation. |
| | the | the | the | Language in . |
| | effectiveness of | presentation. | presentation. | presentation is |
| _ | the | Language in | Language in . | not appropriate |
| Language | presentation. | presentation is | presentation is | to audience. |

| | т . | • | • | |
|------------|------------------|------------------|------------------|--------------------|
| | Language in | appropriate to | appropriate to | |
| | presentation is | audience. | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | | Delivery | |
| | (posture, | Delivery | techniques | Delivery |
| | gesture, eye | techniques | (posture, | techniques |
| | contact, and | (posture, | gesture, eye | (posture, gesture, |
| | vocal | gesture, eye | contact, and | eye contact, and |
| | expressiveness) | contact, and | vocal | vocal |
| | make the | vocal | expressiveness) | expressiveness) |
| | presentation | expressiveness) | make the | detract from the |
| | compelling, | make the | presentation | understandability |
| | and speaker | presentation | understandable, | of the |
| | appears | interesting, and | and speaker | presentation, and |
| | polished and | speaker appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations from | quotations from | quotations from | statistics, |
| | relevant | relevant | relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on the | authority on the | authority on the |
| Material | topic. | topic. | topic. | topic. |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Software Architecture

Course Code: IT114IU

1. General information

| Course designation | This course provides str Software Architecture. | udent methodogies an | nd techniques in | | | |
|---|--|-------------------------------|------------------|--|--|--|
| Semester(s) in which the course is taught | | | | | | |
| Person responsible for the course | Dr. Ha Viet Uyen Synh | | | | | |
| Language | English | English | | | | |
| Relation to curriculum | Elective (CS) | | | | | |
| Teaching methods | Lecture, lesson, project | , seminar. | | | | |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours: 45 (lectu Private study including hours: 120 | | | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | | |
| Required and recommended prerequisites for joining the course | | | | | | |
| Course objectives | Provides the student with a thorough understanding of varying methodologies and techniques in analysis, design and implementation of information system by using UML. | | | | | |
| Course learning outcomes | CLO 1. Understand the steps of the System Development Life Cycle and the techniques for each step CLO 2. Using a CASE tool in analysis and design of a system. CLO 3. Apply to a real system Competency level Course learning outcome (CLO) | | | | | |
| | Knowledge | 1,2 | | | | |
| | Skill | 3 | | | | |
| | Attitude | | | | | |
| Content | The description of the covered weighting of the content Weight: lecture session Teaching levels: I (Intro Topic | t and the level. (3 hours) | • | | | |

| | Introduction to systems analysis and design, | 3 | I | |
|------------------------------------|---|--------|-----|--|
| | Requirements. | 3 | T,U | |
| | Use Case Modeling | 6 | T,U | |
| | Dynamic Modeling | 6 | T,U | |
| | State-Dependent Dynamic Interaction Modeling | 6 | T,U | |
| | Data Modeling | 6 | T,U | |
| | Normal Forms | 6 | T,U | |
| | Structural Modeing 6 | | T,U | |
| | Architectural Design. 3 I,T | | | |
| Examination forms | Multiple-choice questions, short-answer que | stions | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | |
| Reading list | Kenneth E. Kendall, Julie E. Kendall, Systems Analysis and Design 7th, 2006 Gary B. Shelly, Thomas J. Cashman, Harry J. Rosenblatt, Systems Analysis and Design 4th, 2001 | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | | X | | | |
| 2 | | | X | | | |
| 3 | | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-------|--------------------|-------------------------|-----------|
| 1 | Introduction to systems analysis and design, | 1,2 | Quiz | lecture, exercises | |
| 2 | Requirements. | 1,2,3 | Quiz, Lab | lecture, exercises, lab | |
| 3 | Use Case Modeling | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |

| 4 | Midterm | | | |
|----|--|-------|--------------------|----------------------------|
| 5 | Dynamic Modeling | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab |
| 6 | State-Dependent Dynamic Interaction Modeling | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab |
| 7 | Data Modeling | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab |
| 8 | Normal Forms | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab |
| 9 | Structural Modeing | 1,2,3 | Quiz, Lab, Exam | lecture, exercises, lab |
| 10 | Architectural Design. | 1,2 | Quiz | lecture, exercises |
| 11 | Final exam | | | |

4. Assessment plan

Assessment Type

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Midterm examination (30%) | 30% | 30% | 30% |
| Final examination (40%) | 40% | 40% | 40% |
| Exercises/ Quiz (10%) | 10% | 10% | 10% |
| Lab. Assignments (20%) | 20% | 20% | 20% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

principal content

5.1. Grading checklist

| 5.1. Grading checklist | | | |
|--|-------------|----------|----------|
| Grading checklist for Write | ten Repo | rts | |
| Student: | HW/A | Assignme | ent: |
| Date: | • • • • • • | | •• |
| | Evalu | ator: | |
| | • • • • • • | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |

| Introduction demonstrates thorough knowledge of relevant background and prior work | 15 | |
|--|-----|---|
| Analysis and discussion demonstrate good subject | 30 | |
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | _ |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Constant Milestons in exams. | | | |
|----------------|------------------------------|-------------------|---------------|----------------|
| | Capstone | Milestone | | Benchmark |
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | Issue/ problem | | problem to | |
| | to be considered | | be | |
| | critically is | Issue/ problem | considered | |
| | stated clearly | to be considered | critically is | |
| | and described | critically is | stated but | Issue/ |
| | comprehensivel | stated, | description | problem to be |
| | y, delivering all | described, and | leaves some | considered |
| | relevant | clarified so that | terms | critically is |
| | information | understanding is | undefined, | stated without |
| | necessary for | not seriously | ambiguities | clarification |
| Explanation of | full | impeded by | unexplored, | or |
| issues | understanding. | omissions. | boundaries | description. |

| | | | undetermine | |
|------------------|-------------------|-------------------|----------------------|-----------------|
| | | | d, and/ or | |
| | | | , | |
| | | | backgrounds unknown. | |
| | | | unknown. | |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | T.1 | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| T 61 | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific position | Specific position | Specific position | Specific |
| Student's | (perspective, | (perspective, | (perspective, | position |
| position | thesis/ | thesis/hypothesi | thesis/ | (perspective, |
| (perspective, | hypothesis) is | s) takes into | hypothesis) | thesis/ |
| thesis/hypothesi | imaginative, | account the | acknowledge | hypothesis) is |
| s) | taking into | complexities of | s different | stated, but is |
| 3) | taking into | complexities of | s unite ent | stated, but is |

| | account the complexities of an issue. Limits of position (perspective, thesis/ | an issue. Others' points of view are acknowledged within position | sides of an issue. | simplistic and obvious. |
|---------------|--|---|--------------------|-------------------------|
| | hypothesis) are | (perspective, thesis/ | | |
| | acknowledged. Others' points of | hypothesis). | | |
| | view are | | | |
| | synthesized | | | |
| | within position (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | | |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | C 1 | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| Complement | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | Organizational | Organizational | |
| | pattern | pattern | pattern | Organizational |
| | (specific | (specific | (specific | pattern (specific |
| | introduction | introduction | introduction | introduction and |
| | and conclusion, | and conclusion, | and conclusion, | conclusion, |
| | sequenced | sequenced | sequenced | sequenced |
| | material within | material within | material within | material within |
| | the body, and | the body, and | the body, and | the body, and |
| | transitions) is | transitions) is | transitions) is | transitions) is not |
| Organization | clearly and | clearly and | intermittently | observable |

| | consistently | consistently | observable | within the |
|------------|-----------------|------------------|------------------|--------------------|
| | observable and | observable | within the | presentation. |
| | is skillful and | within the | presentation. | presentation. |
| | makes the | presentation. | presentation. | |
| | content of the | presentation. | | |
| | | | | |
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | · | |
| | imaginative, | _ | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| Supporting | quotations | authorities) | authorities) | relevant |
| Material | from relevant | make | make | authorities) |
| | | 1 | 1 | / |

| | authorities) | appropriate | appropriate | make reference |
|---------|-----------------|-----------------|------------------|-------------------|
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Data Mining

Course Code: IT160IU

1. General information

| Course designation | 3 | duces the students to the principles and a mining, and the requirements of a data | | |
|---|---|--|--|--|
| Semester(s) in which the course is taught | | | | |
| Person responsible for the course | Dr. Nguyen Thi Thanh Sang | | | |
| Language | English | | | |
| Relation to curriculum | Elective (CS, NE Compulsory (DS) | | | |
| Teaching methods | Lecture, lesson, p | oroject, laboratory. | | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | | | |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming | | | |
| Course objectives | solve problems of with skills of using | ly data mining concepts and algorithms to f knowledge discovery. They will be equipped ag recent data mining software for solving as and gain experience of doing independent h. | | |
| Course learning | | | | |
| outcomes | Competency Course learning outcome (CLO) level | | | |
| | Knowledge | CLO 1. Understand basic contents of data warehousing and data mining. CLO 2. Explain modern algorithms in the area of data mining and knowledge discovery. | | |
| | Skill | CLO 3. Apply data mining techniques to some case studies using existing datasets. | | |

| | Attitude | CLO 4. Work in a team to build a data mining process. | | | | | |
|--|---|---|--------|-------|--|--|--|
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | | |
| | Topic | | Weight | Level | | | |
| | Introduction to I | Introduction to Data Mining | | | | | |
| | Know your data | Know your data | | | | | |
| | Data preprocessi | ing | 1 | T, U | | | |
| | Data mining kno | wledge representation | 1 | T, U | | | |
| | Evaluating what | 's been learned | 1 | T | | | |
| | Data mining algo | Data mining algorithms: Classification | | | | | |
| | Mining Frequent Correlations: Ba | 2 | T | | | | |
| | Data mining algo | Data mining algorithms: Clustering | | | | | |
| | Classification: A | Advanced Methods | 1 | T, I | | | |
| | Semantic data m | ining | 1 | I | | | |
| Examination forms Study and examination requirements | Multiple-choice questions, short-answer questions Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | | |
| Reading list | 50/100 points overall to pass this course. [1] Jiawei Han, Micheline Kamber, <i>Data Mining: Concepts and Techniques</i>, 3rd Edition, 2011. [2] Ian H.Witten, Eibe Frank, Mark A. Hall, and Christopher J. Pal, <i>Data Mining: Practical Machine Learning Tools and Techniques</i>, Fourth Edition, Morgan Kaufmann, 2016. [3] A. Lawrynowicz, <i>Semantic Data Mining: An Ontology-based Approach (Studies on the Semantic Web)</i>, IOS Press (April 15, 2017), ISBN-10 1614997454. | | | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |

| 1 | X | | | |
|---|---|--|---|---|
| 2 | X | | | |
| 3 | | | | X |
| 4 | | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|-------|---|-------|-------------|------------------------------|--|
| 1 | Introduction to Data Mining | 1 | | Lecture, Discussion | [1, 2]. Chapter 1 |
| 2 | Know your data | 1 | Quiz.s2 | Lecture, In-class quiz | [1]. Chapter 2 |
| 3 | Data preprocessing | 1,4 | | Lecture, Discussion | [1]. Chapter 3 |
| 4 | Data mining knowledge representation | 1 | Quiz.s4 | Lecture, In-class quiz | [2]. Chapter 3; Reading [1]. Chapter 4 – Data Warehousing |
| 5 | Evaluating what's been learned | 1 | Quiz.s5 | Lecture, In-class quiz | [2]. Chapter 5 |
| 6-7 | Data mining algorithms: Classification | 2,3 | Quiz.s6-7 | Lecture, In-class quiz | [1]. Chapter 8; [2]. Chapter 4.3 |
| 8 | Data mining to code | 3 | | Lecture, Discussion | |
| 9 | Midterm | | | | |
| 10-11 | Mining Frequent Patterns, Association and Correlations: Basic Concept and Methods | 2,3,4 | Quiz.s10-11 | Lecture, In-class quiz | [1]. Chapter 6; [2]. Chapter 4.5 |
| 12-13 | Data mining algorithms: Clustering | 2,3,4 | Quiz.s12-13 | Lecture, In-class quiz | [1]. Chapter 10; [2]. Chapter 4.8 |
| 14 | Classification: Advanced Methods | 2 | Quiz.s14 | Lecture, In-class quiz | [1]. Chapter 9 |
| 15 | Semantic data mining | 2 | | Lecture, Discussion | [3] |
| 16 | Revision | | | Review- test | |
| 17 | Final exam | | | | |

Laboratory

| Week | Lab |
|------|--|
| 5 | Introduction to Weka |
| 6 | Evaluation |
| 7 | Simple classifiers |
| 8 | Programming - Pre-processing data |
| 9 | More classifiers |
| 10 | Putting it all together |
| 11 | Programming - Clustering |
| 12 | Programming - Sequential pattern discovery |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (10%) | | | 100% | |
| Programming (20%) | | | 70% | 30% |
| Midterm examination (30%) | 50% | 50% | | |
| Final examination (40%) | | 40% | 60% | |

| Tillal Challination (4070) | | 1 0 / 0 | 0070 | , | |
|--|-----------|--------------------|---------------|---------|----------|
| 5. Rubrics (optional) 5.1. Grading checklist | | | | | |
| Grading checkli | ist for W | ritten | Repo | orts | |
| Student: | | | | Assignm | nent: |
| Date: | | | | | |
| | | | Evalu | ator: | |
| | | | · · · · · · · | | |
| | | N | <u>Iax.</u> | Score | Comments |
| Technical content (60%) |) | | | | |
| Abstract clearly identifies purpose and sum | marizes | | 10 | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowle | edge of | | 15 | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good s | subject | | 30 | | |
| mastery | | | | | |
| Summary and conclusions appropriate and | complete | e | 5 | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | | | 5 | | |
| Content clearly and logically organized, goo | od | | 5 | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | | | 10 | | |
| Clear and easy to read | | | 10 | | |
| Quality of Layout and Graphics (1 | 0%) | | 10 | | |
| TOTA | L SCO | RE | 100 | | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | | Benchmark |
|-----------------------------|--|--|---|--|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is | Issue/ problem | Issue/ problem to be considered critically is stated but description leaves some | |
| Explanation of issues | stated clearly and described comprehensivel y, delivering all relevant information necessary for full understanding. | to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions. | terms undefined, ambiguities unexplored, boundaries undetermine d, and/ or backgrounds unknown. | Issue/ problem to be considered critically is stated without clarification or description. |
| Evidence | Information is taken from source(s) with | Information is taken from source(s) with | Information is taken from source(s) | Information is taken from source(s) |
| Selecting and | enough | enough | with some | without any |
| using | interpretation/ | interpretation/ | interpretation | interpretation/ |
| information to | evaluation to | evaluation to | / evaluation, | evaluation. |
| investigate a | develop a | develop a | but not | Viewpoints of |
| point of view or conclusion | comprehensive analysis or | coherent analysis or | enough to develop a | experts are taken as fact, |

| | synthesis. | synthesis. | coherent | without |
|------------------|-------------------|-------------------|-------------------------|----------------|
| | Viewpoints of | Viewpoints of | analysis or | question. |
| | experts are | experts are | synthesis. | question. |
| | questioned | subject to | Viewpoints | |
| | | _ | _ | |
| | thoroughly. | questioning. | of experts are taken as | |
| | | | | |
| | | | mostly fact, | |
| | | | with little | |
| | | | questioning. | |
| | | | Questions | |
| | | | some | ~- |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | Specific | | |
| | taking into | position | | |
| | account the | (perspective, | | |
| | complexities of | thesis/hypothesi | | |
| | an issue. Limits | s) takes into | | |
| | of position | account the | | |
| | (perspective, | complexities of | Specific | |
| | thesis/ | an issue. Others' | position | Specific |
| | hypothesis) are | points of view | (perspective, | position |
| | acknowledged. | are | thesis/ | (perspective, |
| Student's | Others' points of | acknowledged | hypothesis) | thesis/ |
| position | view are | within position | acknowledge | hypothesis) is |
| (perspective, | synthesized | (perspective, | s different | stated, but is |
| thesis/hypothesi | within position | thesis/ | sides of an | simplistic and |
| s) | (perspective, | hypothesis). | issue. | obvious. |
| 5) | (perspective, | nypomesis). | 10000. | 0011000. |

| | thesis/ hypothesis). | | | |
|-------------------------|--|--|---|---|
| | Conclusions and related | Conclusion is | Conclusion is logically tied to information | Conclusion is |
| | outcomes (consequences and implications) are logical and | logically tied to a range of information, including opposing | (because information is chosen to fit the desired | inconsistently tied to some of the information discussed; |
| | reflect student's informed | viewpoints; related | conclusion); some related | related outcomes |
| Conclusions and related | evaluation and ability to place | outcomes (consequences | outcomes (consequence | (consequence s and |
| outcomes | evidence and | and | s and | implications) |
| (implications and | perspectives discussed in | implications) are identified | implications) are identified | are oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: IT Project Management

Course Code: IT056IU

1. General information

| Course designation | This subject introduces to students the process of IT project management; the area of knowledge required and techniques appropriate for successful IT project management. |
|---|---|
| Semester(s) in which the course is taught | |
| Person responsible for the course | Assoc. Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | All programs: Elective course |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming Web application development Software engineering |
| Course objectives | This course provides students the fundamental IT project management knowledge, with particular emphasis on software products, project management and contemporary issues in the delivery of software solutions to business. It considers plan-driven and agile methodologies, estimating techniques, change management, risk management, and the role of project management in business. And it identifies the managerial control and reporting aspects necessary from inception to implementation of a software development project. |
| Course learning outcomes | CLO 1. Explain the IT project management process; CLO 2. Identify the areas of knowledge required for successful IT project management; CLO 3. Apply techniques appropriate for successful software project management; |

| | | G | 4 | <u></u> |
|--------------------------|---|-----------------------------------|--------------|-----------|
| | Competency level | Course learning out | tcome (CL | () |
| | Knowledge | CLO1 | | |
| | Skill | CLO2, CLO3 | | |
| | Attitude | CLO4 | | |
| Content | The description of the conweighting of the content of Weight: lecture session (3 Teaching levels: I (Introd | and the level. B teaching hours) | | |
| | Topic | | Weight | Level |
| | Week 1: Orientation & I course | ntroduction to the | 3 | I,T |
| | Week 2: Introduction to management | IT project | 3 | I,T |
| | Week 3: Software project | ct planning | 3 | I,T,U |
| | Week 4: Estimation (cos | t, time, scope) | 3 | I,T,U |
| | Week 5: Project Schedu | les | 3 | I,T,U |
| | Week 6: Review process | S | 3 | I,T,U |
| | Week 7: Software Requi | | 3 | I,T,U |
| | Week 8: Design & Prog | ramming | 3 | I,T,U |
| | Week 9: Review for mic | Iterm examination | 3 | U |
| | Week 10: Design and Pr | ogramming | 3 | I,T,U |
| | Week 11: Software Test | ing | 3 | I,T,U |
| | Week 12: Understanding | g Change | 3 | I,T,U |
| | Week 13: Management | · | 3 | I,T,U |
| | Week 14: Managing an | Outsourced Project | 3 | I,T,U |
| | Week 15: Process Impro | | 3 | I,T,U |
| Examination forms | Multiple-choice questions writing | s, short-answer questic | ons and essa | .y |
| Study and | Attendance: A minimum | | | |
| examination requirements | encouraged. Assignments/Examination | nestions and comments | ents are | strongly |
| Reading list | points overall to pass this Kathy Schwalbe, IT Stellman and Green Applied Software 1 2006. | Project Management | | |

3. Marchewka, J.T., Information Technology Project Management Providing Measureable Organizational Value 5th, 2016

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | X | | | | |
| 2 | | X | X | | | |
| 3 | | X | | | | X |
| 4 | | | X | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-------|----------------------------|---|-----------|
| 1 | Orientation & Introduction to the course | 1 | Question and answer | Lecture, | [1, 2, 3] |
| 2 | Introduction to IT project management | 1 | Question and answer | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 3 | Software project planning | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 4 | Estimation (cost, time, scope) | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 5 | Project Schedules | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 6 | Review process | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 7 | Software Requirement | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, | [1, 2, 3] |

| | <u> </u> | T | 1 | T | 1 |
|----|----------------------|---------|------------------|-------------|-----------|
| | | | | In-class | |
| | | | | exercises | |
| 8 | Design & | 2,3,4 | Quiz, Lab, | Lecture, | [1, 2, 3] |
| | Programming | | Midterm exam | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 9 | Review for midterm | 1,2,3 | | Discussion, | |
| | examination | | | In-class | |
| | | | | exercises | |
| 10 | Design and | 2,3,4 | Quiz, Lab, Final | Lecture, | [1, 2, 3] |
| | Programming | | exam | Discussion, | |
| | 88 | | | In-class | |
| | | | | exercises | |
| 11 | Software Testing | 2,3,4 | Quiz, Lab, Final | Lecture, | [1, 2, 3] |
| | 2010 | | exam | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 12 | Understanding | 2,3,4 | Quiz, Lab, Final | Lecture, | [1, 2, 3] |
| | Change | | exam | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 13 | Management and | 2,3,4 | Quiz, Lab, Final | Lecture, | [1, 2, 3] |
| | Leadership | | exam | Discussion, | |
| | p | | | In-class | |
| | | | | exercises | |
| 14 | Managing an | 2,3,4 | Quiz, Lab, Final | Lecture, | [1, 2, 3] |
| | Outsourced Project | | exam | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 15 | Process Improvement. | 2,3,4 | Quiz, Lab, Final | Lecture, | [1, 2, 3] |
| | | | exam | Discussion, | |
| | | | | In-class | |
| | | | | exercises | |
| 16 | Final examination | 2,3,4 | | | |
| 10 | - mai vamillimulvii | 1 / - 1 | 1 | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------------------|------|------|------|------|
| Midterm examination (30%) | 40% | 50% | | |
| Projects/Presentations/ Report (20%) | | 40% | 30% | 30% |
| Final examination (40%) | | | 70% | 30% |
| Exercises/ Quiz (10%) | 25% | 25% | 25% | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|---------------------------------------|------------|----------|----------|--|--|
| Student: | HW/A | Assignme | ent: | | |
| Date: | | | | | |
| | Evaluator: | | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Tochnical content (60%) | | | | | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|--------------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | 1 | | Ι | |
|------------------|-------------------|-------------------|----------------|-----------------|
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | | | Issue/ |
| | | critically is | undefined, | |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | * | * | coherent | |
| | evaluation to | evaluation to | | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | Shows an |
| | Thoroughly | | some | emerging |
| | (systematically | | assumptions. | awareness of |
| | and | | Identifies | present |
| | methodically) | | several | assumptions |
| | analyzes own | Identifies own | relevant | (sometimes |
| | and others' | and others' | contexts | labels |
| | assumptions | assumptions and | when | assertions as |
| | and carefully | several relevant | presenting a | assumptions). |
| Influence of | evaluates the | | | _ |
| | | contexts when | position. | Begins to |
| context and | relevance of | presenting a | May be more | identify some |
| assumptions | contexts when | position. | aware of | contexts |

| | | | -41 | 1 |
|------------------|-------------------|-------------------|----------------|----------------|
| | presenting a | | others' | when |
| | position. | | assumptions | presenting a |
| | | | than one's | position. |
| | | | own (or vice | |
| | | | versa). | |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | | thesis/ | • |
| C4do41a | | are | | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | G 1 · · | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Miles | stone | Benchmark |
|--------------|--------------------|------------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and is | transitions) is | the body, and | material within |
| | skillful and | clearly and | transitions) is | the body, and |
| | makes the content | consistently | intermittently | transitions) is not |
| | of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | | | Language | |
| | | Language | choices are | |
| | Language choices | choices are | mundane and | Language |
| | are imaginative, | thoughtful and | commonplace | choices are |
| | memorable, and | generally | and partially | unclear and |
| | compelling, and | support the | support the | minimally |
| | enhance the | effectiveness | effectiveness of | support the |
| | effectiveness of | of the | the | effectiveness of |
| | the presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | | Delivery | Delivery | |
| | Delivery | techniques | techniques | Delivery |
| | techniques | (posture, | (posture, | techniques |
| | (posture, gesture, | gesture, eye | gesture, eye | (posture, gesture, |
| | eye contact, and | contact, and | contact, and | eye contact, and |
| | vocal | vocal | vocal | vocal |
| | expressiveness) | expressiveness) | expressiveness) | expressiveness) |
| | make the | make the | make the | detract from the |
| | presentation | presentation | presentation | understandability |
| | compelling, and | interesting, and | understandable, | of the |
| | speaker appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |

| | A variety of types | Cupporting | Cupporting | |
|------------|--------------------|----------------------|----------------------|-------------------|
| | of supporting | Supporting materials | Supporting materials | Insufficient |
| | materials | | | |
| | | (explanations, | (explanations, | supporting |
| | (explanations, | examples, | examples, | materials |
| | examples, | illustrations, | illustrations, | (explanations, |
| | illustrations, | statistics, | statistics, | examples, |
| | statistics, | analogies, | analogies, | illustrations, |
| | analogies, | quotations | quotations | statistics, |
| | quotations from | from relevant | from relevant | analogies, |
| | relevant | authorities) | authorities) | quotations from |
| | authorities) make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on | authority on | authority on the |
| Material | topic. | the topic. | the topic. | topic. |
| | Central message | | | |
| | is compelling | | Central | |
| | (precisely stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, and | consistent with | but is not often | explicitly stated |
| Central | strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |
| TITCHHUSE | supported.) | l . | not momorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Software Engineering

Course Code: IT076IU

1. General information

| Course designation | This course focuses on the design of software by implementing significant projects in teams |
|---|--|
| Semester(s) in which the course is taught | |
| Person responsible for the course | Assoc. Prof. Dr. Nguyen Thi Thuy Loan |
| Language | English |
| Relation to curriculum | Compulsory (CS, CE) Elective (NE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | IT069IU (Object-Oriented Programming) |
| Course objectives | This course provides students the fundamentals of software engineering concepts, methodologies, and processes. It covers the subjects on software process models, agile development methodologies, requirements engineering and analysis models, software design and implementation methods, test strategies, and software evolution. Students apply contemporary agile requirements analysis, planning, architecture, design, implementation and testing practices to software engineering project work in small teams. |
| Course learning outcomes | CLO 1. Describe the implement of software development process. CLO 2. Apply the principles and methods of software engineering in practice. CLO3. Practice teamwork skills in a software engineering project. |

| | Competency level | Course learning | outcome (| (CLO) | | |
|-------------------|--|---|-------------|----------|-----|--|
| | Knowledge | CLO1 | | | | |
| | Skill | CLO2, CLO3 | | | | |
| | Attitude | CLO3 | | | | |
| Content | 1 0 | e description of the contents should clearly indicate the | | | | |
| | | veighting of the content and the level. | | | | |
| | Weight: lecture session (| • | (T]4:1:) | | | |
| | Teaching levels: I (Introd | iuce); I (Teach); U | | Level |] | |
| | Topic | | Weight | | | |
| | Software developme | ent in practice | 3 | I | | |
| | Beginning a project | | 3 | T, U | | |
| | Requirements | | 7.5 | T, U | | |
| | The user experience | The user experience | | | | |
| | System design | System design | | | | |
| | Program developme | nt | 7.5 | T, U | | |
| | Reliability and testing | ng | 6 | T, U | | |
| | The business of soft | ware development | 4.5 | T, U | | |
| | Review | | 3 | I, U | | |
| Examination forms | Multiple-choice question | s, short-answer que | estions | | | |
| Study and | Attendance: A minimum | • | | - | • | |
| examination | for the class sessions. Stu | | | | | |
| requirements | their class participation. | Questions and com | ments are | strongly | r | |
| | encouraged. | on: Students must be | ava mora i | than 50/ | 100 | |
| | Assignments/Examination points overall to pass this | | ave more | man 50/ | 100 | |
| Reading list | 1. Ian Sommerville, Software Engineering 10th, 2019. | | | | | |
| | | 2. Hyrum Wright, Titus Winters, and Tom Manshreck. | | | | |
| | Software Engineering at Google, 2020 | | | | | |
| | 3. Hans van Vliet, Son Practice 3rd, 2008 | ftware Engineering | : Principle | es and | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|----|---|-----|-----|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | | | | | XXX |
| 2 | | | XX | | | XXX |
| 3 | | | XX | | XXX | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--------------------------------------|-----|---------------------------|--|-----------|
| 1 | Software development in practice | 1 | Quiz | Lecture | [1] |
| 2 | Beginning a project | 1,3 | Quiz, Midterm, Project | Lecture, Discussion, Inclass, exercise | [1,3] |
| 3 | Requirements | 2,3 | Quiz, Midterm, Project | Lecture, Discussion, Inclass, exercise | [1,2] |
| 4 | The user experience | 2,3 | Quiz, Midterm, Project | Lecture, Discussion, Inclass, exercise | [1,2] |
| 5 | System design | 2,3 | Quiz, Midterm, Project | Lecture, Discussion, Inclass, exercise | [1,2,3] |
| 6 | Midterm | | | | |
| 7 | Program development | 2,3 | Quiz, Final, Project | Lecture, Discussion, Inclass, exercise | [1,2,3] |
| 8 | Reliability and testing | 2,3 | Quiz, Final, Project | Lecture, Discussion, Inclass, exercise | [1,2,3] |
| 9 | The business of software development | 2,3 | Quiz, Project | Lecture, Discussion, In- class, exercise | [1,2,3] |
| 10 | Review | 1,3 | Quiz | Discussion, Inclass, exercise | [1,2] |
| 11 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Midterm examination (25%) | 30% | 20% | |
| Projects/Presentations/ Report (25%) | 30% | 30% | 60% |
| Final examination (40%) | 30% | 40% | |
| Exercises/ Quiz (10%) | 10% | 10% | 40% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | |
|---------------------------------------|----------------|--|--|--|
| Student: | HW/Assignment: | | | |
| Date: | | | | |
| | Evaluator: | | | |
| | | | | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Holi | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | Milestone | |
|-----------------------|------------------|-------------------------------|---------------|----------------|
| | 4 | 3 | 3 2 | |
| | Issue/ problem | Issue/ problem | Issue/ | Issue/ |
| | to be considered | to be considered problem to | | problem to be |
| | critically is | critically is | be | considered |
| Explanation of | stated clearly | stated, | considered | critically is |
| issues | and described | described, and | critically is | stated without |

| | comprehensivel y, delivering all relevant information necessary for full understanding. | clarified so that understanding is not seriously impeded by omissions. | stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermine d, and/ or backgrounds unknown. | clarification or description. |
|---|---|---|---|---|
| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question. |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |

| | G .C. | | | |
|------------------|-------------------|-------------------|----------------|----------------|
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Miles | Benchmark | |
|----------|-------|-----------|---|
| 4 | 3 | 2 | 1 |

| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
|--------------|---|--|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |

| | A variety of | | | |
|------------|-----------------|-----------------|------------------|-------------------|
| | types of | | | |
| | • • | Supporting | Supporting | |
| | supporting | Supporting | Supporting | In our fei ai and |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Object-Oriented Analysis and Design

Course Code: IT090IU

1. General information

| 1. Course designation | This course helps students learn about system life cycle development and the knowledge and skills required to develop object-oriented system. | | | | |
|---|---|--|--|--|--|
| Semester(s) in which the course is taught | | | | | |
| Person responsible for the course | MSc. Dao Tran Hoang (| Chau | | | |
| Language | English | | | | |
| Relation to curriculum | Compulsory (CS) | | | | |
| Teaching methods | Lecture, lesson, project, | seminar. | | | |
| Workload (incl. contact hours, self- study hours) | (Estimated) Total workload: 195 hours. Contact hours: Lecture 45 hours, Lab 30 hours: Private hours: 120 hours. Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. | | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | |
| Required and recommended prerequisites for joining the course | Object-Oriented Program | mming | | | |
| Course objectives | design approaches other object-oriented design? | the following questions• What are than object-oriented design? What is • What is a good design? How do you good and a bad design? What are the s of a good design? | | | |
| Course learning outcomes | CLO 1. Identify client needs based on a written or verbal specification; CLO 2. Know how analyze and design a system with object-oriented concepts and design patterns; CLO 3. Know how to work in team effectively; | | | | |
| | Competency level | Course learning outcome (CLO) | | | |
| | Knowledge | 1, 2 | | | |
| | Skill | 1, 3 | | | |

| | Attitude | 3 | | | |
|------------------------------------|---|--|--------|-------|--|
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (45 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | Topic | | Weight | Level | |
| | Software developme | ent life cycle; | 2 | T | |
| | Requirements gather | ring techniques; | 1 | T | |
| | Analyze client's req | uirements; | 4 | T | |
| | Design and impleme | Design and implementation the system; | | | |
| | Design patterns; | Design patterns; 2 T, U | | | |
| Examination forms | Multiple-choice questions, short-answer questions | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | 1. Craig Larman, Apintroduction to Of 3rd, 2004 | oplying UML and Pa bject-Oriented Analy | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SI | O | | | | |
|-----|----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | | X | | | | |
| 3 | | | | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|------------------------------------|-----|--------------|-----------------------------|-----------|
| 1 | Software development life cycle; | 1 | Midterm exam | Lecture, Inclass activities | |
| 2 | Requirements gathering techniques; | 1 | Midterm exam | Lecture, Inclass activities | |

| 3 | Analyze client's requirements; | 1,3 | Midterm exam, Assignment, Lab quiz | Lecture, Inclass activities, Ouiz |
|---|---------------------------------------|------|--|-----------------------------------|
| 4 | Midterm | | | |
| 5 | Design and implementation the system; | 2, 3 | Final exam, Assignment, Lab quiz | Lecture, Inclass activities, Quiz |
| 6 | Design patterns; | 2 | Final exam | Lecture, Inclass activities |
| 7 | Final exam | | | |

4. Assessment plan

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Midterm examination (25%) | 40% | 25% | |
| Projects/Presentations/ Report (25%) | 60% | 30% | 70% |
| Final examination (40%) | | 30% | 10% |
| Exercises/ Quiz (10%) | | 15% | 20% |

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------|----------|----------|--|--|
| Student: | HW/A | Assignme | ent: | | |
| Date: | | | | | |
| | Evalu | ator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |

| Summary and conclusions appropriate and complete | 5 | |
|--|-----|--|
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holi | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|---|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | | Benchmark |
|----------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | Issue/ problem | | considered | |
| | to be considered | | critically is | |
| | critically is | Issue/ problem | stated but | |
| | stated clearly | to be considered | description | |
| | and described | critically is | leaves some | Issue/ |
| | comprehensivel | stated, | terms | problem to be |
| | y, delivering all | described, and | undefined, | considered |
| | relevant | clarified so that | ambiguities | critically is |
| | information | understanding is | unexplored, | stated without |
| | necessary for | not seriously | boundaries | clarification |
| Explanation of | full | impeded by | undetermine | or |
| issues | understanding. | omissions. | d, and/ or | description. |

| | | | backgrounds | |
|------------|-----------------------------|----------------------------|----------------------------|--------------------------------|
| | | | unknown. | |
| | | | | |
| | | | T.C. | |
| | | | Information is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, but not | |
| | source(s) with enough | source(s) with enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| I I | develop a | develop a | analysis or | without any |
| | comprehensive analysis or | coherent analysis or | synthesis. Viewpoints | interpretation/ evaluation. |
| _ | synthesis. | synthesis. | of experts are | Viewpoints of |
| U | Viewpoints of | Viewpoints of | taken as | experts are |
| _ | experts are | experts are | mostly fact, | taken as fact, |
| | questioned | subject to | with little | without |
| Conclusion | thoroughly. | questioning. | questioning. Questions | question. |
| | | | some | |
| | | | assumptions. | Shows an |
| | 7D1 1.1 | | Identifies | emerging |
| I I | Thoroughly (systematically | | several relevant | awareness of present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | Idontifica | position. | assertions as |
| | assumptions and carefully | Identifies own and others' | May be more aware of | assumptions). Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| | contexts when | contexts when | than one's | when |
| | presenting a position. | presenting a position. | own (or vice versa). | presenting a position. |
| - | Specific | Specific | Specific | position. |
| | position | position | position | Specific |
| | (perspective, | (perspective, | (perspective, | position |
| 1 | thesis/ | thesis/hypothesi | thesis/ | (perspective, |
| | hypothesis) is imaginative, | s) takes into account the | hypothesis) acknowledge | thesis/ hypothesis) is |
| | taking into | complexities of | s different | stated, but is |

| | account the complexities of an issue. Limits of position (perspective, | an issue. Others' points of view are acknowledged within position | sides of an issue. | simplistic and obvious. |
|---------------|--|---|--------------------|-------------------------|
| | thesis/ hypothesis) are | (perspective, thesis/ | | |
| | acknowledged. | hypothesis). | | |
| | Others' points of view are | | | |
| | synthesized | | | |
| | within position (perspective, | | | |
| | thesis/ | | | |
| | hypothesis). | | | |
| | | | Conclusion | |
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | | stone | Benchmark |
|--------------|-----------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | Organizational | Organizational | |
| | pattern | pattern | pattern | Organizational |
| | (specific | (specific | (specific | pattern (specific |
| | introduction | introduction | introduction | introduction and |
| | and conclusion, | and conclusion, | and conclusion, | conclusion, |
| | sequenced | sequenced | sequenced | sequenced |
| | material within | material within | material within | material within |
| | the body, and | the body, and | the body, and | the body, and |
| | transitions) is | transitions) is | transitions) is | transitions) is not |
| Organization | clearly and | clearly and | intermittently | observable |

| | consistently | consistently | observable | within the |
|------------|------------------|------------------|------------------|--------------------|
| | observable and | observable | within the | presentation. |
| | is skillful and | within the | presentation. | presentation. |
| | makes the | | presentation. | |
| | | presentation. | | |
| | content of the | | | |
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| • | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations | quotations | analogies, |
| | analogies, | from relevant | from relevant | quotations from |
| Supporting | quotations | authorities) | authorities) | relevant |
| Material | from relevant | make | make | authorities) |
| Maichai | 110111 Televalit | make | шакс | aumornics) |

| | authorities) | appropriate | appropriate | make reference |
|---------|-----------------|-----------------|------------------|-------------------|
| | make | reference to | reference to | to information or |
| | appropriate | information or | information or | analysis that |
| | reference to | analysis that | analysis that | minimally |
| | information or | generally | partially | supports the |
| | analysis that | supports the | supports the | presentation or |
| | significantly | presentation or | presentation or | establishes the |
| | supports the | establishes the | establishes the | presenter's |
| | presentation or | presenter's | presenter's | credibility/ |
| | establishes the | credibility/ | credibility/ | authority on the |
| | presenter's | authority on | authority on | topic. |
| | credibility/ | the topic. | the topic. | |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Principles of Programming Languages Course Code: IT092IU

1. General information

| 1. General information | | | | | |
|---|---|---|--|--|--|
| Course designation | 1 | idents the important principles of | | | |
| | programming languages | 5. | | | |
| Semester(s) in which the course is taught | | | | | |
| Person responsible for the course | Dr. Ha Viet Uyen Synh | | | | |
| Language | English | | | | |
| Relation to curriculum | Compulsory (CS) | | | | |
| Teaching methods | Lecture, lesson, project | Lecture, lesson, project, seminar. | | | |
| Workload (incl. contact hours, self- study hours) | Total workload: 195 Contact hours: 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | |
| Required and recommended prerequisites for joining the course | | | | | |
| Course objectives | programming languages programming languages | nts: Learn important principles of s; Learn basic components of s; Learn programming language ogramming and software engineering | | | |
| Course learning outcomes | CLO 1. Understand a wide range of programming paradigms CLO 2. Understand how different programming languages evolved CLO 3. Understand the differences in problem domains and language suitability CLO 4. Understand the basic features of programming language translation CLO 5. Understand implementation techniques for selected language constructs Competency level Course learning outcome (CLO) Knowledge 1,2,3,4,5 | | | | |
| | Skill Attitude | 2 | | | |
| | Attitude | | | | |

| Content | The description of the contents should clearly indicate the | | | | |
|------------------------------------|---|----------------------------|--------|--|--|
| | weighting of the content and the level. | | | | |
| | Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (| (Hilize) | | | |
| | Topic | Weight | Level | | |
| | Preliminaries | 3 | I,T | | |
| | Evolution of the Major Programmin Languages | 6 | I,T | | |
| | Functional Programming Languages | 6 | I,T | | |
| | Software processes Describing Syntax and Semantics | 3 | I,T | | |
| | Lexical and Syntax Analytics | 3 | I,T | | |
| | Names, Bindings, Type Checking, and Scopes | 3 | I,T | | |
| | Data Types | 3 | I,T | | |
| | Expressions and Assignment Statement | 3 | I,T | | |
| | Logic Programming Languages | 6 | I,T | | |
| | Statement-Level Control Structures | 3 | I,T | | |
| | Subprograms | 3 | I,T | | |
| | Implement Subprograms | 3 | I,T | | |
| Examination forms | Multiple-choice questions, short-answer ques | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 per compulsory for the class sessions. Students we the basis of their class participation. Question are strongly encouraged. | vill be asse as and com | ments | | |
| | Assignments/Examination: Students must have 50/100 points overall to pass this course. | ve more th | an | | |
| Reading list | 1. Robert W. Sebesta, Concepts of program 10th, 2012 | mming lan | guages | | |
| | 2. Terrence W.Pratt and Marvin V. Zelkov Programming Languages - Design and 2 4th, 2011 | | ation | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SI | O | | | | |
|-----|----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |

| 1 | X | | | |
|---|---|---|--|--|
| 2 | | X | | |
| 3 | X | | | |
| 4 | X | | | |
| 5 | X | | | |

3. Planned learning activities and teaching methods

| 1 | | | | | |
|------|--|-------|--------------------|----------------------------|-----------|
| Week | Topic | CLO | Assessments | Learning activities | Resources |
| 1 | Preliminaries | 1 | Quiz, | lecture, exercises | |
| 2 | Evolution of the Major Programming Languages | 2,3 | Quiz, | lecture, exercises | |
| 3 | Functional Programming Languages | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 4 | Software processes Describing Syntax and Semantics | 3,4,5 | Quiz, Exam | lecture, exercises | |
| 5 | Lexical and Syntax Analytics | 4,5 | Quiz, Exam | lecture, exercises | |
| 6 | Midterm | | | | |
| 7 | Names, Bindings, Type Checking, and Scopes | 4,5 | Quiz, Exam | lecture, exercises | |
| 8 | Data Types | 4,5 | Quiz, Exam | lecture, exercises | |
| 9 | Expressions and Assignment Statement | 4,5 | Quiz, Exam | lecture, exercises | |
| 10 | Logic Programming Languages | 2,3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 11 | Statement-Level Control Structures | 4,5 | Quiz, Exam | lecture, exercises | |
| 12 | Subprograms | 4,5 | Quiz, Exam | lecture, exercises | |
| 13 | Implement Subprograms | 4,5 | Quiz, Exam | lecture, exercises | |
| 14 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 |
|---------------------------|------|------|------|------|------|
| Midterm examination (30%) | 50% | 50% | 50% | | |
| Final examination (40%) | | | | 50% | 50% |

| Exercises/ Quiz (10%) | 20% | 20% | 20% | 20% | 20% |
|------------------------|-----|-----|-----|-----|-----|
| Lab. Assignments (20%) | 30% | 30% | 30% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Writt | en Reports | | | |
|--|----------------|-------|-------------------|--|
| Student: | HW/Assignment: | | | |
| Date: | | | •• | |
| | Evalu | ator: | | |
| | | | • • • • • • • • • | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |
| Content clearly and logically organized, good | 5 | | | |
| transitions | | | | |
| Presentation (20%) | | | | |
| Correct spelling, grammar, and syntax | 10 | | | |
| Clear and easy to read | 10 | | | |
| Quality of Layout and Graphics (10%) | 10 | | | |
| TOTAL SCORE | 100 | | | |

5.2. Holistic rubric

| Holis | stic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|-------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical thinking va | Capstone Capstone | Milest | | Benchmark |
|----------------------|-------------------|-------------------|----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | - | | Issue/ | 1 |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | Thoroughly | | Questions | Shows an |
| | (systematically | Identifies own | some | emerging |
| | and | and others' | assumptions. | awareness of |
| Influence of | methodically) | assumptions and | Identifies | present |
| context and | analyzes own | several relevant | several | assumptions |
| assumptions | and others' | contexts when | relevant | (sometimes |

| assumptions and carefully evaluates the relevance of contexts when presenting a position. Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are Others' points of contexts when presenting a position. Begins to dentify some contexts when presenting a position. Begins to dentify some contexts when presenting a position. Specific position. May be more aware of contexts when presenting a position. Specific position (perspective, thesis/ hypothesis) is imaginative, thesis/ position (perspective, thesis/hypothesis) are acknowledged. Others' points of view are Assumptions assumptions are position. Specific position. Specific position. May be more aware of contexts when presenting a position. | |
|--|----------------|
| evaluates the relevance of contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view presenting a position. Specific position (perspective, thesis/ solution) Gerspective, thesis/ solution (perspective, oposition) Specific position (perspective, of position account the complexities of an issue. Others' points of view operations) Begins to identify some contexts when presenting a position. Specific position. Way be more aware of others' position. Specific position. May be more aware of others' position. Specific position. Begins to identify some contexts when presenting a position. Specific position. Specific position. Specific position (perspective, position) | |
| relevance of contexts when presenting a position. Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view Others' points of position. May be more aware of contexts when presenting a position. Specific position. May be more aware of contexts when presenting a position. Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/hypothesis) are acknowledged. Others' points of view Others' points of view Degins to identify some contexts when presenting a position. Specific position. May be more aware of contexts when presenting a position. | |
| contexts when presenting a position. Specific position (perspective, thesis/ hypothesis) of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of the sis of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of the saware of contexts when presenting a position. May be more aware of contexts when presenting a position. Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ account the complexities of acknowledged. Others' points of view Specific position (perspective, position (perspective, position specific position (perspective, position specific position (perspective, position specific position specific position specific position (perspective, position specific position specific position specific position (perspective, position specific position. | |
| presenting a position. Specific position (perspective, thesis/ of position account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view position presenting a others' when presenting a position. Specific position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view position (perspective, perspective, p | |
| presenting a position. Specific position (perspective, thesis/ of position account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view position presenting a others' when presenting a position. Specific position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view position (perspective, perspective, p | |
| position. Specific position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view position. Specific position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view position (perspective, assumptions than one's own (or vice versa). Specific position (perspective, thesis/ hypothesis of an issue. Limits of position (perspective, thesis/hypothesis of an issue. Others' points of view (perspective, position (perspective, perspective, position (perspective, perspective, position (perspective, perspective, perspective, perspective, | |
| Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of | |
| than one's own (or vice versa). Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ so f position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view than one's own (or vice versa). Specific position. Specific position. (perspective, versa). Specific position. (perspective, versa). Specific position. Specific position. Specific position. Specific position. Specific position. | |
| Specific position (perspective, thesis/ hypothesis of an issue. Limits of position (perspective, thesis/ of position (perspective, of position thesis/ hypothesis) are account the hypothesis) are acknowledged. Others' points of Specific versa). Specific position (perspective, thesis/ position (perspective, thesis/ account the specific position Specific position (perspective, position Specific position (perspective, position Specific position Specific | |
| Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of Specific position (perspective, thesis/ account the complexities of acknowledged. Others' points of view versa). versa). Versa). Specific position Specific position (perspective, position Specific position (perspective, position | |
| Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of | |
| position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of (perspective, thesis/ account the complexities of account the position Specific position Specific position Specific position Specific position Specific position Specific position | |
| (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view (perspective, position (perspective, perspective, position (perspective, perspective, position (perspective, perspective, perspec | |
| thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view hypothesis) is imaginative, taking into account the position (perspective, thesis/hypothesi s) takes into account the complexities of an issue. Others' points of view Specific position Specific position Specific position | |
| hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ account the hypothesis) are acknowledged. Others' points of one account to the image of the position account the complexities of an issue. Others' position account the position position position (perspective, position) | |
| imaginative, taking into account the complexities of an issue. Limits of position (perspective, of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of position Specific position | |
| taking into account the complexities of an issue. Limits of position (perspective, of position (perspective, s) takes into thesis/ hypothesis) are acknowledged. Others' points of view Specific position (perspective, s) takes into account the Specific position (perspective, s) takes into account the hypothesis) are acknowledged. Others' points of view (perspective, position | |
| account the complexities of an issue. Limits of position (perspective, of position (perspective, s) takes into thesis/ account the hypothesis) are acknowledged. Others' points of view Specific position Specific position (perspective, s) takes into account the complexities of an issue. Others' position Specific position | |
| account the complexities of an issue. Limits of position (perspective, of position (perspective, s) takes into thesis/ account the hypothesis) are acknowledged. Others' points of view Specific position Specific position (perspective, s) takes into account the complexities of an issue. Others' position Specific position | |
| complexities of an issue. Limits of position (perspective, thesis/hypothesi (perspective, thesis/ account the hypothesis) are acknowledged. Others' points of view position position position (perspective, position position position position | |
| an issue. Limits of position (perspective, thesis/hypothesi (perspective, s) takes into thesis/ hypothesis) are acknowledged. Others' points of view (perspective, s) takes into account the complexities of an issue. Others' position Specific position (perspective, position | |
| of position (perspective, thesis/ thesis/ account the hypothesis) are acknowledged. Others' points of of position thesis/hypothesi s) takes into account the complexities of an issue. Others' position position Specific position | |
| (perspective, thesis/ account the hypothesis) are acknowledged. Others' points of points of view (perspective, position position | |
| thesis/ hypothesis) are acknowledged. Others' points of of points of view acknowledged. Others' points of view account the complexities of an issue. Others' position points of view position (perspective, position) | |
| hypothesis) are acknowledged. Others' points of points of view hypothesis) are acknowledged. Others' points of view hypothesis) are acknowledged. Specific position position | |
| acknowledged. an issue. Others' position Specific points of view (perspective, position | |
| Others' points of view (perspective, position | |
| | |
| view are are thesis/ (perspective, | |
| | |
| Student's synthesized acknowledged hypothesis) thesis/ | Student's |
| position within position within position acknowledge hypothesis) is | position |
| (perspective, (perspective, s different stated, but is | (perspective, |
| thesis/hypothesi thesis/ thesis/ sides of an simplistic and | |
| s) hypothesis). hypothesis). issue. obvious. | - - |
| Conclusion is Conclusion Conclusion is | |
| Conclusions logically tied to is logically inconsistently | |
| and related a range of tied to tied to some | |
| outcomes information, information of the | |
| (consequences including (because information | |
| | |
| | |
| implications) viewpoints; is chosen to related | |
| are logical and related fit the outcomes | |
| Conclusions reflect student's outcomes desired (consequence | |
| and related informed (consequences conclusion); s and | |
| outcomes evaluation and and some related implications) | |
| (implications ability to place implications) outcomes are | /* 1° 4° |
| and evidence and are identified (consequence oversimplifie | (implications |
| consequences) perspectives clearly. s and d. | |

| discussed priority of | implications) are identified clearly. | |
|-----------------------|---------------------------------------|--|
| | | |

Oral communication value rubric for evaluating presentation tasks:

| | | for evaluating presentation tasks: Milestone Benchmark | | | | |
|--------------|-----------------|---|------------------|---------------------|--|--|
| | Capstone | | 1 | Benchmark | | |
| | 4 | 3 | 2 | 1 | | |
| | Organizational | | | | | |
| | pattern | | | | | |
| | (specific | | | | | |
| | introduction | Organizational | | | | |
| | and conclusion, | pattern | Organizational | | | |
| | sequenced | (specific | pattern | | | |
| | material within | introduction | (specific | Organizational | | |
| | the body, and | and conclusion, | introduction | pattern (specific | | |
| | transitions) is | sequenced | and conclusion, | introduction and | | |
| | clearly and | material within | sequenced | conclusion, | | |
| | consistently | the body, and | material within | sequenced | | |
| | observable and | transitions) is | the body, and | material within | | |
| | is skillful and | clearly and | transitions) is | the body, and | | |
| | makes the | consistently | intermittently | transitions) is not | | |
| | content of the | observable | observable | observable | | |
| | presentation | within the | within the | within the | | |
| Organization | cohesive. | presentation. | presentation. | presentation. | | |
| - | Language | | | | | |
| | choices are | | | | | |
| | imaginative, | | Language | | | |
| | memorable, | Language | choices are | | | |
| | and | choices are | mundane and | Language | | |
| | compelling, | thoughtful and | commonplace | choices are | | |
| | and enhance | generally | and partially | unclear and | | |
| | the | support the | support the | minimally | | |
| | effectiveness | effectiveness | effectiveness of | support the | | |
| | of the | of the | the | effectiveness of | | |
| | presentation. | presentation. | presentation. | the presentation. | | |
| | Language in | Language in | Language in | Language in | | |
| | presentation is | presentation is | presentation is | presentation is | | |
| | appropriate to | appropriate to | appropriate to | not appropriate | | |
| Language | audience. | audience. | audience. | to audience. | | |
| 5 5 | Delivery | Delivery | Delivery | Delivery | | |
| | techniques | techniques | techniques | techniques | | |
| | (posture, | (posture, | (posture, | (posture, gesture, | | |
| Delivery | gesture, eye | gesture, eye | gesture, eye | eye contact, and | | |

| | 4- (1 | 4- / 1 | | 1 |
|------------|-----------------|------------------|------------------|-------------------|
| | contact, and | contact, and | contact, and | vocal |
| | vocal . | vocal | vocal | expressiveness) |
| | expressiveness) | expressiveness) | expressiveness) | detract from the |
| | make the | make the | make the | understandability |
| | presentation | presentation | presentation | of the |
| | compelling, | interesting, and | understandable, | presentation, and |
| | and speaker | speaker | and speaker | speaker appears |
| | appears | appears | appears | uncomfortable. |
| | polished and | comfortable. | tentative. | |
| | confident. | | | |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Mobile Application Development

Course Code: IT133IU

1. General information

| 1. General information | |
|---|--|
| Course designation | Advanced programming course with focus on mobile environment |
| Semester(s) in which the course is taught | |
| Person responsible for the course | MSc. Le Thanh Son |
| Language | English |
| Relation to curriculum | Elective (All programs) |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-oriented analysis and design |
| Course objectives | This course is designed to introduce and familiarize students with programming in the mobile environment: Android platform will be used throughout the course. The course starts with introductions to basic components, concepts, structures of Android applications then move on with common user interface elements, persistent storage, database for mobile etc. Introduction to most common tools and techniques for writing Android application is also included with hands on experience in form of lab exercise programming project. |
| Course learning outcomes | CLO 1. Understand the structure of mobile application, especially Android application CLO 2. Understand most common mobile platform user interface, database, services CLO 3. Able to develop mobile application CLO 4. Team working |

| | Competency level | Course learning out | tcome (Cl | LO) | | |
|-------------------|--|-------------------------------------|--------------|--------|--|--|
| | Knowledge | 1 | | | | |
| | Skill | 2, 3 | | | | |
| | Attitude | 4 | | | | |
| Content | The description of the co | ontents should clearly indicate the | | | | |
| | weighting of the content | | | | | |
| | Weight: lecture session (| | T.*1* \ | | | |
| | Teaching levels: I (Introd | duce); I (Ieach); U (U | | Larval | | |
| | Topic | | Weight 3 | Level | | |
| | Introduction to mobile | | | | | |
| | Android and Modal Vi | ew Controller | 3 | I, T | | |
| | Activity Lifecycle | | 3 | I, T | | |
| | Adroid SDK Versions | and Compatbility | 3 | I, T | | |
| | Creating UI: Layout an | d Widgets | 3 | T, U | | |
| | ListFragment | | 3 | | | |
| | ViewPager | | 3 | T, U | | |
| | Dialogs | | 3 | T, U | | |
| | MediaPlayer | | 3 | T, U | | |
| | Action Bar | Action Bar | | | | |
| | Saving and Loading Lo | ocal Files | 3 | T, U | | |
| | Context Menu and Cor | ntextual Action Mode | 3 | T, U | | |
| | Taking Pictures and Ha | andling Images | 3 | T, U | | |
| | Intents | | 3 | T, U | | |
| | Browsing the Web & V | VebView | 3 | T, U | | |
| Examination forms | Multiple-choice question | ıs, short-answer questi | ons | | | |
| Study and | Attendance: A minimum | - | | • | | |
| examination | for the class sessions. Stu | | | | | |
| requirements | their class participation. encouraged. | Questions and comme | ents are str | ongiy | | |
| | Assignments/Examination: Students must have more than 50/100 | | | | | |
| | points overall to pass this course. | | | | | |
| Reading list | 1. C. Stewart, K. Mar | | gramming: | The | | |
| | Big Nerd Ranch G | | | | | |
| | 2. D. Griffiths, Head | _ | oment: A I | Brain- | | |
| | Friendly Guide 1st | , 2015 | | | | |

1. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SLO | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|---|----|---|---|---|-----|
| 1 | X | | | | | |
| 2 | X | | | | | |
| 3 | | XX | | | | XXX |
| 4 | | | X | | | XXX |

2. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|---------|-----------------------|---|-----------|
| 1 | Introduction to mobile programming | 1 | Quiz | Lecture | 2 |
| 2 | Android and Modal View Controller | 1 | Quiz | Lecture | 2 |
| 3 | Activity Lifecycle | 1 | Quiz | Lecture | 2 |
| 4 | Adroid SDK Versions and Compatbility | 1 | Quiz, Lab, Midterm | Lecture, Discussion | 2 |
| 5 | Creating UI: Layout and Widgets | 2, 3, | Quiz, Lab, Midterm | Lecture, Discussion, Inclass Exercise | 1 |
| 6 | ListFragment | 2, 3, | Quiz, Lab, Midterm | Lecture, Discussion, Inclass Exercise | 1 |
| 7 | ViewPager | 2, 3, | Quiz, Lab, Midterm | Lecture, Discussion, Inclass Exercise | 1 |
| 8 | Dialogs | 2, 3, | Quiz, Lab, Midterm | Lecture, Discussion, Inclass Exercise | 1 |
| | Midterm | | | | |
| 9 | MediaPlayer | 2, 3, 4 | Quiz, Lab, Final | Lecture, Discussion, Inclass Exercise | 1 |
| 10 | Action Bar | 2, 3, | Quiz, Lab, Final | Lecture, Discussion, In- class Exercise | 1 |
| 11 | Saving and Loading Local Files | 2, 3, | Quiz, Lab, Final | Lecture, Discussion, Inclass Exercise | 1 |

| 12 | Context Menu and Contextual Action Mode | 2, 3, | Quiz, Lab, Final | Lecture, Discussion, In- class Exercise | 1 |
|----|---|---------|---------------------|---|---|
| 13 | Taking Pictures and Handling Images | 2, 3, 4 | Quiz, Lab, Final | Lecture, Discussion, In- class Exercise | 1 |
| 14 | Intents | 2, 3, 4 | Quiz, Lab, Final | Lecture, Discussion, Inclass Exercise | 1 |
| 15 | Browsing the Web & WebView | 2, 3, 4 | Quiz, Lab, Final | Lecture, Discussion, Inclass Exercise | 1 |
| | Final exam | | | | |

3. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Quiz / Assigment (10%) | 50% | 10% | 10% | 70% |
| Labs (20%) | 10% | 30% | 30% | 30% |
| Midterm examination (30%) | 30% | 30% | 30% | |
| Final examination (40%) | 10% | 30% | 30% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

4. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | | |
|--|----------------|--------|----------|--|--|--|
| Student: | HW/Assignment: | | | | | |
| Date: | | | | | | |
| | Evalu | iator: | | | | |
| | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good | 5 | | | | | |
| transitions | | | | | | |

| Presentation (20%) | | |
|---------------------------------------|-----|--|
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | | |
| | are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | | |
| | are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| _ | Capstone | Milest | one | Benchmark |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Information | |
|------------------|----------------------------------|----------------------------------|-----------------------|---------------------------|
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | If., |
| | enough | enough | enough to | Information is taken from |
| | interpretation/ evaluation to | interpretation/ evaluation to | develop a coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts when | assumptions |
| | methodically) analyzes own | | presenting a | (sometimes labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | | |
| | position | position | | |
| | (perspective, | (perspective, | a ·c· | |
| | thesis/ | thesis/hypothesi | Specific | Chasicia |
| | hypothesis) is imaginative, | s) takes into account the | position | Specific position |
| | taking into | complexities of | (perspective, thesis/ | (perspective, |
| Student's | account the | an issue. Others' | hypothesis) | thesis/ |
| position | complexities of | points of view | acknowledge | hypothesis) is |
| (perspective, | an issue. Limits | are | s different | stated, but is |
| thesis/hypothesi | of position | acknowledged | sides of an | simplistic and |
| \mathbf{s}) | (perspective, | within position | issue. | obvious. |

| | thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ | (perspective, thesis/ hypothesis). | | |
|---------------|--|---|--|---|
| Conclusions | hypothesis). Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and | Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes | Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communic | anon value rubrio | : jor evatuating pr | esemanon tasks. | |
|---------------|-------------------|---------------------|-----------------|---------------------|
| | Capstone | Mile | stone | Benchmark |
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | Organizational | | |
| | (specific | pattern | Organizational | |
| | introduction | (specific | pattern | |
| | and conclusion, | introduction | (specific | Organizational |
| | sequenced | and conclusion, | introduction | pattern (specific |
| | material within | sequenced | and conclusion, | introduction and |
| | the body, and | material within | sequenced | conclusion, |
| | transitions) is | the body, and | material within | sequenced |
| | clearly and | transitions) is | the body, and | material within |
| | consistently | clearly and | transitions) is | the body, and |
| | observable and | consistently | intermittently | transitions) is not |
| | is skillful and | observable | observable | observable |
| | makes the | within the | within the | within the |
| Organization | content of the | presentation. | presentation. | presentation. |

| | T | | | |
|------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | _ | statistics, | | _ |
| | examples, | ' | statistics, | illustrations, |
| | illustrations, statistics, | analogies, | analogies, | statistics, |
| | · · | quotations from relevant | quotations from relevant | analogies, |
| | analogies, | | | quotations from relevant |
| | quotations from relevant | authorities) make | authorities) make | |
| | | | | authorities) make reference |
| | authorities) | appropriate | appropriate | |
| | make | reference to | reference to | to information or |
| C | appropriate | information or | information or | analysis that |
| Supporting | reference to | analysis that | analysis that | minimally |
| Material | information or | generally | partially | supports the |

| | analysis that significantly supports the presentation or establishes the presenter's | supports the presentation or establishes the presenter's credibility/ authority on | supports the presentation or establishes the presenter's credibility/ authority on | presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|--|--|--|---|
| | credibility/ | the topic. | the topic. | • |
| | authority on | | | |
| | the topic. | | | |
| | Central | | | |
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Optimization and Applications

Course Code: IT163IU

1. General information

| 1. General information | |
|---|--|
| Course designation | This subject covers linear programming, convex optimization theory, and applications. |
| Semester(s) in which the course is taught | |
| Person responsible for the course | Assoc. Prof. Vo Thi Luu Phuong, Ph.D. |
| Language | English |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120. |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | |
| Course objectives | Optimization, particularly convex optimization, is applied in many fields such as data science, computer science, economics, engineering, logistics, etc. Optimization models of various applications in machine learning, resource allocations, etc. are introduced. Background theory of iterative algorithms solving problems such as gradient descent, mini-batch stochastic gradient descent, subgradient method, proximal gradient descent, etc. are taught. The course also covers linear programming (LP) which is a subfield of convex optimization. Some LP applications such as max flow – min cut, transportation, shortest path, problems are mentioned. |
| Course learning outcomes | CLO 1. Formulate a practical problem as an optimization model and solve it using optimization solvers. CLO 2. Understand the background theory of convex problem, duality, and iterative algorithms solving the problems. |

CLO 3. Be able to develop computer programs that applied iterative algorithms such as gradient descent, stochastic gradient descent, proximal gradient descent, subgradient method, ... to solve optimization problems in various applications.

| Competency level | Course learning outcome (CLO) |
|------------------|-------------------------------|
| Knowledge | CLO1, CLO2 |
| Skill | CLO3 |
| Attitude | |

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weigh t | Level |
|---|------------|------------|
| Course introduction | 1 | I, T |
| Mathematical background (linear algebra and calculus) | | |
| Linear program and applications | 2 | I, T, U |
| Integer linear program and its applications | 1 | I, T |
| Convex sets and convex functions | 1 | I, T |
| Convex problems. | 1 | I, T, U |
| Some applications: - Linear regression | 1 | I, T, U |
| - Classification | | |
| - Regularization: Ridge regression, Lasso regression | | |
| First-order methods: | 2 | I, T, |
| - gradient descent | | U |
| - subgradient | | |
| - stochastic gradient | | |
| - proximal gradient | | |
| Duality | 2 | I, T |
| - Lagrange, duality gap | | |
| - KKT condition | | |
| - Dual problem | | |
| Dual-based methods: | 1 | I, U, |
| - Dual decomposition | | T |
| - Dual of support vector machine problem | | |

| | Second-order methods: - Newton method - Log-barrier method Advanced topic in optimization | 1 | I, U, T |
|------------------------------------|---|---------------------------|----------------|
| | Final review | 1 | U |
| Examination forms | Multiple-choice questions, short-answer que programming | estions, | |
| Study and examination requirements | Attendance: A minimum attendance of 80 per compulsory for the class sessions. Students of the basis of their class participation. Question are strongly encouraged. Assignments/Examination: Students must have 50/100 points overall to pass this course. | will be ass ons and co | mments |
| Reading list | Stephen P. Boyd and Lieven Vandenle optimization. Cambridge university p Robert J. Vanderbei. Linear programmand extensions, 5th edition. Springer | ress, 2004 ming: fou | 4. ndations |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | XX | | | | |
| 2 | XX | | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| Wee k | Topic | CL O | Assessments | Learning activities | Resource s |
|----------|---|---------|---------------------------|-------------------------------|---------------|
| 1 | Course introduction | 2 | | lecture | 1, 2 |
| 2 | Mathematical background (linear algebra and calculus) | 2 | | lecture | 1 |
| 3-4 | Linear program and applications | 1, 2 | Midterm, homework, lab | lecture, exercises, lab | 2 |
| 5 | Integer linear program and its applications | 1, 2 | Midterm, homework | lecture, exercises | 2 |
| 6 | Convex sets and convex functions | 1, 2 | Midterm, homework | lecture, exercises | 1 |

| 7 | Some applications: - Linear regression - Classification - Regularization: Ridge regression, Lasso regression | 1 | Midterm, homework, lab | lecture, exercises, lab | 1, 2 |
|------|--|------|---------------------------|-------------------------------|------------|
| | Midterm | | | | |
| 8-10 | First-order methods: - gradient descent - subgradient - stochastic gradient - proximal gradient | 2, 3 | Final, homework, lab | lecture, exercises, lab | 1 |
| 11 | Duality - Lagrange, duality gap - KKT condition - Dual problem | 2 | Final, homework | lecture, exercises | 1 |
| 12 | Dual-based methods: - Dual decomposition - Dual of support vector machine problem | 2, 3 | Final, homework, lab | lecture, exercises, lab | 1 |
| 13 | Second-order methods: - Newton method - Log-barrier method | 2, 3 | Final, homework, lab | lecture, exercises, lab | 1 |
| 14 | Advanced topic in optimization | 2 | Final, homework | lecture, exercises | Literature |
| 15 | Final review | 1 | | lecture | |
| 14 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO 1 | CLO 2 | CLO 3 |
|---------------------------|----------|----------|----------|
| Labs (25%) | 25% | | 50% |
| Midterm examination (30%) | 25% | 40% | |
| Final examination (35%) | 25% | 40% | 25% |
| Homeworks (10%) | 25% | 20% | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

^{1.} When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written | n Repo | rts | |
|--|--------|-------|----------|
| Student: HW/Assignment: | | | |
| Date: Evaluator: | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | | | |
| Clear and easy to read 10 | | | |
| Quality of Layout and Graphics (10%) 10 | | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Hol | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | |
|------|--|--|--|
| Scor | Description | | |
| e | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | |
| | are included in response | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | |
| | task are included. | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | |
| | included. | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | |
| | missing. | | |
| 1 | Demonstrates no understanding of the problem. | | |
| 0 | No response/task not attempted | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | g value rubric for evo | Miles | | Benchmark |
|----------------|------------------------|-------------------|-----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | Issue/ |
| | described | stated, | ambiguities | problem to be |
| | comprehensively, | described, and | unexplored, | considered |
| | delivering all | clarified so that | boundaries | critically is |
| | relevant | understanding is | undetermined, | stated without |
| | information | not seriously | and/ or | clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is | Information is | some | |
| | taken from | taken from | interpretation/ | |
| | source(s) with | source(s) with | evaluation, but | |
| | enough | enough | not enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| Evidence | develop a | develop a | analysis or | without any |
| Selecting | comprehensive | coherent | synthesis. | interpretation/ |
| and using | analysis or | analysis or | Viewpoints of | evaluation. |
| information | synthesis. | synthesis. | experts are | Viewpoints of |
| to investigate | Viewpoints of | Viewpoints of | taken as | experts are |
| a point of | experts are | experts are | mostly fact, | taken as fact, |
| view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | Thoroughly | | Questions | Shows an |
| | (systematically and | T.14:C: - | some | emerging |
| | methodically) | Identifies own | assumptions. | awareness of |
| | analyzes own and | and others' | Identifies | present |
| | others' | assumptions and | several | assumptions |
| T £1 | assumptions and | several relevant | relevant | (sometimes |
| Influence of | carefully evaluates | contexts when | contexts when | labels |
| context and | the relevance of | presenting a | presenting a | assertions as |
| assumptions | contexts when | position. | position. May | assumptions). |

| | ı | | 1 | D : . |
|--------------|----------------------|-------------------|------------------|----------------|
| | presenting a | | be more aware | Begins to |
| | position. | | of others' | identify some |
| | | | assumptions | contexts |
| | | | than one's own | when . |
| | | | (or vice versa). | presenting a |
| | | | | position. |
| | Specific position | | | |
| | (perspective, | | | |
| | thesis/ hypothesis) | Specific | | |
| | is imaginative, | position | | |
| | taking into account | (perspective, | | |
| | the complexities of | thesis/hypothesi | | |
| | an issue. Limits of | s) takes into | | |
| | position | account the | | |
| | (perspective, | complexities of | | |
| | thesis/ hypothesis) | an issue. Others' | Specific | Specific |
| | are acknowledged. | points of view | position | position |
| Student's | Others' points of | are | (perspective, | (perspective, |
| position | view are | acknowledged | thesis/ | thesis/ |
| (perspective | synthesized within | within position | hypothesis) | hypothesis) is |
| , | position | (perspective, | acknowledges | stated, but is |
| thesis/hypot | (perspective, | thesis/ | different sides | simplistic and |
| hesis) | thesis/ hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | Conclusion is | logically tied | Conclusion is |
| | | logically tied to | to information | inconsistently |
| | Conclusions and | a range of | (because | tied to some |
| | related outcomes | information, | information is | of the |
| | (consequences and | including | chosen to fit | information |
| | implications) are | opposing | the desired | discussed; |
| | logical and reflect | viewpoints; | conclusion); | related |
| Conclusions | student's informed | related | some related | outcomes |
| and related | evaluation and | outcomes | outcomes | (consequence |
| outcomes | ability to place | (consequences | (consequences | s and |
| (implication | evidence and | and | and | implications) |
| s and | perspectives | implications) | implications) | are |
| consequence | discussed in | are identified | are identified | oversimplifie |
| s) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | 0 ' ' 1 | | | |
|-------------|---------------------------------------|------------------|------------------|-------------------|
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is |
| | content of the | observable | observable | not observable |
| Organizatio | presentation | within the | within the | within the |
| n | cohesive. | presentation. | presentation. | presentation. |
| | conesi ve. | presentation. | Language | presentation. |
| | Language | Language | choices are | |
| | choices are | choices are | mundane and | Language |
| | imaginative, | thoughtful and | commonplace | choices are |
| | memorable, and | generally | and partially | unclear and |
| | · · · · · · · · · · · · · · · · · · · | • | | |
| | compelling, and | support the | support the | minimally |
| | enhance the | effectiveness of | effectiveness of | support the |
| | effectiveness of | the | the | effectiveness of |
| | the presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in . |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | Delivery | Delivery |
| | techniques | Delivery | techniques | techniques |
| | (posture, | techniques | (posture, | (posture, |
| | gesture, eye | (posture, | gesture, eye | gesture, eye |
| | contact, and | gesture, eye | contact, and | contact, and |
| | vocal | contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandabilit |
| | compelling, and | presentation | understandable, | y of the |
| | speaker appears | interesting, and | and speaker | presentation, and |
| | polished and | speaker appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |

| | A variety of | | | |
|------------|------------------|------------------|------------------|-------------------|
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | | | | |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations from | quotations from | quotations from | statistics, |
| | relevant | relevant | relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or | presentation or | presentation or | presentation or |
| | establishes the | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on the | authority on the | authority on the |
| Material | topic. | topic. | topic. | topic. |
| | Central message | | | |
| | is compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, and | consistent with | but is not often | explicitly stated |
| Central | strongly | the supporting | repeated and is | in the |
| Message | | | | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Nguyen Van Sinh

Course Name: Fundamental Concepts of Data Security

Course Code: IT140IU

1. General information

| 1. General illiormation | |
|---|--|
| 1. Course designation | Fundamental concept of data security: This course focuses on information security, integrity and privacy techniques. |
| Semester(s) in which the course is taught | |
| Person responsible for the course | Le Thanh Son, MSc. |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. | (Estimated) Total workload: 195 |
| contact hours, self- study hours) | Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) |
| | Private study including examination preparation, specified in hours: 120 |
| | Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits: 4 |
| | Lecture: 3 |
| | Laboratory: 1 |
| Required and recommended prerequisites for joining the course | |
| Course objectives | This course introduces students to cryptographic principals and systems (symmetric and public key encryptions), and their applications in data security, secure communications, authentication and authorization. These core principles will be applied to the concepts of information risk management, and the analysis and handling of compromised systems. The ethics around computer crime, privacy, and intellectual property are covered in detail. Finally, the unit will cover the criteria and controls for information classification. |

Course learning outcomes

CLO 1. Gain understanding of the cryptography concepts including symmetric key encryption, hash function, message authentication code, public key encryption, digital signature and digital envelope;

CLO 2. Apply the concepts of authentication and authorization in implementing secure systems and networks;

CLO 3. Understand and categorize the malicious software and their attacking mechanisms;

CLO 4. Explore the buffer overflow attacks and fuzzing to find software vulnerabilities, and obtain the knowledge of software and operating system security;

CLO 5. Understand and practice Internet security protocols and authentication applications;

| Competency level | Course learning outcome (CLO) |
|------------------|-------------------------------|
| Knowledge | CLO1, CLO2, CLO3, CLO5 |
| Skill | CLO4 |
| Attitude | |

Content

Examination forms

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (3 hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weigh | Leve |
|---|-------|------|
| | t | 1 |
| Symmetric-key encipherment (AES, DES) | 2 | T,U |
| Asymmetric-key encipherment (RSA, Diffie-Hellman,); | 2 | T,U |
| Message integrity and message authentication; | 2 | T,U |
| Cryptographic hash function; | 1 | T,U |
| Digital signature; | 1 | T,U |
| Entity authentication; | 1 | T,U |
| Security at the application layer: PGP and S/MINE; | 1 | T |
| Security at the transport layer: SSL and TLS; | 1 | T |
| Security at network layer: IPSec; | 1 | T |
| Malicious software; | 2 | T |
| Database and cloud security; | 1 | T,U |

| Study and | Attendance: A minimum attendance of 80 percent is |
|--------------|---|
| examination | compulsory for the class sessions. Students will be assessed on |
| requirements | the basis of their class participation. Questions and comments |
| | are strongly encouraged. |
| | Assignments/Examination: Students must have more than |
| | 50/100 points overall to pass this course. |
| Reading list | William Stallings, Cryptography and Network Security |
| | 7th, 2016 |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|---------|-----|---|---|---|---|---|
| CL O | 1 | 2 | 3 | 4 | 5 | 6 |
| О | | | | | | |
| 1 | X | | X | X | | |
| 2 | | X | | | | |
| 3 | X | | | | | |
| 4 | X | | | | | |
| 5 | X | | | | | |

3. Planned learning activities and teaching methods

| Wee k | Topic | CL O | Assessmen ts | Learning activities | Resource s |
|----------|---|---------|-----------------|-------------------------------|---------------|
| 1 | Symmetric-key encipherment (AES, DES) | 1 | Quiz, exam | Lecture, exercises, lab | [1] |
| 2 | Asymmetric-key encipherment (RSA, Diffie-Hellman,); | 1 | Quiz, exam | Lecture, exercises, lab | [1] |
| 3 | Message integrity and message authentication; | 1,2 | Quiz, exam | Lecture, exercises, lab | [1] |
| 4 | Cryptographic hash function; | 1 | Quiz, exam | Lecture, exercises, lab | [1] |
| 5 | Digital signature; | 1 | Quiz, exam | Lecture, exercises, lab | [1] |

| 6 | Midterm | | | | |
|----|--|-----|------------|-------------------------------|-----|
| 7 | Entity authentication; | 2 | Quiz, exam | Lecture, exercises, lab | [1] |
| 8 | Security at the application layer: PGP and S/MINE; | 5 | Quiz, exam | Lecture, exercises | [1] |
| 9 | Security at the transport layer: SSL and TLS; | 5 | Quiz, exam | Lecture, exercises | [1] |
| 10 | Security at network layer: IPSec; | 5 | Quiz, exam | Lecture, exercises | [1] |
| 11 | Malicious software; | 3,4 | Quiz, exam | Lecture, exercises, lab | [1] |
| 12 | Database and cloud security; | 3,4 | Quiz, exam | Lecture, exercises, lab | [1] |
| 13 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO 1 | CLO 2 | CLO 3 | CLO 4 | CLO 5 |
|---------------------------|----------|----------|----------|----------|----------|
| Midterm examination (30%) | 68% | 70% | 55% | | |
| Final examination (40%) | | | | 74% | 67% |
| Exercises/ Quiz (30%) | 32% | 30% | 45% | 26% | 33% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organization of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.↔

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | |
|---------------------------------------|----------------|--|--|
| Student: | HW/Assignment: | | |
| Date: | Evaluator: | | |

| | Max. | Score | Comments |
|--|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | 30 | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Hol | istic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|------|--|
| Scor | Description |
| e | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task |
| | are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of |
| | task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are |
| | included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are |
| | missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | | | Issue/ problem | |
|----------------|----------------------|-------------------|------------------|-----------------|
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | - | |
| | T/1-1 | | stated but | |
| | Issue/ problem to | T / 11 | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | Issue/ |
| | described | stated, | ambiguities | problem to be |
| | comprehensively, | described, and | unexplored, | considered |
| | delivering all | clarified so that | boundaries | critically is |
| | relevant | understanding is | undetermined, | stated without |
| | information | not seriously | and/ or | clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is | Information is | some | |
| | taken from | taken from | interpretation/ | |
| | source(s) with | source(s) with | evaluation, but | |
| | enough | enough | not enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| Evidence | develop a | develop a | analysis or | without any |
| Selecting | comprehensive | coherent | synthesis. | interpretation/ |
| and using | analysis or | analysis or | Viewpoints of | evaluation. |
| information | synthesis. | synthesis. | experts are | Viewpoints of |
| to investigate | Viewpoints of | Viewpoints of | taken as | experts are |
| a point of | experts are | experts are | mostly fact, | taken as fact, |
| view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | |
| | | | some | Shows an |
| | | | assumptions. | emerging |
| | Thoroughly | | Identifies | awareness of |
| | (systematically and | | several | present |
| | methodically) | | relevant | assumptions |
| | analyzes own and | | contexts when | (sometimes |
| | others' | Identifies own | presenting a | labels |
| | assumptions and | and others' | position. May | assertions as |
| | carefully evaluates | assumptions and | be more aware | assumptions). |
| | the relevance of | several relevant | of others' | Begins to |
| Influence of | contexts when | contexts when | assumptions | identify some |
| context and | presenting a | presenting a | than one's own | contexts |
| assumptions | position. | position. | (or vice versa). | when |

| | | | | presenting a |
|--------------|----------------------|-------------------|-----------------|----------------|
| | | | | position. |
| | Specific position | | | position. |
| | Specific position | | | |
| | (perspective, | C : C: - | | |
| | thesis/ hypothesis) | Specific | | |
| | is imaginative, | position | | |
| | taking into account | (perspective, | | |
| | the complexities of | thesis/hypothesi | | |
| | an issue. Limits of | s) takes into | | |
| | position | account the | | |
| | (perspective, | complexities of | G | G |
| | thesis/ hypothesis) | an issue. Others' | Specific | Specific |
| | are acknowledged. | points of view | position | position |
| Student's | Others' points of | are | (perspective, | (perspective, |
| position | view are | acknowledged | thesis/ | thesis/ |
| (perspective | synthesized within | within position | hypothesis) | hypothesis) is |
| , | position | (perspective, | acknowledges | stated, but is |
| thesis/hypot | (perspective, | thesis/ | different sides | simplistic and |
| hesis) | thesis/ hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | Conclusion is | logically tied | Conclusion is |
| | | logically tied to | to information | inconsistently |
| | Conclusions and | a range of | (because | tied to some |
| | related outcomes | information, | information is | of the |
| | (consequences and | including | chosen to fit | information |
| | implications) are | opposing | the desired | discussed; |
| | logical and reflect | viewpoints; | conclusion); | related |
| Conclusions | student's informed | related | some related | outcomes |
| and related | evaluation and | outcomes | outcomes | (consequence |
| outcomes | ability to place | (consequences | (consequences | s and |
| (implication | evidence and | and | and | implications) |
| s and | perspectives | implications) | implications) | are |
| consequence | discussed in | are identified | are identified | oversimplifie |
| s) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Orai communic | canon value rubric | : jor evaiuaiing pr | esemanon tasks. | |
|---------------|--------------------|---------------------|-----------------|-------------------|
| | Capstone | Mile | stone | Benchmark |
| | 4 | 3 | 2 | 1 |
| | Organizational | Organizational | Organizational | Organizational |
| | pattern (specific | pattern | pattern | pattern (specific |
| | introduction and | (specific | (specific | introduction and |
| | conclusion, | introduction | introduction | conclusion, |
| | sequenced | and conclusion, | and conclusion, | sequenced |
| Organizatio | material within | sequenced | sequenced | material within |
| n | the body, and | material within | material within | the body, and |

| | transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | the body, and transitions) is clearly and consistently observable within the presentation. | the body, and transitions) is intermittently observable within the presentation. | transitions) is not observable within the presentation. |
|------------------------|--|---|--|---|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Language | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandabilit y of the presentation, and |
| Delivery | polished and confident. A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from | speaker appears comfortable. Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) | appears tentative. Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) | speaker appears uncomfortable. Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant |
| Supporting Material | relevant authorities) | make appropriate | make appropriate | authorities) make reference |

| | make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic. |
|--------------------|--|---|---|---|
| Central Message | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.) | Central message is clear and consistent with the supporting material. | Central message is basically understandable but is not often repeated and is not memorable. | Central message can be deduced but is not explicitly stated in the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Nguyen Van Sinh

Course Name: Decision support systems

Course Code: IT145IU

| 1. General information | on |
|---|---|
| Course designation | Introduction to the decision support system (DSS), an interactive computer-based system (or subsystem) intended to help decision makers. DSS simulate cognitive decision-making functions of humans based on AI methods including the area of knowledge: Expert systems, Data mining, Machine learning, Connectionism, Logical reasoning. |
| Semester(s) in which the course is taught | semester |
| Person responsible for the course | Nguyen Van Sinh, Assoc.Prof. |
| Language | English |
| Relation to curriculum | Compulsory / elective / specialisation Names of other study programmes with which the module is shared |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignments. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming |
| Course objectives | A Decision Support System (DSS) is an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge and/or models to identify and solve problems, complete decision process tasks, and make decisions. DSS simulate cognitive decision-making functions of humans based on artificial intelligence methodologies (including expert systems, data mining, machine learning, connectionism, logistical reasoning, |

| | etc.) in order to perform decision support functions. DSS is a general term for any computer application that enhances a person or group's ability to make decisions. Also, DSS refers to an academic field of research that involves designing and studying DSS in their context of use. | | | |
|--------------------------|--|--------------------|--------------------|----------------|
| Course learning outcomes | CLO 1. Understand the goals and different forms of decision support, and gain knowledge of the practical issues of implementation CLO 2. Examine systems based on statistical and logical approaches to decision making that include statistical prediction, rule-based systems, case-based reasoning, neural networks, fuzzy logic, etc. CLO 3. Obtain an overview of the various computerized decision support techniques together with a detailed assessment of successful and unsuccessful applications developed CLO 4. Examine the actual and potential impact of the technology together with the challenges associated with this kind of application | | | |
| | etency level | Cou | ırse learn | ing outcome (C |
| | edge | | | |
| | | | | |
| | e | | | |
| Content | The description of the content weighting of the content and Weight: lecture session (3 hor Teaching levels: I (Introduce) | <i>the l</i> ours) | evel. Teach); U | (Utilize) |
| | | | Weight | Level |
| | Introduction to Decision Maki and Decision Support | ng | 3 | I, U |
| | Models, Cognitive Tools and 3 I, T, U Decision Making | | | I, T, U |
| | Decision support systems | | 3 | I, T, U |
| | Modeling and analysis | 3 | I, T, U | |
| | Data warehousing, Data Acquisition, Data Mining, Business analysis, and visualization | | | I, T, U |
| | Decision support system development | | 3 | I, T, U |

| | | Collaborative computing technologies: Group support systems | 3 | I, T, U | |
|-----------------|---|--|-------------|---------------|--|
| | | Review for Midterm Exam | 3 | U | |
| | | Enterprise Information Systems | 3 | I, T, U | |
| | | Knowledge management | 3 | I, T, U | |
| | | Artificial intelligent & Expert systems: Knowledge-Based systems | 3 | I, T, U | |
| | | Knowledge Acquisition, Representation and Reasoning | 3 | I, T, U | |
| | | Advanced Intelligent Systems | 3 | I, T, U | |
| | | Ecommerce applications | 3 | I, T, U | |
| | | Review for final exam | 3 | U | |
| Examination for | orms | Multiple-choice questions, short- | answer que | estions | |
| Study and | | Attendance: A minimum attendar | | | |
| examination | compulsory for the class sessions. Students will be | | | will be | |
| requirements | - · | | | tion. | |
| | | Questions and comments are stro | ngly encou | ıraged. | |
| | | Assignments/Examination: Stude | ents must h | ave more than | |
| | | 50/100 points overall to pass this course. | | | |
| Reading list | | | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | | X | | | | |
| 3 | | X | | | | |
| 4 | | | | X | | |

β . Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learnin | Resource |
|------|------------|-----|-------------|-----------------|----------|
| | | | | g activities | S |
| 1 | Introducti | 1 | | | |
| | on to | | | | |
| | Decision | | | | |
| | Making | | | | |

| Week | Topic | CLO | Assessments | Learnin | Resource |
|------|--|-------|-------------|-----------------|----------|
| | | | | g activities | s |
| | and Decision Support | | | | |
| 2 | Models, Cognitive Tools and Decision Making | 2,3 | | | |
| 3 | Decision support systems | 2,3 | | | |
| 4 | Modeling and analysis | 2,3,4 | | | |
| 5 | Data warehousi ng, Data Acquisitio n, Data Mining, Business analysis, and visualizati on | 2,3,4 | | | |
| 6 | Midterm | | | | |
| 7 | Decision support system developm ent | 2,3,4 | | | |
| 8 | Collaborat ive computin g technologi es: Group support systems | 2,3,4 | | | |
| 9 | Enterprise Informati | 2,3,4 | | | |

| Week | Topic | CLO | Assessments | Learnin g activities | Resource s |
|------|---|-------|-------------|----------------------|---------------|
| | on Systems | | | | |
| 10 | Knowledg e managem ent | 2,3,4 | | | |
| 11 | Artificial intelligent & Expert systems: Knowledg e-Based systems | 2,3,4 | | | |
| 12 | Knowledg e Acquisitio n, Represent ation and Reasoning | 2,3,4 | | | |
| 13 | Advanced Intelligent Systems | 2,3,4 | | | |
| 14 | Ecommer ce applications | 2,3,4 | | | |
| 15 | Final exam | | | | |

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (25%) | X | X | X | X |
| Midterm examination (30%) | X | X | | |
| Final examination (40%) | | X | X | X |

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------|------|------|------|------|
| Exercises/ Quiz (10%) | X | X | X | X |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

- 1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.↔
- 5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | | |
|--|------|-------|----------|--|--|--|
| Student: HW/Assignme | ent: | | | | | |
| Date: Evaluator: | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good | 5 | | | | | |
| transitions | | | | | | |
| Presentation (20%) | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | |
| Clear and easy to read | 10 | | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | | |
| TOTAL SCORE | 100 | | | | | |

5.2. Holistic rubric

| Hol | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | |
|------|--|--|--|--|
| Scor | Description | | | |
| e | | | | |

| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
|---|---|
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|----------------|---|------------------|---------------------------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | Issue/ |
| | described | stated, | ambiguities | problem to be |
| | comprehensively, | described, and | unexplored, consider | |
| | delivering all clarified so that boundaries | | critically is | |
| | relevant understanding is undetermined, | | stated without | |
| | information | not seriously | and/ or clarificatio | |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |
| | Information is | Information is | Information is | |
| | taken from | taken from | taken from | |
| | source(s) with | source(s) with | source(s) with | |
| | enough | enough | some | Information is |
| | interpretation/ | interpretation/ | interpretation/ | taken from |
| | evaluation to | evaluation to | evaluation, but | source(s) |
| Evidence | develop a | develop a | not enough to | without any |
| Selecting | comprehensive | coherent | develop a | interpretation/ |
| and using | analysis or | analysis or | analysis or coherent evaluation | |
| information | synthesis. | synthesis. | analysis or | Viewpoints of |
| to investigate | Viewpoints of | Viewpoints of | synthesis. | experts are |
| a point of | experts are | experts are | Viewpoints of | taken as fact, |
| view or | questioned | subject to | experts are | without |
| conclusion | thoroughly. | questioning. | taken as | question. |

| | | | mostly fact, | |
|---|--|--------------------------------|----------------------------------|------------------------|
| | | | with little | |
| | | | questioning. | |
| | | | Overtions | Shows an |
| | | | Questions | emerging awareness of |
| | | some awareness of assumptions. | | |
| | Thoroughly | | assumptions. present assumptions | |
| | (systematically and | | several | (sometimes |
| | methodically) | | relevant | labels |
| | analyzes own and | | contexts when | assertions as |
| | others' | Identifies own | presenting a | assumptions). |
| | assumptions and | and others' | position. May | Begins to |
| | carefully evaluates | assumptions and | be more aware | identify some |
| - m | the relevance of | several relevant | of others' | contexts |
| Influence of | contexts when | contexts when | assumptions | when |
| context and | | | presenting a position. | |
| assumptions | position. Specific position | position. | osition. (or vice versa). posi | |
| | (perspective, | | | |
| | thesis/ hypothesis) | Specific | | |
| | is imaginative, | position | | |
| | taking into account | (perspective, | | |
| | the complexities of | thesis/hypothesi | | |
| an issue. Limits of s) takes into account the | | s) takes into | | |
| | | | | |
| | (perspective, complexities of | | G | G : C' |
| thesis/ hypothesis) an issue. Others | | Specific | Specific | |
| Student's | are acknowledged. points of view position | | _ | position |
| position | Student's Others' points of are acknowledg | | (perspective, thesis/ | (perspective, thesis/ |
| (perspective | synthesized within | acknowledged within position | hypothesis) | hypothesis) is |
| , perspective | position | (perspective, acknowledges | | stated, but is |
| thesis/hypot | | | different sides | simplistic and |
| hesis) | thesis/ hypothesis). | hypothesis). | | |
| | | Conclusion is | Conclusion is | Conclusion is |
| | Conclusions and | logically tied to | logically tied | inconsistently |
| | related outcomes | a range of | to information | tied to some |
| Complement | (consequences and | information, | (because | of the |
| Conclusions and related | implications) are logical and reflect | including | information is chosen to fit | information discussed; |
| outcomes | student's informed | opposing viewpoints; | the desired | related |
| (implication | evaluation and | related | conclusion); | outcomes |
| s and | ability to place | outcomes | some related | (consequence |
| consequence | evidence and | (consequences | outcomes | s and |
| s) - | perspectives | and | (consequences | implications) |

| | discussed in priority order. | implications) are identified clearly. | and implications) are identified clearly. | are oversimplifie d. | |
|--|------------------------------|---------------------------------------|---|----------------------|--|
|--|------------------------------|---------------------------------------|---|----------------------|--|

Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | | stone | Benchmark |
|--|-------------------------|------------------|------------------|-------------------|
| | 4 | 3 | 2 | 1 |
| | | Organizational | | |
| | Organizational | pattern | Organizational | |
| | pattern (specific | (specific | pattern | |
| | introduction and | introduction | (specific | Organizational |
| | conclusion, | and conclusion, | introduction | pattern (specific |
| | sequenced material | sequenced | and conclusion, | introduction and |
| | within the body, and | material within | sequenced | conclusion, |
| | transitions) is clearly | the body, and | material within | sequenced |
| | and consistently | transitions) is | the body, and | material within |
| | observable and is | clearly and | transitions) is | the body, and |
| | skillful and makes | consistently | intermittently | transitions) is |
| the content of the observable observable | | not observable | | |
| Organizatio | presentation | within the | within the | within the |
| n cohesive. presentation. | | presentation. | presentation. | |
| | | | Language | |
| | | Language | choices are | |
| | Language choices are | choices are | mundane and | Language |
| | imaginative, | thoughtful and | commonplace | choices are |
| | memorable, and | generally | and partially | unclear and |
| | compelling, and | support the | support the | minimally |
| | enhance the | effectiveness of | effectiveness of | support the |
| | effectiveness of the | the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| appropriate to appropriate to | | appropriate to | not appropriate | |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery techniques | Delivery | Delivery | Delivery |
| | (posture, gesture, eye | techniques | techniques | techniques |
| | contact, and vocal | (posture, | (posture, | (posture, |
| | expressiveness) make | gesture, eye | gesture, eye | gesture, eye |
| | the presentation | contact, and | contact, and | contact, and |
| | compelling, and | vocal | vocal | vocal |
| | speaker appears | expressiveness) | expressiveness) | expressiveness) |
| | polished and | make the | make the | detract from the |
| Delivery | confident. | presentation | presentation | understandabilit |

| | | interesting, and | and understandable, y of the | | |
|------------|---|------------------|------------------------------|-----------------------|--|
| | | speaker appears | and speaker | presentation, and | |
| | | comfortable. | appears | speaker appears | |
| | | | tentative. | uncomfortable. | |
| | | Supporting | Supporting | | |
| | | | | Insufficient | |
| | | | supporting | | |
| | | | | materials | |
| | | illustrations, | illustrations, | (explanations, | |
| | A variety of types of | statistics, | statistics, examples, | | |
| | supporting materials | analogies, | analogies, | illustrations, | |
| | (explanations, | quotations from | quotations from | statistics, | |
| | examples, | relevant | relevant | analogies, | |
| | illustrations, | authorities) | authorities) | quotations from | |
| | statistics, analogies, | make | make | relevant | |
| | quotations from | appropriate | appropriate | - | |
| | relevant authorities) | reference to | reference to | | |
| | make appropriate | information or | information or | to information or | |
| | reference to | analysis that | analysis that | | |
| | information or | generally | partially minimally | | |
| | analysis that | supports the | supports the supports to | | |
| | significantly supports | presentation or | 1 | | |
| | the presentation or | establishes the | * | | |
| | establishes the | presenter's | presenter's presenter's | | |
| | presenter's | credibility/ | credibility/ | credibility/ | |
| Supporting | credibility/ authority | authority on the | authority on the | authority on the | |
| Material | on the topic. | topic. | topic. | topic. | |
| | | | Central | | |
| | compelling (precisely message is basically ca | | _ | Central message | |
| | | | can be deduced | | |
| | stated, appropriately | clear and | understandable | rstandable but is not | |
| | repeated, memorable, | consistent with | but is not often | explicitly stated | |
| Central | and strongly | the supporting | repeated and is | in the | |
| Message | supported.) | material. | not memorable. | presentation. | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Much

Nguyen Van Sinh

Course Name: Cloud Computing

Course Code: IT164IU

| 1. General in | ioi mauon |
|---|---|
| Course designation | The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. |
| Semester(s) in which the course is taught | |
| Person responsible for the course | Dr. Le Duy Tan |
| Language | English |
| Relation to curriculum | Elective (CS, NE, CE) |
| Teaching methods | Lecture |
| Workload (incl. contact hours, self- study hours) | Total workload: 182.5 hours Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Lecture: 37.5 hours + Laboratory: 25 hours. Private study including examination preparation, specified in hours: 120 hours. |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Computer Networks |
| Course objectives | This course concentrates on parallel programming techniques for cloud computing and large-scale distributed systems which form the cloud infrastructure. The topics include overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services. |

| Course learning outcomes | CLO 1. Analyze the trade-of cloud and over the local infraction CLO 2. Able to deploy computing infrastructures surely Azure, and Google AppEngicute CLO 3. Solve a real-world proup collaboration. | astructure. applications over ch as Amazon Web ne. | commerc Services, | ial cloud Windows |
|--------------------------|---|---|-------------------------|----------------------|
| | Competency level | Course learning o | outcome | |
| | Knowledge | 1 | | |
| | Skill | 2, 3 | | |
| | Attitude | 3 | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | |
| | Topic | | Weigh | Level |
| | | | 1 | T |
| | Introduction to Cloud Computing | | 3 | T |
| | Cloud Computing Platform | | | |
| | Parallel Programming in the | 3 | T, U | |
| | Distributed Storage Systems | | | T, U |
| | Virtualization | | 2 | T, U |
| | Cloud Security | | 2 | Т |
| | Multicore Operating Syste | | 1 | Т |
| Examination forms | Short-answer questions, Prog | gramming exercises | | |
| Study and | Attendance: A minimum atte | endance of 80 percen | t is comp | ulsory for |
| examination | the class sessions. Students v | vill be assessed on the | e basis of | their class |
| requirements | participation. Questions and | _ | • | _ |
| | Assignments/Examination: S points overall to pass this co | | ore than : | 50/100 |
| Reading list | 4. Rountree, Derrick, an computing: Understate computing in theory of 5. Patterson, Scott. Lear | d Ileana Castrillo. <i>The nding the fundamenta and practice</i> . Newnes | als of clou s, 2013. | id |
| | Beginner's Guide to U Gateway, and Service Publishing Ltd, 2019. | Jsing AWS Lambda, es from Amazon Web | Amazon . | API |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SL | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|---|----|---|---|---|---|
| OT | | | | | | |
| 1 | X | | | | | |
| 2 | | XX | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| We | Topic | CLO | Assessment | Learning | Resource |
|-----|---|------|-----------------------|--|----------|
| ek | | | S | activities | S |
| 1 | Introduction to Cloud Computing | 1 | Quiz | Lecture | 1 |
| 2 | Cloud Computing Platforms – Part 1 | 1 | Quiz | Lecture | 1 |
| 3 | Cloud Computing Platforms – Part 2 | 1 | Quiz | Lecture, Discussion , In-class Exercise | 2 |
| 4 | Cloud Computing Platforms – Part 3 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 5 | Parallel Programming in the Cloud – Part 1 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 6 | Parallel Programming in the Cloud – Part 2 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 2 |
| 7 | Parallel Programming in the Cloud – Part 3 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| 8 | Distributed Storage Systems – Part 1 | 2, 3 | Quiz, Lab, Midterm | Lecture, Discussion , In-class Exercise | 1 |
| Mid | term | | | | |
| 9 | Distributed Storage Systems – Part 2 | 2, 3 | Quiz, Lab, Final | Lecture, Discussion | 1 |

| | | | | , In-class | |
|------|-------------------------------|------|------------|------------|------|
| | | | | Exercise | |
| 10 | Distributed Storage Systems – | 2, 3 | Quiz, Lab, | Lecture, | 1 |
| | Part 3 | | Final | Discussion | |
| | | | | , In-class | |
| | | | | Exercise | |
| 11 | Virtualization – Part 1 | 2, 3 | Quiz, Lab, | Lecture, | 1 |
| | | | Final | Discussion | |
| | | | | , In-class | |
| | | | | Exercise | |
| 12 | Virtualization – Part 2 | 2, 3 | Quiz, Lab, | Lecture, | 1 |
| | | | Final | Discussion | |
| | | | | , In-class | |
| | | | | Exercise | |
| 13 | Cloud Security – Part 1 | 2, 3 | Quiz, Lab, | Lecture, | 1, 2 |
| | | | Final | Discussion | |
| | | | | , In-class | |
| | | | | Exercise | |
| 14 | Cloud Security – Part 2 | 2, 3 | Quiz, Lab, | Lecture, | 1 |
| | | | Final | Discussion | |
| | | | | , In-class | |
| | | | | Exercise | |
| 15 | Multicore Operating Systems | 2, 3 | Quiz, Lab, | Lecture, | 1 |
| | | | Final | Discussion | |
| | | | | , In-class | |
| | | | | Exercise | |
| Fina | l | | | | |

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Quiz / Assigment (10%) | 50% | 10% | 10% |
| Labs (20%) | 10% | 30% | 30% |
| Midterm examination (30%) | 30% | 30% | 30% |
| Final examination (40%) | 10% | 30% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| adii 5 circcini 50 | | | |
|---------------------------------------|----------------|--|--|
| Grading checklist for Written Reports | | | |
| Student: | HW/Assignment: | | |
| | Evaluator: | | |
| Date: | | | |
| | | | |

| | Max. | Score | Comments |
|---|------|-------|----------|
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and | 10 | | |
| summarizes principal content | | | |
| Introduction demonstrates thorough | 15 | | |
| knowledge of relevant background and prior | | | |
| work | | | |
| Analysis and discussion demonstrate good | 30 | | |
| subject mastery | | | |
| Summary and conclusions appropriate and | 5 | | |
| complete | | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| Holistic | rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|----------|--|
| Score | Description |
| 5 | Demonstrates complete understanding of the problem. All requirements of |
| | task are included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements |
| | of task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of |
| | task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of |
| | task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | | | Issue/ problem | |
|----------|----------------------|-------------------|-------------------------|-------------------|
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | |
| | described | stated, | ambiguities | |
| | comprehensively, | described, and | unexplored, | Issue/ problem |
| | delivering all | clarified so that | boundaries | to be considered |
| Expla | relevant | understanding is | undetermined, | critically is |
| natio | information | not seriously | and/ or | stated without |
| n of | necessary for full | impeded by | backgrounds | clarification or |
| issues | understanding. | omissions. | unknown. | description. |
| Evide | _ | | Information is | |
| nce | | | taken from | |
| Selecti | | | source(s) with | |
| ng | Information is | Information is | some | |
| and | taken from | taken from | interpretation/ | |
| using | source(s) with | source(s) with | evaluation, but | |
| inform | enough | enough | not enough to | |
| ation | interpretation/ | interpretation/ | develop a | Information is |
| to | evaluation to | evaluation to | coherent | taken from |
| investi | develop a | develop a | analysis or | source(s) |
| gate a | comprehensive | coherent | synthesis. | without any |
| point | analysis or | analysis or | Viewpoints of | interpretation/ |
| of | synthesis. | synthesis. | experts are | evaluation. |
| view | Viewpoints of | Viewpoints of | taken as | Viewpoints of |
| or | experts are | experts are | mostly fact, | experts are taken |
| conclu | questioned | subject to | with little | as fact, without |
| sion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | Showe on |
| | | | some | Shows an emerging |
| | Thoroughly | | assumptions. Identifies | awareness of |
| | (systematically and | | several | present |
| | methodically) | | relevant | assumptions |
| | analyzes own and | | contexts when | (sometimes |
| Influe | others' | Identifies own | presenting a | labels assertions |
| nce of | assumptions and | and others' | position. May | as assumptions). |
| conte | carefully evaluates | assumptions and | be more aware | Begins to |
| xt | the relevance of | several relevant | of others' | identify some |
| and | contexts when | contexts when | assumptions | contexts when |
| assum | presenting a | presenting a | than one's own | presenting a |
| ptions | position. | position. | (or vice versa). | position. |
| L STORES | F 002420444 | L | (51 .100 , 0154). | L and a series |

| | Specific position | | | |
|---------|----------------------|-------------------|-----------------|-------------------|
| | (perspective, | | | |
| | thesis/ hypothesis) | Specific | | |
| | is imaginative, | position | | |
| | taking into account | (perspective, | | |
| | the complexities of | thesis/hypothesi | | |
| | an issue. Limits of | s) takes into | | |
| Stude | position | account the | | |
| nt's | (perspective, | complexities of | | |
| positi | thesis/ hypothesis) | an issue. Others' | Specific | |
| on | are acknowledged. | points of view | position | Specific position |
| (pers | Others' points of | are | (perspective, | (perspective, |
| pectiv | view are | acknowledged | thesis/ | thesis/ |
| e, | synthesized within | within position | hypothesis) | hypothesis) is |
| thesis/ | position | (perspective, | acknowledges | stated, but is |
| hypot | (perspective, | thesis/ | different sides | simplistic and |
| hesis) | thesis/ hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | Conclusion is | logically tied | |
| Concl | | logically tied to | to information | |
| usions | Conclusions and | a range of | (because | |
| and | related outcomes | information, | information is | |
| relate | (consequences and | including | chosen to fit | Conclusion is |
| d | implications) are | opposing | the desired | inconsistently |
| outco | logical and reflect | viewpoints; | conclusion); | tied to some of |
| mes | student's informed | related | some related | the information |
| (impli | evaluation and | outcomes | outcomes | discussed; |
| cation | ability to place | (consequences | (consequences | related outcomes |
| s and | evidence and | and | and | (consequences |
| conse | perspectives | implications) | implications) | and |
| quenc | discussed in | are identified | are identified | implications) are |
| es) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | , <u> </u> | Milestone | | |
|--------|--|---------------------------|---------------------|---------------------|--|
| | 4 | 3 | 2 | 1 | |
| | Organizational | Organizational | Organizational | Organizational | |
| | pattern (specific | pattern | pattern | pattern (specific | |
| | introduction and (specific (specific intro | | (specific (specific | | |
| | conclusion, | introduction introduction | | conclusion, | |
| | sequenced | and conclusion, | and conclusion, | sequenced material | |
| | material within | sequenced | sequenced | within the body, | |
| | the body, and | material within | material within | and transitions) is | |
| Orga | transitions) is | the body, and | the body, and | not observable | |
| nizati | clearly and | transitions) is | transitions) is | within the | |
| on | consistently | clearly and | intermittently | presentation. | |

| | observable and | consistently | observable | |
|--------|---------------------------|---------------------------|---------------------------|-------------------------------------|
| | is skillful and | observable | within the | |
| | makes the | within the | presentation. | |
| | content of the | presentation. | | |
| | presentation | | | |
| | cohesive. | | T | |
| | T | T | Language | |
| | Language choices are | Language choices are | choices are mundane and | |
| | imaginative, | thoughtful and | | |
| | memorable, and | generally | commonplace and partially | Language choices |
| | compelling, and | support the | support the | are unclear and |
| | enhance the | effectiveness of | effectiveness of | minimally support |
| | effectiveness of | the | the | the effectiveness of |
| | the presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| Lang | appropriate to | appropriate to | appropriate to | appropriate to |
| uage | audience. | audience. | audience. | audience. |
| | Delivery | D 1' | Delivery | D 11 |
| | techniques | Delivery | techniques | Delivery |
| | (posture, | techniques | (posture, | techniques |
| | gesture, eye contact, and | (posture, | gesture, eye contact, and | (posture, gesture, eye contact, and |
| | vocal | gesture, eye contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandability |
| | compelling, and | presentation | understandable, | of the presentation, |
| | speaker appears | interesting, and | and speaker | and speaker |
| Delive | polished and | speaker appears | appears | appears |
| ry | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, illustrations, | examples, illustrations, | (explanations, examples, |
| | (explanations, examples, | statistics, | statistics, | illustrations, |
| | illustrations, | analogies, | analogies, | statistics, |
| | statistics, | quotations from | quotations from | analogies, |
| | analogies, | relevant | relevant | quotations from |
| | quotations from | authorities) | authorities) | relevant |
| | relevant | make | make | authorities) make |
| Supp | authorities) | appropriate | appropriate | reference to |
| orting | make | reference to | reference to | information or |
| Mater | appropriate | information or | information or | analysis that |
| ial | reference to | analysis that | analysis that | minimally supports |

| | information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | the presentation or establishes the presenter's credibility/ authority on the topic. |
|-------|---|--|--|--|
| | Central message is compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | |
| | appropriately | message is | basically | Central message |
| Centr | repeated, | clear and | understandable | can be deduced but |
| al | memorable, and | consistent with | but is not often | is not explicitly |
| Messa | strongly | the supporting | repeated and is | stated in the |
| ge | supported.) | material. | not memorable. | presentation. |

Date revised: August 28, 2023

Ho Chi Minh City, 28/08/2023 **Dean of School of Computer Science and Engineering** Al Such

Assoc.Prof. Nguyen Van Sinh

Course Name: Business Process Analysis

Course Code: IT144IU

| 1. General informat | |
|---|---|
| Course designation | The course aims to provide fundamental knowledge of business process analysis, improvement and evaluation. |
| Semester(s) in which the course is | |
| Person responsible for the course | Assof. Pror.Dr. Vo Thi Luu Phuong |
| Language | English |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 195 hours. Lecture: 45 hours. Lab: 30 hours. Private study including examination preparation, specified in hours: 120 hours. Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | None |
| Course objectives | Every organization thrives to implement effective business processes to increase employee and customer satisfaction, enhance business performance, reduce costs and boost productivity. All activities including altering critical processes, merging or splitting business units require a consistent framework to manage the changes. The course aims to provide fundamental knowledge of business process analysis, improvement and evaluation. Various approaches, techniques and software tools used to analyze and manage business process improvement are also introduced in the course. |
| Course learning outcomes | CLO 1. Practice the Framework for Process Improvement |

| | CLO 2. Identify and analyze an organization's business process using different techniques such as ANSI, Swim Lane, Business Process Diagrams, UML, SIPOC, and Value Stream Maps CLO 3. Evaluate process improvement effectiveness | | | | |
|------------------------------------|---|----------------|---------------|---------------|--|
| | Competency level Course learn (CLO) | | | rning outcome | |
| | Knowledge | | 1, 2, 3 | | |
| | Skill | | 1, 3 | | |
| | Attitude | | | | |
| | m i i | C .1 | . , , , , , , | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | | Weight | | Level | |
| | cience in Action | 1 | | I | |
| | s Models and s Discovery | 3 | | T, U | |
| | nt Types of Models | 4 | | T,U | |
| | s Discovery ques and mance ng | 3 | | T,U | |
| | ment of Process | 3 | | T,U | |
| | ional Support nclusions | 1 | | I | |
| Examination forms | Multiple-choice | questions, sh | ort-answer | questions | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than | | | | |
| Reading list | 50/100 points ov | verall to pass | tnis course. | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | X | | | X | |
| 2 | | X | | | | |
| 3 | | X | X | | | |
| | | | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessme nts | Learning activities | Resource s |
|------|---|------|--------------------------------------|---------------------------------|---------------|
| 1 | Data Science in Action | 2 | Midterm | In-class activities | |
| 2 | Process Models and Process Discovery | 2, 5 | Midterm, Quiz, Project, Lab | In-class activities, quiz | |
| 3 | Midterm | | | | |
| 4 | Different Types of Process Models | 2 | Final, Project, Lab | In-class activities | |
| 5 | Process Discovery Technique s and Conforma nce Checking | 2, 3 | Final, Project, Quiz, Lab | In-class activities, Quiz | |
| 6 | Enrichme nt of Process Models | 2 | Final, Project, Lab | In-class activities | |
| 7 | Operation al Support and Conclusio ns | 2 | Final, Project, Lab | In-class activities | |

| Week | Topic | CLO | Assessme nts | Learning activities | Resource s |
|------|------------|-----|-----------------|---------------------|---------------|
| 8 | Final exam | | | | |

| Assessment Type | CLO1 | CLO2 | CLO3 |
|-----------------------------------|------|------|------|
| Labs (20%) | 20% | 20% | |
| Midterm examination (30%) | 50% | 40% | |
| Final examination (40%) | | 20% | 60% |
| Exercises/ Quiz/ Project (10%) | 30% | 20% | 40% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.↔

5. Rubrics (optional)

5.1. Grading checklist

| 5.1. Grading enceknst | | | | |
|--|------|-------|-------------|--|
| Grading checklist for Written Reports | | | | |
| Student: HW/Assignme | ent: | | • • • • • • | |
| Date: Evaluator: | | | • • • • • | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |

| Content clearly and logically organized, good | 5 | |
|---|-----|--|
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Houstic Lubite | | | | |
|--|--|--|--|--|
| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
| Description | | | | |
| | | | | |
| Demonstrates complete understanding of the problem. All requirements of task | | | | |
| are included in response | | | | |
| Demonstrates considerable understanding of the problem. All requirements of | | | | |
| task are included. | | | | |
| Demonstrates partial understanding of the problem. Most requirements of task are | | | | |
| included. | | | | |
| Demonstrates little understanding of the problem. Many requirements of task are | | | | |
| missing. | | | | |
| Demonstrates no understanding of the problem. | | | | |
| No response/task not attempted | | | | |
| | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|-------------|----------------------|-------------------|----------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | | | stated but | |
| | Issue/ problem to | | description | |
| | be considered | Issue/ problem | leaves some | |
| | critically is stated | to be considered | terms | |
| | clearly and | critically is | undefined, | Issue/ |
| | described | stated, | ambiguities | problem to be |
| | comprehensively, | described, and | unexplored, | considered |
| | delivering all | clarified so that | boundaries | critically is |
| | relevant | understanding is | undetermined, | stated without |
| | information | not seriously | and/ or | clarification |
| Explanation | necessary for full | impeded by | backgrounds | or |
| of issues | understanding. | omissions. | unknown. | description. |

| | Information is taken from | Information is taken from | Information is taken from source(s) with some interpretation/ | |
|--------------------|-----------------------------------|-----------------------------------|---|-----------------------|
| | source(s) with enough | source(s) with enough | evaluation, but not enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| Evidence | evaluation to develop a | evaluation to develop a | coherent analysis or | source(s) without any |
| Selecting | comprehensive | coherent | synthesis. | interpretation/ |
| and using | analysis or | analysis or | Viewpoints of | evaluation. |
| information | synthesis. | synthesis. | experts are | Viewpoints of |
| to investigate | Viewpoints of | Viewpoints of | taken as | experts are |
| a point of | experts are | experts are | mostly fact, | taken as fact, |
| view or conclusion | questioned thoroughly. | subject to questioning. | with little questioning. | without question. |
| conclusion | morouginy. | questioning. | questioning. | Shows an |
| | | | Questions | emerging |
| | | | some | awareness of |
| | | | assumptions. | present |
| | Thoroughly | | Identifies | assumptions |
| | (systematically and | | several relevant | (sometimes labels |
| | methodically) analyzes own and | | contexts when | assertions as |
| | others' | Identifies own | presenting a | assumptions). |
| | assumptions and | and others' | position. May | Begins to |
| | carefully evaluates | assumptions and | be more aware | identify some |
| | the relevance of | several relevant | of others' | contexts |
| Influence of | contexts when | contexts when | assumptions | when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. Specific position | position. Specific | (or vice versa). | position. |
| | (perspective, | position | | |
| | thesis/ hypothesis) | (perspective, | | |
| | is imaginative, | thesis/hypothesi | | |
| | taking into account | s) takes into | | |
| | the complexities of | account the | | |
| | an issue. Limits of | complexities of an issue. Others' | Specific | Specific |
| | position (perspective, | points of view | Specific position | Specific position |
| Student's | thesis/ hypothesis) | are | (perspective, | (perspective, |
| position | are acknowledged. | acknowledged | thesis/ | thesis/ |
| (perspective | Others' points of | within position | hypothesis) | hypothesis) is |
| , | view are | (perspective, | acknowledges | stated, but is |
| thesis/hypot | synthesized within | thesis/ | different sides | simplistic and |
| hesis) | position | hypothesis). | of an issue. | obvious. |

| | (perspective, thesis/ hypothesis). | | | |
|-----------------------------------|--|--|--|--|
| | | Conclusion is logically tied to | Conclusion is logically tied to information | Conclusion is inconsistently |
| | Conclusions and related outcomes (consequences and implications) are logical and reflect | a range of information, including opposing viewpoints; | (because information is chosen to fit the desired conclusion); | tied to some of the information discussed; related |
| Conclusions and related | student's informed evaluation and | related outcomes | some related outcomes | outcomes (consequence |
| outcomes (implication s and | ability to place evidence and perspectives | (consequences and implications) | (consequences and implications) | s and implications) are |
| consequence s) | discussed in priority order. | are identified clearly. | are identified clearly. | oversimplifie d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | <u> </u> | stone | Benchmark |
|-------------|-------------------|-----------------|-----------------|-------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is |
| | content of the | observable | observable | not observable |
| Organizatio | presentation | within the | within the | within the |
| n | cohesive. | presentation. | presentation. | presentation. |

| | | | Language | |
|------------|-------------------|------------------|------------------|-------------------|
| | Language | Language | choices are | |
| | choices are | choices are | mundane and | Language |
| | imaginative, | thoughtful and | commonplace | choices are |
| | memorable, and | generally | and partially | unclear and |
| | compelling, and | support the | support the | minimally |
| | enhance the | effectiveness of | effectiveness of | support the |
| | effectiveness of | the | the | effectiveness of |
| | the presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| Language | Delivery Delivery | uddienee. | Delivery | Delivery |
| | techniques | Delivery | techniques | techniques |
| | (posture, | techniques | (posture, | (posture, |
| | gesture, eye | (posture, | gesture, eye | gesture, eye |
| | contact, and | gesture, eye | contact, and | contact, and |
| | vocal | contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandabilit |
| | compelling, and | presentation | understandable, | y of the |
| | speaker appears | interesting, and | and speaker | presentation, and |
| | polished and | speaker appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| v | A variety of | Supporting | Supporting | |
| | types of | materials | materials | Insufficient |
| | supporting | (explanations, | (explanations, | supporting |
| | materials | examples, | examples, | materials |
| | (explanations, | illustrations, | illustrations, | (explanations, |
| | examples, | statistics, | statistics, | examples, |
| | illustrations, | analogies, | analogies, | illustrations, |
| | statistics, | quotations from | quotations from | statistics, |
| | analogies, | relevant | relevant | analogies, |
| | quotations from | authorities) | authorities) | quotations from |
| | relevant | make | make | relevant |
| | authorities) | appropriate | appropriate | authorities) |
| | make | reference to | reference to | make reference |
| | appropriate | information or | information or | to information or |
| | reference to | analysis that | analysis that | analysis that |
| | information or | generally | partially | minimally |
| | analysis that | supports the | supports the | supports the |
| | significantly | presentation or | presentation or | presentation or |
| | supports the | establishes the | establishes the | establishes the |
| Supporting | presentation or | presenter's | presenter's | presenter's |
| Material | establishes the | credibility/ | credibility/ | credibility/ |

| | presenter's credibility/ authority on the topic. | authority on the topic. | authority on the topic. | authority on the topic. |
|--------------------|--|---|---|--|
| Central Message | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.) | Central message is clear and consistent with the supporting material. | Central message is basically understandable but is not often repeated and is not memorable. | Central message can be deduced but is not explicitly stated in the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Nguyen Van Sinh

Course Name: Critical Thinking

Course Code: PE008IU

| Course designation | This course provides the nature and techniques of thought as a basis for our claims, beliefs, and attitudes about the world. The course also explores the process in which people develop their claims and support their beliefs. Specifically, the course includes the theory and practice of presenting arguments in oral and written forms, making deductive and inductive arguments, evaluating the validity or strength of arguments, detecting fallacies in arguments, and refuting fallacious arguments. Resources for the reasoning process include hypothetical and real-life situations in various fields of natural sciences, social sciences, and humanities. |
|---|---|
| Semester(s) in which the course is taught | 1, 2, 3 |
| Person responsible for the course | Trần Thanh Tú (Ph.D) Nguyễn Thị Thủy (Ph.D) Phạm Ngọc (Ph.D) Nguyễn Văn Tiếp (Ph.D) Vũ Tiến Thịnh (MA) Đỗ Thị Diệu Ngọc (MA) |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lectures, discussions, homework assignments, students' presentations |
| Workload (incl. contact hours, self- study hours) | (Estimated) Total workload: 135 Contact hours (lecture, exercise): 45 Private study including examination preparation, specified in hours: 90 |
| Credit points | 3 |

| Required and recommended prerequisites for joining the course | None | | | | | | | | |
|---|---|---|--|--|--|--|--|--|--|
| Course objectives | nis course will enable students to | | | | | | | | |
| | _ | its of assessing and defending the of their beliefs and values as well as those of | | | | | | | |
| | appreciate the ir of perspectives | nportance of looking at an issue from a variety | | | | | | | |
| | apply critical th | inking skills in both public and personal settings | | | | | | | |
| Course learning outcomes | Upon the successful completion of this course, students will able to: | | | | | | | | |
| | Competency level Course learning outcome (| | | | | | | | |
| | Knowledge | CLO1. Know the general concepts and standards of critical thinking; and comprehend the disadvantages of barriers to critical thinking in various contexts | | | | | | | |
| | | CLO2. Know the elements of an argument and two patterns of reasoning | | | | | | | |
| | | CLO3 Know the fallacies of relevance and insufficient evidence in arguments | | | | | | | |
| | Skill | CLO4. Construct and evaluate deductive and inductive arguments in spoken and written forms | | | | | | | |
| | | CLO5. Test the validity of deductive arguments using Venn diagram and truth tables | | | | | | | |
| | | CLO6. Analyze and standardize arguments | | | | | | | |
| | CLO7. Evaluate truth claims and refu | | | | | | | | |
| | | CLO8. Analyze weaknesses in inductive arguments to strengthen them | | | | | | | |
| | Attitude CLO9. Defend personal/group beliefs good arguments and in appropriations (project presentations) | | | | | | | | |

| Content | The description of the contents should clear weighting of the content and the level. | ly indicate | e the | | | | | |
|------------------------------------|--|-------------|----------|--|--|--|--|--|
| | Weight: lecture session (2 hours) | | | | | | | |
| | Teaching levels: I (Introduce); T (Teach); U | (Utilize) | | | | | | |
| | Topic | Weight | Level | | | | | |
| | Introduction to Critical thinking | 3 | I, T, U | | | | | |
| | Recognizing arguments | 3 | T, U | | | | | |
| | Basic logical concepts | 3 | T, U | | | | | |
| | A little categorical logic | 3 | T, U | | | | | |
| | A little propositional logic | 3 | T, U | | | | | |
| | Logical fallacies I | 3 | T, U | | | | | |
| | Logical fallacies II | 3 | T, U | | | | | |
| | Review for Midterm test | 3 | U | | | | | |
| | Analyzing arguments | 3 | T, U | | | | | |
| | Evaluating arguments and truth claims | 3 | T, U | | | | | |
| | Inductive reasoning | 3 | T, U | | | | | |
| | Project: Group presentation | 9 | U | | | | | |
| | Review for Final Exam | 3 | U | | | | | |
| Examination forms | 40 multiple-choice questions for the midterr and group presentations for the final project | | l exams | | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Overall passing score: 50/100 | | | | | | | |
| Reading list | [1] Bassham, Irwin, Nardone, and Wallace, <i>A Student's Introduction</i> , 6 th edition, McGra 2020. | | _ | | | | | |
| | [2] Moore, B.N. et al. (2009). <i>Critical Thin</i> McGraw-Hill | king, 9th e | ed. | | | | | |
| | [3] Patrick J. Hurley (2012). <i>A Concise Intr</i> (11 th ed.), Wadsworth, Cengage Learning | coduction | to Logic | | | | | |
| | + Relevant web resources | | | | | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | | SLO | | | | | | | |
|-----|---|-----|---|---|---|---|--|--|--|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |

3. Planned learning activities and teaching methods

| Week | Торіс | CLO | Assessments | Learning activities | Resources |
|--------|---------------------------------------|---------|---------------|---|----------------|
| 1 | Introduction to Critical thinking | 1 | HW 1/Quiz 1 | Lecture, Discussion, Homework, Quiz | [1] Chapter 1 |
| 2 | Recognizing arguments | 2 | HW 2/Quiz 2 | Lecture, Discussion, Homework, Quiz | [1] Chapter 2 |
| 3 | Basic logical concepts | 2 | HW 3/Quiz 3 | Lecture, Discussion, Homework, Quiz | [1] Chapter 3 |
| 4 | A little categorical logic | 3 | HW 4/Quiz 4 | Lecture, Discussion, Homework, Quiz | [1] Chapter |
| 5 | A little propositional logic | 3 | HW 5/Quiz 5 | Lecture, Discussion, Homework, Quiz | [1] Chapter 10 |
| 6 | Logical fallacies I | 4 | HW 6/Quiz 6 | Lecture, Discussion, Homework, Quiz | [1] Chapter 5 |
| 7 | Logical fallacies II | 4 | HW 7/Quiz 7 | Lecture, Discussion, Homework, Quiz | [1] Chapter 6 |
| 8 | Review for midterm ex | xam + s | sample test | | |
| 9 + 10 | Mi | dterm | exam: Chapter | s 1, 2, 3, 9, 10 | |
| 11 | Analyzing arguments | 5 | HW 8/Quiz 8 | Lecture, Discussion, Homework | [1] Chapter 7 |
| 12 | Evaluating arguments and truth claims | 5 | HW 9/Quiz 9 | Lecture, Discussion, Homework | [1] Chapter 8 |

| 13 | Inductive reasoning | 2 | HW 10/Quiz 10 | Lecture, Discussion, Homework | [1] Chapter 11 | | |
|-------|-------------------------------------|---------|------------------|-------------------------------|-------------------|--|--|
| 14 | Project: Group presentation | 6 | Group work | Presentation, Discussion | | | |
| 15 | Project: Group presentation | 6 | Group work | Presentation, Discussion | | | |
| 16 | Project: Group presentation | 6 | Group work | Presentation, Discussion | | | |
| 17 | Review for final exan | n + san | ıple test | | | | |
| 18 | Reserved week | | | | | | |
| 19+20 | Final exam: Chapters 5, 6, 7, 8, 11 | | | | | | |

| Assessmen | CLO |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| t Type | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Class participatio n and Assignment s (30%) | 80% Pass | 80% Pass | 80% Pass | 80% Pass | 80% Pass | | | | 80% Pass |
| Midterm exam (30%) | | | | | | 80% Pass | 80% Pass | 80% Pass | |
| Final exam (40%) | | | | | | 80% Pass | 80% Pass | 80% Pass | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

Course Name: Theoretical Models in Computing

Course Code: IT131

| 1. General information | 1 | | | | | | | |
|---|---|--|--|--|--|--|--|--|
| Course designation | | course is oriented to the king knowledge of n | hose undergraduate students who require umerical methods | | | | | |
| Semester(s) in which the course is taught | | <u> </u> | | | | | | |
| Person responsible for the course | Dr. H | a Viet Uyen Synh | | | | | | |
| Language | Engli | English | | | | | | |
| Relation to curriculum | Comp | Compulsory | | | | | | |
| Teaching methods | Lectu | re, lesson, project, se | minar. | | | | | |
| Workload (incl. contact hours, self-study hours) | Conta | Total workload: 195 Contact hours: 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | | | | |
| Required and recommended prerequisites for joining the course | | | | | | | | |
| Course objectives | This course is oriented to those undergraduate students who require a working knowledge of numerical methods. Topics to be covered include solving nonlinear equations and linear systems, interpolation and least square method, numerical evaluation of derivatives, integral and solution of differential equations. The focus will be on understanding the solving techniques and the engineering meaning of diver problems, and not on rigorous profs. | | | | | | | |
| Course learning outcomes | CLO 1. Solve numerically nonlinear equations by bisection, iterative and Newton methods. CLO 2. Solve big linear systems by exact and iterative methods. CLO 3. Fit data by interpolation polynomials, Spline polynomials and least square methods. CLO 4. Evaluate numerically derivatives and integrals. CLO 5. Solve numerically Boundary value problems by Euler, Euler improved and Finite Difference methods. CLO 6. Study diverse engineering problems by numerical methods | | | | | | | |
| | | Competency level | Course learning outcome (CLO) | | | | | |
| | | Knowledge | 1,2,3,4,5 | | | | | |
| | | Skill | 6 | | | | | |
| | Attitude | | | | | | | |

| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | | | |
|------------------------------------|---|-----------|--------|--|--|--|--|--|
| | Topic | Weight | Level | | | | | |
| | Chapter 1. Introduction | 3 | I | | | | | |
| | Chapter 2. Errors & Taylor Series | 3 | T,U | | | | | |
| | Chapter 3. Roots of Non-linear Equations | 3 | T,U | | | | | |
| | Chapter 4. Linear Algebraic Equations | 6 | T,U | | | | | |
| | Chapter 5. Optimization | 6 | T,U | | | | | |
| | Chapter 6. Curve Fitting & Interpolation | 6 | T,U | | | | | |
| | Chapter 7. Numerical Differentiation and Integration | 6 | T,U | | | | | |
| | Chapter 8. Ordinary Differential Equations | 6 | T,U | | | | | |
| | Chapter 9. Partial Differential Equations | 6 | T,U | | | | | |
| Examination forms | Multiple-choice questions, short-answer questions | | | | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | | | |
| Reading list | 1. Steven C. Chapra, Raymond P. Canale, Nu for engineers 6th, 2008 | merical m | ethods | | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | | | | | |
| 3 | X | | | | | |
| 4 | | X | | | | |
| 5 | X | | | | | |
| 6 | | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning | Resources |
|------|-------|-----|-------------|------------|-----------|
| | | | | activities | |

| 1 | Chapter 1. Introduction | | | lecture, |
|----|--|---|--------------------|----------------------------|
| 2 | Chapter 2. Errors & Taylor Series | 1 | Quiz, Lab, Exam | lecture, exercises, lab |
| 3 | Chapter 3. Roots of Non-linear Equations | 1 | Quiz, Lab, Exam | lecture, exercises, lab |
| 4 | Chapter 4. Linear Algebraic Equations | 2 | Quiz, Lab, Exam | lecture, exercises, lab |
| 5 | Chapter 5. Optimization | 3 | Quiz, Lab, Exam | lecture, exercises, lab |
| 6 | Midterm | | | |
| | Chapter 6. Curve Fitting & Interpolation | 4 | Quiz, Lab, Exam | lecture, exercises, lab |
| 7 | Chapter 7. Numerical Differentiation and Integration | 5 | Quiz, Lab, Exam | lecture, exercises, lab |
| 8 | Chapter 8. Ordinary Differential Equations | 6 | Quiz, Exam | lecture, exercises, lab |
| 9 | Chapter 9. Partial Differential Equations | 6 | Quiz, Exam | lecture, exercises, lab |
| 10 | Final exam | | | |

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 |
|---------------------------|------|------|------|------|------|------|
| Quiz (10%) | 20% | 20% | 20% | 20% | 20% | 20% |
| Labs (20%) | 30% | 30% | 30% | 30% | 30% | 30% |
| Midterm examination (30%) | 50% | 50% | 50% | | | |
| Final examination (40%) | | | | 50% | 50% | 50% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.1. Grading checklist

| 5.1. Grading checkingt | | | |
|--|----------------|-------|----------|
| Grading checklist for Written Reports | | | |
| Student: HW/Assig | HW/Assignment: | | |
| Date: Evaluator: | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| | | | |

| Analysis and discussion demonstrate good subject | 30 | |
|---|-----|--|
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good transitions | 5 | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2.Holistic rubric

| I | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|-------|--|--|--|--|--|--|
| Score | Description | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are | | | | | |
| | included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are | | | | | |
| | included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | | | | |
| | included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | | |
| | missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Mile | estone | Benchmark |
|----------------|-----------------------|--------------------|----------------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem to | |
| | | | be considered | |
| | | Issue/ problem to | critically is stated | |
| | Issue/ problem to be | be considered | but description | |
| | considered critically | critically is | leaves some terms | |
| | is stated clearly and | stated, described, | undefined, | Issue/ problem |
| | described | and clarified so | ambiguities | to be |
| | comprehensively, | that unexplored, | | considered |
| | delivering all | understanding is | boundaries | critically is |
| | relevant information | not seriously | undetermined, and/ | stated without |
| Explanation | necessary for full | impeded by | or backgrounds | clarification or |
| of issues | understanding. | omissions. | unknown. | description. |
| Evidence | Information is taken | Information is | Information is | Information is |
| Selecting and | from source(s) with | taken from | taken from | taken from |
| using | enough | source(s) with | source(s) with | source(s) |
| information to | interpretation/ | enough | some | without any |
| investigate a | evaluation to | interpretation/ | interpretation/ | interpretation/ |
| point of view | develop a | evaluation to | evaluation, but not | evaluation. |
| or conclusion | comprehensive | develop a | enough to develop | Viewpoints of |

| | | Γ | T | T |
|---------------|--------------------------------------|----------------------------------|----------------------|-----------------|
| | analysis or | coherent analysis | a coherent analysis | experts are |
| | synthesis. | or synthesis. | or synthesis. | taken as fact, |
| | Viewpoints of | Viewpoints of | Viewpoints of | without |
| | experts are | experts are | experts are taken as | question. |
| | questioned | subject to | mostly fact, with | |
| | thoroughly. | questioning. | little questioning. | |
| | | | | |
| | | | | C1 |
| | | | | Shows an |
| | | | | emerging |
| | T1 1.1 | | | awareness of |
| | Thoroughly | | 0 | present |
| | (systematically and | | Questions some | assumptions |
| | methodically) | | assumptions. | (sometimes |
| | analyzes own and | T.1 4: C' | Identifies several | labels |
| | others' assumptions | Identifies own | relevant contexts | assertions as |
| | and carefully | and others' | when presenting a | assumptions). |
| | evaluates the | assumptions and | position. May be | Begins to |
| T., 61 | relevance of | several relevant | more aware of | identify some |
| Influence of | contexts when | contexts when | others' assumptions | contexts when |
| context and | presenting a | presenting a | than one's own (or | presenting a |
| assumptions | position. | position. | vice versa). | position. |
| | Specific position | | | |
| | (perspective, thesis/ | | | |
| | hypothesis) is | Specific position | | |
| | imaginative, taking into account the | Specific position | | |
| | complexities of an | (perspective, thesis/hypothesis) | | |
| | issue. Limits of | takes into account | | |
| | position | the complexities | | |
| | (perspective, thesis/ | of an issue. | | Specific |
| | hypothesis) are | Others' points of | | position |
| | acknowledged. | view are | Specific position | (perspective, |
| Student's | Others' points of | acknowledged | (perspective, | thesis/ |
| position | view are synthesized | within position | thesis/ hypothesis) | hypothesis) is |
| (perspective, | within position | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | (perspective, thesis/ | thesis/ | different sides of | simplistic and |
| esis) | hypothesis). | hypothesis). | an issue. | obvious. |
| ŕ | Conclusions and | Conclusion is | Conclusion is | Conclusion is |
| | related outcomes | logically tied to a | logically tied to | inconsistently |
| | (consequences and | range of | information | tied to some of |
| | implications) are | information, | (because | the information |
| | logical and reflect | including | information is | discussed; |
| | student's informed | opposing | chosen to fit the | related |
| Conclusions | evaluation and | viewpoints; | desired | outcomes |
| and related | ability to place | related outcomes | conclusion); some | (consequences |
| outcomes | evidence and | (consequences | related outcomes | and |
| (implications | perspectives | and implications) | (consequences and | implications) |
| and | discussed in priority | are identified | implications) are | are |
| consequence) | order. | clearly. | identified clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | for evaluating presentation tasks: Milestone Benchmark | | | | |
|--------------|--------------------|---|--------------------|---------------------|--|--|
| | 4 | 3 | 2 | 1 | | |
| | Organizational | <u> </u> | | - | | |
| | pattern (specific | | | | | |
| | introduction and | | | | | |
| | conclusion, | Organizational | | | | |
| | sequenced | pattern (specific | Organizational | | | |
| | material within | introduction and | | | | |
| | | | pattern (specific | Ousseinstians! | | |
| | the body, and | conclusion, | introduction and | Organizational | | |
| | transitions) is | sequenced | conclusion, | pattern (specific | | |
| | clearly and | material within | sequenced | introduction and | | |
| | consistently | the body, and | material within | conclusion, | | |
| | observable and is | transitions) is | the body, and | sequenced | | |
| | skillful and | clearly and | transitions) is | material within | | |
| | makes the content | consistently | intermittently | the body, and | | |
| | of the | observable | observable | transitions) is not | | |
| | presentation | within the | within the | observable within | | |
| Organization | cohesive. | presentation. | presentation. | the presentation. | | |
| | | _ | Language | | | |
| | Language choices | Language | choices are | | | |
| | are imaginative, | choices are | mundane and | Language choices | | |
| | memorable, and | thoughtful and | commonplace | are unclear and | | |
| | compelling, and | generally support | and partially | minimally support | | |
| | enhance the | the effectiveness | support the | the effectiveness | | |
| | effectiveness of | of the | effectiveness of | of the | | |
| | the presentation. | presentation. | the presentation. | presentation. | | |
| | Language in | Language in | Language in | Language in | | |
| | presentation is | presentation is | presentation is | presentation is not | | |
| | appropriate to | appropriate to | appropriate to | appropriate to | | |
| Language | audience. | audience. | audience. | audience. | | |
| | Delivery | | Delivery | Delivery | | |
| | techniques | Delivery | techniques | techniques | | |
| | (posture, gesture, | techniques | (posture, gesture, | (posture, gesture, | | |
| | eye contact, and | (posture, gesture, | eye contact, and | eye contact, and | | |
| | vocal | eye contact, and | vocal | vocal | | |
| | expressiveness) | vocal | expressiveness) | expressiveness) | | |
| | make the | expressiveness) | make the | detract from the | | |
| | presentation | make the | presentation | understandability | | |
| | compelling, and | presentation | understandable, | of the | | |
| | speaker appears | interesting, and | and speaker | presentation, and | | |
| | polished and | speaker appears | appears | speaker appears | | |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. | | |
| • | A variety of types | Supporting | Supporting | Insufficient | | |
| | of supporting | materials | materials | supporting | | |
| | materials | (explanations, | (explanations, | materials | | |
| | (explanations, | examples, | examples, | (explanations, | | |
| | examples, | illustrations, | illustrations, | examples, | | |
| Supporting | illustrations, | statistics, | statistics, | illustrations, | | |
| Material | l ' | · · · · · · · · · · · · · · · · · · · | | l * | | |
| wiateriai | statistics, | analogies, | analogies, | statistics, | | |

| | analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic. |
|--------------------|---|--|--|---|
| Central Message | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.) | Central message is clear and consistent with the supporting material. | Central message is basically understandable but is not often repeated and is not memorable. | Central message can be deduced but is not explicitly stated in the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Optimization and Applications

Course Code: IT155

1. General information

| 1. General information | | |
|---|--|--|
| Course designation | This subject covers linear pro theory, and applications. | ogramming, convex optimization |
| Semester(s) in which the course is taught | 6 or 7 | |
| Person responsible for the course | Assoc. Prof. Vo Thi Luu Phu | ong, Ph.D. |
| Language | English | |
| Relation to curriculum | Elective | |
| Teaching methods | Lecture, lesson, project, semi | inar. |
| Workload (incl. contact hours, self-study hours) | session, etc.): 45 (lecture) + 3 | whether lecture, exercise, laboratory |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | |
| Required and recommended prerequisites for joining the course | | |
| Course objectives | fields such as data science, co- engineering, logistics, etc. Op- applications in machine learn introduced. Background theor problems such as gradient de- descent, subgradient method, taught. The course also covers linear of convex optimization. Some min cut, transportation, shorter | ptimization models of various aing, resource allocations, etc. are ary of iterative algorithms solving scent, mini-batch stochastic gradient proximal gradient descent, etc. are programming (LP) which is a subfield the LP applications such as max flow est path, problems are mentioned. |
| Course learning outcomes | solve it using optimization so CLO 2. Understand the backg duality, and iterative algorithm CLO 3. Be able to develop coalgorithms such as gradient d proximal gradient descent, su optimization problems in variance. | ground theory of convex problem, ms solving the problems. Omputer programs that applied iterative descent, stochastic gradient descent, abgradient method, to solve ious applications. |
| | | Course learning outcome (CLO) |
| | Knowledge | CLO1, CLO2 |

| | | Skill | CLO3 | | |
|--|--|---|---|---------------------------------|--------------------|
| | | Attitude | | | |
| Content | of the Weig | content and the level ht: lecture session (| | | veighting |
| | Top | | duce), I (Ieucii), e (eti | Weight | Level |
| | | rse introduction | | 1 | I, T |
| | | hematical backgrou | nd (linear algebra and | | 2, 1 |
| | Line | ar program and app | olications | 2 | I, T, U |
| | Integ | ger linear program a | and its applications | 1 | I, T |
| | Con | vex sets and convex | functions | 1 | I, T |
| | Con | vex problems. | | 1 | I, T, U |
| | Some applications: - Linear regression - Classification - Regularization: Ridge regression, Lasso regression | | | 1 | I, T, U |
| | - gra - sut - sto | r-order methods: dient descent ogradient chastic gradient oximal gradient | | 2 | I, T, U |
| | Dua - La | | | 2 | I, T |
| | Dua - Du | l-based methods: al decomposition al of support vector | machine problem | 1 | I, U, T |
| | - Ne | ond-order methods: wton method g-barrier method | | 1 | I, U, T |
| | | anced topic in optir | nization | 1 | I, U |
| | | l review | | 1 | U |
| Examination forms Study and examination requirements | Atten the cl class encou Assig | dance: A minimum ass sessions. Studer participation. Quest raged. | as, short-answer question attendance of 80 percer attendance of so percer attendance of so percer attendance on the tions and comments are on: Students must have no secourse. | nt is compune basis of strongly | lsory for their |

| Reading list | 3. | Stephen P. Boyd and Lieven Vandenberghe. Convex optimization. Cambridge university press, 2004. |
|--------------|----|--|
| | 4. | Robert J. Vanderbei. Linear programming: foundations and extensions, 5th edition. Springer Nature, 2020. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | XX | | | | |
| 2 | XX | | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|------|---------------------------|----------------------------|-----------|
| 1 | Course introduction | 2 | | lecture | 1, 2 |
| 2 | Mathematical background (linear algebra and calculus) | 2 | | lecture | 1 |
| 3-4 | Linear program and applications | 1, 2 | Midterm, homework, lab | lecture, exercises, lab | 2 |
| 5 | Integer linear program and its applications | 1, 2 | Midterm, homework | lecture, exercises | 2 |
| 6 | Convex sets and convex functions | 1, 2 | Midterm, homework | lecture, exercises | 1 |
| 7 | Some applications: - Linear regression - Classification - Regularization: Ridge regression, Lasso regression | 1 | Midterm, homework, lab | lecture, exercises, lab | 1, 2 |
| | Midterm | | | | |
| 8-10 | First-order methods: - gradient descent - subgradient - stochastic gradient - proximal gradient | 2, 3 | Final, homework, lab | lecture, exercises, lab | 1 |
| 11 | Duality - Lagrange, duality gap - KKT condition - Dual problem | 2 | Final, homework | lecture, exercises | 1 |
| 12 | Dual-based methods: - Dual decomposition | 2, 3 | Final, homework, lab | lecture, exercises, lab | 1 |

| | - Dual of support vector machine problem | | | | |
|----|--|------|-------------------------|----------------------------|------------|
| 13 | Second-order methods: - Newton method - Log-barrier method | 2, 3 | Final, homework, lab | lecture, exercises, lab | 1 |
| 14 | Advanced topic in optimization | 2 | Final, homework | lecture, exercises | Literature |
| 15 | Final review | 1 | | lecture | |
| 14 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Labs (25%) | 25% | | 50% |
| Midterm examination (30%) | 25% | 40% | |
| Final examination (35%) | 25% | 40% | 25% |
| Homeworks (10%) | 25% | 20% | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

2. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.4. Grading checklist

| Grading checklist for Written | Repor | ts | |
|---|-------|-------|----------|
| Student: HW/Assignme | nt: | | |
| Date: Evaluator: | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | |
| principal content | | | |
| Introduction demonstrates thorough knowledge of | 15 | | |
| relevant background and prior work | | | |
| Analysis and discussion demonstrate good subject | | | |
| mastery | | | |
| Summary and conclusions appropriate and complete | 5 | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good transitions | 5 | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) 10 | | | |

| Γ | TOTAL SCORE 1 | 100 | |
|---|---------------|-----|--|
| | | | |

5.5. Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|------|--|--|--|--|--|
| Scor | Description | | | | |
| e | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are | | | | |
| | included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are | | | | |
| | included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | | | |
| | included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | |
| | missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.6. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|----------------|-----------------------|--------------------|------------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be considered | |
| | | | critically is | |
| | | | stated but | |
| | | | description | |
| | | Issue/ problem to | leaves some | |
| | Issue/ problem to be | be considered | terms | |
| | considered critically | critically is | undefined, | |
| | is stated clearly and | stated, described, | ambiguities | Issue/ problem |
| | described | and clarified so | unexplored, | to be |
| | comprehensively, | that | boundaries | considered |
| | delivering all | understanding is | undetermined, | critically is |
| | relevant information | not seriously | and/ or | stated without |
| Explanation | necessary for full | impeded by | backgrounds | clarification or |
| of issues | understanding. | omissions. | unknown. | description. |
| | Information is taken | Information is | Information is | |
| | from source(s) with | taken from | taken from | |
| | enough | source(s) with | source(s) with | Information is |
| | interpretation/ | enough | some | taken from |
| | evaluation to | interpretation/ | interpretation/ | source(s) |
| | develop a | evaluation to | evaluation, but | without any |
| Evidence | comprehensive | develop a | not enough to | interpretation/ |
| Selecting and | analysis or | coherent analysis | develop a | evaluation. |
| using | synthesis. | or synthesis. | coherent | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | analysis or | experts are |
| investigate a | experts are | experts are | synthesis. | taken as fact, |
| point of view | questioned | subject to | Viewpoints of | without |
| or conclusion | thoroughly. | questioning. | experts are | question. |

| | | | taken as mostly fact, with little | |
|-------------------|------------------------------------|-----------------------------------|-----------------------------------|------------------------------|
| | | | questioning. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | Shows an emerging |
| | Thoroughly | | Questions some assumptions. | awareness of present |
| | (systematically and | | Identifies | assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | T1 | contexts when | labels |
| | others' assumptions and carefully | Identifies own and others' | presenting a | assertions as |
| | evaluates the | assumptions and | position. May be more aware | assumptions). Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| | Specific position | | | |
| | (perspective, thesis/ | | | |
| | hypothesis) is imaginative, taking | Specific position | | |
| | into account the | (perspective, | | |
| | complexities of an | thesis/hypothesis) | | |
| | issue. Limits of | takes into account | | |
| | position | the complexities | | |
| | (perspective, thesis/ | of an issue. | Specific | Specific |
| | hypothesis) are | Others' points of | position | position |
| Student's | acknowledged. Others' points of | view are acknowledged | (perspective, thesis/ | (perspective, thesis/ |
| position | view are synthesized | within position | hypothesis) | hypothesis) is |
| (perspective, | within position | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | (perspective, thesis/ | thesis/ | different sides | simplistic and |
| esis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | Conclusions | Conclusion | Conclusion is | Complusion |
| | Conclusions and related outcomes | Conclusion is logically tied to a | logically tied to information | Conclusion is inconsistently |
| | (consequences and | range of | (because | tied to some of |
| | implications) are | information, | information is | the information |
| | logical and reflect | including | chosen to fit the | discussed; |
| Conclusions | student's informed | opposing | desired | related |
| and related | evaluation and | viewpoints; | conclusion); | outcomes |
| outcomes | ability to place evidence and | related outcomes | some related | (consequences and |
| (implications and | perspectives | (consequences and implications) | outcomes (consequences | implications) |
| consequences | discussed in priority | are identified | and | are |
|) | order. | clearly. | implications) | oversimplified. |

| | are identified clearly. | |
|--|-------------------------|--|
| | | |

| Oral communication value rubric for evaluating presentation tasks: | | | | |
|--|-------------------------|------------------------------|--------------------|--------------------------------|
| | Capstone | | stone | Benchmark |
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | | | |
| | conclusion, | Organizational | | |
| | sequenced | pattern (specific | Organizational | |
| | material within | introduction and | pattern (specific | |
| | the body, and | conclusion, | introduction and | Organizational |
| | transitions) is | sequenced | conclusion, | pattern (specific |
| | clearly and | material within | sequenced | introduction and |
| | consistently | the body, and | material within | conclusion, |
| | observable and is | transitions) is | the body, and | sequenced |
| | skillful and | clearly and | transitions) is | material within |
| | makes the content | consistently | intermittently | the body, and |
| | of the | observable | observable | transitions) is not |
| | presentation | within the | within the | observable within |
| Organization | cohesive. | presentation. | presentation. | the presentation. |
| | | * | Language | • |
| | Language choices | Language | choices are | |
| | are imaginative, | choices are | mundane and | Language choices |
| | memorable, and | thoughtful and | commonplace | are unclear and |
| | compelling, and | generally support | and partially | minimally support |
| | enhance the | the effectiveness | support the | the effectiveness |
| | effectiveness of | of the | effectiveness of | of the |
| | the presentation. | presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| Zungunge | Delivery | addiction. | Delivery | Delivery |
| | techniques | Delivery | techniques | techniques |
| | (posture, gesture, | techniques | (posture, gesture, | (posture, gesture, |
| | eye contact, and | (posture, gesture, | eye contact, and | eye contact, and |
| | vocal | eye contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandability |
| | compelling, and | presentation | understandable, | of the |
| | speaker appears | interesting, and | and speaker | presentation, and |
| | | <i>C</i> , | _ | 1 - |
| Delivery | _ | | | |
| Delivery | polished and confident. | speaker appears comfortable. | appears tentative. | speaker appears uncomfortable. |

| | A variety of types | | | |
|------------|--------------------|--------------------------|--------------------------|----------------------|
| | of supporting | Supporting | | Insufficient |
| | materials | materials | Supporting | supporting |
| | (explanations, | (explanations, | materials | materials |
| | examples, | examples, | (explanations, | (explanations, |
| | illustrations, | illustrations, | examples, | examples, |
| | statistics, | statistics, | illustrations, | illustrations, |
| | analogies, | analogies, | statistics, | statistics, |
| | quotations from | quotations from | analogies, | analogies, |
| | relevant | relevant | quotations from | quotations from |
| | | | relevant | relevant |
| | authorities) make | authorities) make | | |
| | appropriate | appropriate reference to | authorities) make | authorities) make |
| | reference to | | appropriate reference to | reference to |
| | information or | information or | | information or |
| | analysis that | analysis that | information or | analysis that |
| | significantly | generally | analysis that | minimally |
| | supports the | supports the | partially supports | supports the |
| | presentation or | presentation or | the presentation | presentation or |
| | establishes the | establishes the | or establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on the | authority on the | authority on the | authority on the |
| Material | topic. | topic. | topic. | topic. |
| | Central message | | | |
| | is compelling | | | |
| | (precisely stated, | | Central message | |
| | appropriately | Central message | is basically | Central message |
| | repeated, | is clear and | understandable | can be deduced |
| | memorable, and | consistent with | but is not often | but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**(Signature)

Assoc.Prof. Nguyen Van Sinh

Course Name: Computer Graphics

Course Code: IT024IU

1. General information

| 1. Genera | I IIIOTIIIAUOII |
|---|--|
| Course designation | This subject introduces the students to principles and algorithms of computer graphics and requirements of creating graphical applications. |
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Assoc.Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | Elective course (CS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming |
| Course objectives | This course provides students the fundamentals of computer graphics concepts, methodologies, and processes. It develop an understanding of the algorithms and fundamental techniques for generating and modifying pictures/objects with a digital computer, including the handling of color, and the generation of visible-surface projections of three dimensional scenes, for applications in science, engineering, and the entertainment world (i.e. connect to the VR & AR application; Games industry and Images processing). |
| Course learning outcomes | CLO 1. Understand and apply the algorithms and fundamental techniques for generating and modifying pictures, 2D/3D objects with a digital computer. CLO 2. Understand and apply the handling of color, and the generation of visible-surface projections of 3D scenes, for applications in science, engineering and the entertainment world. |

| | programming to developments, process image | n to ready build a compu | reconstruc | t 2D/3D |
|------------------------------------|---|---|------------|--------------|
| Content | The description of the weighting of the content Weight: lecture session Teaching levels: I (Introduced) | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 teaching hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | |
| | Topic West 1. Introduction | to Commuter Cranbins | Weight 3 | Level I,T |
| | Mathematics Foundat | to Computer Graphics, | 3 | 1,1 |
| | Week 2: Bessenham | algorithms | 3 | I,T,U |
| | Week 3: Line clippin | | 3 | I,T,U |
| | Week 4: Polygon clip | | 3 | I,T,U |
| | Week 5: Transformat | | 3 | I,T |
| | | Week 6: Transformation (cont.) | | I,T,U |
| | Week 7: Introduction programing | 3 | I,T,U | |
| | Week 8: View Transf | Week 8: View Transformation + Midterm | | |
| | Week 9: 3D clipping | 3 | I,T,U | |
| | Week 10: Visual Surf | 3 | I,T,U | |
| | Week 11: Color Models | | 3 | I,T,U |
| | Week 12: Image Ren | dering and Generation | 3 | I,T,U |
| | Week 13: Ray Tracin | g & Texture Mapping | 3 | I,T,U |
| | Week 14: Bezier Cur processing | 3 | I,T,U | |
| | Week 15: Building gr final review | 3 | I,T,U | |
| Examination forms | Multiple-choice questions, short-answer questions (computing and programing) | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | |

| Reading list | 5. Steve Marschner and Peter Shirley, Fundamentals of Computer Graphics 5th, by A K Peters/CRC Press ISBN: 9780367505035, 2021. |
|--------------|---|
| | 6. Frank Klawonn, Introduction to Computer Graphics Using Java 2D and 3D, 2nd Edition, Springer 2012. |
| | 7. Sumanta Guha, Computer Graphics Through OpenGL From Theory to Experiments Third Edition (AIT), CRC Press, 2019. |
| | 8. John Vince, Mathematics for Computer Graphics, 5th Edition, Springer 2017. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | X | | | | |
| 3 | | X | | | | X |
| 4 | | | | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|------|-------------------------------|---|-----------|
| 1 | Introduction to Computer Graphics, Mathematics Foundation | 1 | Quiz | Lecture, | [1, 4] |
| 2 | Bessenham algorithms | 1, 2 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 3 | Line clipping | 1, 2 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 4 | Polygon clipping | 1, 2 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |

| 5 | Transformation | 2, 3 | Quiz, Lab, | Lecture, | [1, 2, 3] |
|-----|--------------------------|-------|--------------------------|----------------------|-----------|
| | and | | Midterm | Discussion, | |
| | Perspective | | exam | In-class | |
| _ | | 2.2 | 0 1 1 | exercises | [1 2 2] |
| 6 | Transformation | 2, 3 | Quiz, Lab, | Lecture, | [1, 2, 3] |
| | (cont.) | | Midterm | Discussion, | |
| | | | exam | In-class | |
| 7 | T . 1 | 224 | Ovia Lab | exercises | [1 2 2] |
| 7 | Introduction to | 2,3,4 | Quiz, Lab, Midterm | Lecture, | [1, 2, 3] |
| | OpenGL | | | Discussion, In-class | |
| | | | exam | exercises | |
| 0 | Midton | | | exercises | |
| 8 | Midterm | 2 2 | 0 1 1 | . | F1 2 21 |
| 9 | View | 2, 3 | Quiz, Lab, | Lecture, | [1, 2, 3] |
| | Transformation | | Final exam | Discussion, | |
| | | | | In-class | |
| | <u> </u> | 2.2 | 0 1 1 | exercises | [1 2 2] |
| 10 | 3D clipping | 2, 3 | Quiz, Lab, | Lecture, | [1, 2, 3] |
| | | | Final exam | Discussion, | |
| | | | | In-class | |
| | | 2.2 | 0 1 1 | exercises | [1 2 2] |
| 11 | Visual Surface | 2, 3 | Quiz, Lab, | Lecture, | [1, 2, 3] |
| | Determination | | Final exam | Discussion, | |
| | | | | In-class | |
| 10 | | 2 2 | Ovia Lab | exercises | [1 2 2] |
| 12 | Color Models | 2, 3 | Quiz, Lab, Final exam | Lecture, | [1, 2, 3] |
| | | | Filiai exaiii | Discussion, In-class | |
| | | | | exercises | |
| 12 | T | 224 | Quiz, Lab, | Lecture, | [1 2 2] |
| 13 | Image | 2,3,4 | Final exam | Discussion, | [1,2,3] |
| | Rendering and Generation | | I mai cxam | In-class | |
| | Generation | | | exercises | |
| 14 | Pay | 2,3,4 | Quiz, Lab, | Lecture, | [1, 2, 3] |
| 14 | Ray Tracing & | 2,3,7 | Final exam | Discussion, | [1, 4, 5] |
| | Texture | | I mai cham | In-class | |
| | Mapping | | | exercises | |
| 1.5 | | 221 | Ouiz Lab | | [1 2 2] |
| 15 | Bezier Curve | 2,3,4 | Quiz, Lab, Final exam | Lecture, | [1, 2, 3] |
| | and Surface | | Tillal Exalli | Discussion, In-class | |
| | processing | | | exercises | |
| 1.6 | Duilding | 2,3,4 | Ouiz Lab | | [1 2 3] |
| 16 | Building | 2,3,4 | Quiz, Lab, Final exam | Lecture, | [1,2,3] |
| | graphics | | 1 mai Cxalli | Discussion, Homework | |
| | application; | | | TIOHICWOIK | |
| | final review | | | | |

| 17 | Final exam | | |
|----|------------|--|--|

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (20%) | | 30% | 30% | 40% |
| Midterm examination (30%) | 40% | 60% | | |
| Final examination (40%) | | 50% | 50% | |
| Exercises/ Quiz (10%) | 30% | 40% | 30% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|----------------|--------|----------|--|--|
| Student: | HW/Assignment: | | | | |
| Date: | | | •• | | |
| | Evalu | ıator: | | | |
| | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good | 5 | | | | |
| transitions | | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|--|---|--|--|--|
| Score | Description | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | |

| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. |
|---|--|
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|------------------|-------------------|-------------------|----------------|-----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is | Information is | Information | |
| | taken from | taken from | is taken from | |
| | source(s) with | source(s) with | source(s) | |
| | enough | enough | with some | Information is |
| | interpretation/ | interpretation/ | interpretation | taken from |
| | evaluation to | evaluation to | / evaluation, | source(s) |
| | develop a | develop a | but not | without any |
| Evidence | comprehensive | coherent | enough to | interpretation/ |
| Selecting and | analysis or | analysis or | develop a | evaluation. |
| using | synthesis. | synthesis. | coherent | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | analysis or | experts are |
| investigate a | experts are | experts are | synthesis. | taken as fact, |
| point of view or | questioned | subject to | Viewpoints | without |
| conclusion | thoroughly. | questioning. | of experts are | question. |

| | Γ | | . 1 | |
|------------------|-------------------|-------------------|------------------------|----------------|
| | | | taken as | |
| | | | mostly fact, | |
| | | | with little | |
| | | | questioning. | |
| | | | | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | | contexts |
| Influence of | | | assumptions than one's | when |
| | contexts when | contexts when | | |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | | | |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| $ \mathbf{s} $ | hypothesis). | hypothesis). | issue. | obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| _ | the | presentation. | the | Language in |
| Language | effectiveness | Language in | presentation. | presentation is |

| | of the | presentation is | Language in | not appropriate |
|-------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| | presentation. | appropriate to | presentation is | to audience. |
| | Language in | audience. | appropriate to | |
| | presentation is | | audience. | |
| | appropriate to | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, | analogies, | illustrations, |
| | quotations | quotations | quotations | statistics, |
| | from relevant | from relevant | from relevant | analogies, |
| | authorities) | authorities) | authorities) | quotations from |
| | make | make | make | relevant |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| | presentation or establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material Material | the topic. | the topic. | the topic. | topic. |
| Central | Central | Central | Central | Central message |
| Message | message is | message is | message is | can be deduced |
| | | | | |

| (precisely stated, appropriately repeated, memorable, and strongly supported.) consistent with the supporting material. consistent with the supporting but is not often repeated and is not memorable. not memorable. consistent with the supporting but is not often repeated and is not memorable. |
|--|
|--|

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: IT Project Management

Course Code: IT056IU

1. General information

| 1. Gener | ai miormauon |
|---|---|
| Course designation | This subject introduces to students the process of IT project management; the area of knowledge required and techniques appropriate for successful IT project management. |
| Semester(s) in which the course is taught | 7 |
| Person responsible for the course | Assoc. Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | All programs: Elective course |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming |
| Course objectives | This course provides students the fundamental IT project management knowledge, with particular emphasis on software products, project management and contemporary issues in the delivery of software solutions to business. It considers plan-driven and agile methodologies, estimating techniques, change management, risk management, and the role of project management in business. And it identifies the managerial control and reporting aspects necessary from inception to implementation of a software development project. |
| Course learning outcomes | CLO 1. Explain the IT project management process; |

CLO 2. Identify the areas of knowledge required for successful IT project management; CLO 3. Apply techniques appropriate for successful software project management; CLO 4. Communicate effectively to the team and stakeholders; construct project related documentation. Competency level **Course learning outcome (CLO)** CLO₁ Knowledge CLO2, CLO3 Skill CLO₄ Attitude The description of the contents should clearly indicate the Content weighting of the content and the level. Weight: lecture session (3 teaching hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) **Topic** Weight Level 3 I.T Week 1: Orientation & Introduction to the course 3 I.T Week 2: Introduction to IT project management 3 I,T,U Week 3: Software project planning 3 I,T,U Week 4: Estimation (cost, time, scope) 3 I,T,U Week 5: Project Schedules 3 I.T.U Week 6: Review process 3 I,T,U Week 7: Software Requirement 3 I,T,U Week 8: Design & Programming 3 U Week 9: Review for midterm examination 3 I,T,U Week 10: Design and Programming 3 I.T.U Week 11: Software Testing 3 I,T,U Week 12: Understanding Change 3 I,T,U Week 13: Management and Leadership 3 I.T.U Week 14: Managing an Outsourced Project 3 I,T,U Week 15: Process Improvement. Examination Multiple-choice questions, short-answer questions and essay forms writing Attendance: A minimum attendance of 80 percent is compulsory for Study and examination the class sessions. Students will be assessed on the basis of their requirements class participation. Questions and comments are encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.

| Reading list | 6. Kathy Schwalbe, IT Project Management - 9th Edition, 2019 |
|--------------|--|
| | 7. Stellman and Greene, |
| | Applied Software Project Management, O'Reilly Media, 2006. |
| | 8. Marchewka, J.T., Information Technology Project Management Providing Measureable Organizational Value 5th, 2016 |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | X | | | | |
| 2 | | X | X | | | |
| 3 | | X | | | | X |
| 4 | | | X | | X | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-----|----------------------------|---|-----------|
| 1 | Orientation & Introduction to the course | 1 | Question and answer | Lecture, | [1, 2, 3] |
| 2 | Introduction to IT project management | 1 | Question and answer | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 3 | Software project planning | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 4 | Estimation (cost, time, scope) | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 5 | Project Schedules | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |

| 6 | Review process | 2,3 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
|----|--------------------------------|-------|----------------------------|--|-----------|
| 7 | Software Requirement | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 8 | Design & Programming | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 9 | Review for midterm examination | 1,2,3 | | Discussion, In-class exercises | |
| 10 | Design and Programming | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 11 | Software Testing | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 12 | Understanding Change | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 13 | Management and Leadership | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 14 | Managing an Outsourced Project | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 15 | Process Improvement. | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1, 2, 3] |
| 16 | Final examination | 2,3,4 | | | |

4. Assessment plan

| ssessment Type | CLO1 | CLO2 | CLO3 | CLO4 | |
|----------------|------|------|------|------|--|
|----------------|------|------|------|------|--|

| Midterm examination (30%) | 40% | 50% | | |
|--------------------------------------|-----|-----|-----|-----|
| Projects/Presentations/ Report (20%) | | 40% | 30% | 30% |
| Final examination (40%) | | | 70% | 30% |
| Exercises/ Quiz (10%) | 25% | 25% | 25% | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | | |
|--|-------------|----------------|----------|--|--|
| Student: | HW/ | HW/Assignment: | | | |
| Date: | Evaluator: | | | | |
| | • • • • • • | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes principal content | 10 | | | | |
| Introduction demonstrates thorough knowledge of relevant background and prior work | 15 | | | | |
| Analysis and discussion demonstrate good subject mastery | 30 | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2. Holistic rubric

| Holi | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|---|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | |

| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
|---|--|
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|----------------|------------------|-------------------|-----------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | |
| | comprehensively | stated, | ambiguities | Issue/ problem |
| | , delivering all | described, and | unexplored, | to be |
| | relevant | clarified so that | boundaries | considered |
| | information | understanding is | undetermined, | critically is |
| | necessary for | not seriously | and/ or | stated without |
| Explanation | full | impeded by | backgrounds | clarification or |
| of issues | understanding. | omissions. | unknown. | description. |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is | Information is | some | |
| | taken from | taken from | interpretation/ | |
| | source(s) with | source(s) with | evaluation, but | |
| | enough | enough | not enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints of | evaluation. |
| using | synthesis. | synthesis. | experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view | questioned | subject to | with little | without |
| or conclusion | thoroughly. | questioning. | questioning. | question. |

| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |
|--------------------------------------|---|--|---|---|
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are | Specific position (perspective, | Specific position (perspective, |
| Student's | synthesized | acknowledged | thesis/ | thesis/ |
| position (perspective, | within position (perspective, | within position (perspective, | hypothesis) acknowledges | hypothesis) is stated, but is |
| thesis/hypothe | thesis/ | thesis/ | different sides | simplistic and |
| sis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | Conclusions and related outcomes (consequences and implications) are | Conclusion is logically tied to a range of information, including | Conclusion is logically tied to information (because information is | Conclusion is inconsistently tied to some of the information |
| Conclusions | logical and | opposing | chosen to fit | discussed; |
| and related | reflect student's | viewpoints; | the desired | related |
| outcomes | informed | related outcomes | conclusion); | outcomes |
| (implications | evaluation and | (consequences | some related | (consequences |
| and | ability to place | and | outcomes | and |
| consequences) | evidence and | implications) are | (consequences | implications) |

| | <i>nunication value rubr</i> Capstone | | stone | Benchmark |
|--------------|--|--------------------|------------------------------|------------------------|
| | 4 | 3 | 2 | 1 |
| | 7 | 3 | 2 | 1 |
| | | | | |
| | | | | |
| | | | | |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | Organizational | |
| | conclusion, | pattern (specific | pattern (specific | |
| | sequenced material | introduction and | introduction and | |
| | within the body, | conclusion, | conclusion, | Organizational |
| | and transitions) is | sequenced | sequenced | pattern (specific |
| | clearly and | material within | material within | introduction and |
| | consistently | the body, and | the body, and | conclusion, |
| | observable and is | transitions) is | transitions) is | sequenced material |
| | skillful and makes | clearly and | intermittently | within the body, and |
| | the content of the | consistently | observable | transitions) is not |
| | presentation | observable within | within the | observable within the |
| Organization | cohesive. | the presentation. | presentation. | presentation. |
| Organization | conesive. | the presentation. | Language | presentation. |
| | Language choices | | choices are | |
| | are imaginative, | Language choices | mundane and | |
| | memorable, and | are thoughtful | commonplace | Language choices are |
| | compelling, and | and generally | and partially | unclear and |
| | enhance the | support the | | minimally support the |
| | effectiveness of | effectiveness of | support the effectiveness of | effectiveness of the |
| | | | | |
| | the presentation. | the presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| Languaga | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| | Delivery | Delivery | Delivery | Delivery techniques |
| | techniques | techniques | techniques | (posture, gesture, eye |
| | (posture, gesture, | (posture, gesture, | (posture, gesture, | contact, and vocal |
| | eye contact, and | eye contact, and | eye contact, and | expressiveness) |
| | vocal | vocal | vocal | detract from the |
| | expressiveness) | expressiveness) | expressiveness) | understandability of |
| Delivery | make the | make the | make the | the presentation, and |

| | | | | 1 |
|------------|-----------------------|-------------------|--------------------|------------------------|
| | presentation | presentation | presentation | speaker appears |
| | compelling, and | interesting, and | understandable, | uncomfortable. |
| | speaker appears | speaker appears | and speaker | |
| | polished and | comfortable. | appears tentative. | |
| | confident. | | | |
| | A variety of types | | | |
| | of supporting | Supporting | | |
| | materials | materials | Supporting | |
| | (explanations, | (explanations, | materials | |
| | examples, | examples, | (explanations, | |
| | illustrations, | illustrations, | examples, | |
| | statistics, | statistics, | illustrations, | Insufficient |
| | analogies, | analogies, | statistics, | supporting materials |
| | quotations from | quotations from | analogies, | (explanations, |
| | relevant | relevant | quotations from | examples, |
| | authorities) make | authorities) make | relevant | illustrations, |
| | appropriate | appropriate | authorities) make | statistics, analogies, |
| | reference to | reference to | appropriate | quotations from |
| | information or | information or | reference to | relevant authorities) |
| | analysis that | analysis that | information or | make reference to |
| | significantly | generally | analysis that | information or |
| | supports the | supports the | partially supports | analysis that |
| | presentation or | presentation or | the presentation | minimally supports |
| | establishes the | establishes the | or establishes the | the presentation or |
| | presenter's | presenter's | presenter's | establishes the |
| | credibility/ | credibility/ | credibility/ | presenter's |
| Supporting | authority on the | authority on the | authority on the | credibility/ authority |
| Material | topic. | topic. | topic. | on the topic. |
| | Central message is | • | 1 | <u> </u> |
| | compelling | | | |
| | (precisely stated, | | Central message | |
| | appropriately | Central message | is basically | |
| | repeated, | is clear and | understandable | Central message can |
| | memorable, and | consistent with | but is not often | be deduced but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |
| | sociation of American | | l . | F |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Web Application Development

Course Code: IT093IU

1. General information

| Course designation | This subject introduces to students the development of web application. How to design and program a web-app in practice based on the tools, techniques and web frameworks |
|---|---|
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Assoc. Prof. Nguyen Van Sinh |
| Language | English |
| Relation to curriculum | Compulsory (NE, CE, CS) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming Principles of Database Management |
| Course objectives | This course provides students the fundamentals of web design and web programming. It provide the concepts and models of HTML, Java Server Page, Java Bean, MVC model, Java utilities and development environments, extended Java frameworks, several new frameworks with different programming languages. To develop skills in understanding and evaluating web-based systems, as well as to develop skills in designing and developing web-based applications. |
| Course learning outcomes | CLO 1. Understand web design, web programming concepts and models. CLO 2. Apply to design and develop static/dynamic web application with HTML, Java Server Pages, Java Bean, extended Java and other frameworks based on the MVC model. CLO 3. Apply knowledge and ability to manage and use Java, XML utilities and IDE for developing web applications with DBMS. CLO 4: work in group, communication, interaction and responsible within a team. |
| | Competency level Course learning outcome (CLO) |

| | Knowledge | CLO1 | | | |
|------------------------------------|--|--|-----------|----------|--|
| | Skill | CLO2, CLO3 | | | |
| | Attitude | CLO4 | | | |
| Content | the content and the level. Weight: lecture session (3 | tents should clearly indicate teaching hours) uce); T (Teach); U (Utilize) | | hting of | |
| | Topic | 1 (1 daen), e (e inize) | Weight | Level | |
| | Week 1: Introduction to | the course and HTML | 3 | I,T | |
| | Week 2: Advanced HTN | AL and CSS | 3 | I,T,U | |
| | Week 3: Introduction to frameworks in web appl | | 3 | I,T | |
| | Week 4: Servlet | | 3 | I,T,U | |
| | Week 5: Java server pag | e and JDBC | 3 | I,T,U | |
| | Week 6: Java Bean and | MVC | 3 | I,T,U | |
| | Week 7: Web state, sess review | ion, cookies & midterm | 3 | I,T,U | |
| | Week 8: Java Script, AP | PIs and Libraries | 3 | I,T,U | |
| | Week 9&10: Node JS Fr | | 3 | I,T,U | |
| | Week 11: Graphical mod multimedia and web 360 | dels on the webpage, web | 3 | I,T,U | |
| | Week 12&13: XML & X | KSLT | 3 | I,T,U | |
| | Week 14: Ajax framewo | ork | 3 | I,T,U | |
| | Week 15: the existing w review | eb frameworks & final | 3 | I,T,U | |
| Examination forms | Multiple-choice questions | , short-answer questions an | d progran | nming | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | Dave Wolf and A. Building Bullhorn: JavaScript, Bootstr Prem Kumar Karun Development", sec Laura Ubelhor and Application for the ASP.NET and Java | SP, Servlet cation ng Busines | s, | | |
| | | V.Sinh, N.T.T.Sang, T.M.H rong mại điện tử trên Netbo 7 | • | -, - | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | | X | | | | |
| 3 | | X | | | | X |
| 4 | | | | | X | |

3. Planned learning activities and teaching methods

| | Taimed learning activities | | | | Ъ |
|------|---|---------|----------------------------|---|-----------|
| Week | Topic | CL O | Assessments | Learning activities | Resources |
| 1 | Introduction to the course and HTML | 1 | Quiz | Lecture, | [1,2] |
| 2 | Advanced HTML and CSS | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3] |
| 3 | Introduction to J2EE and new frameworks in web application | 1 | Quiz, Midterm | Lecture, Discussion | [1,2] |
| 4 | Servlet | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 5 | Java server page and JDBC | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 6 | Java Bean and MVC | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 7 | Web state, session, cookies & midterm review | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 8 | Java Script, APIs and Libraries & midterm review | 2,3,4 | Quiz, Lab, Midterm exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 9 | Node JS Framework | 2,3 | Quiz, Lab | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 10 | Node JS Framework (continue) | 2,3 | Quiz, Lab | Lecture, Discussion, In-class exercises | [1,2,3,4] |
| 11 | Graphical models on the webpage, web multimedia and web 360 | 2,3,4 | Quiz, Lab, Final exam | Lecture, Discussion, In-class exercises | [1,2,3,4] |

| 12 | XML & XSLT | 2,3,4 | Quiz, Lab, Final | Lecture, | [1,2,3,4] |
|----|--------------------|-------|------------------|--------------------|-----------|
| | | | exam | Discussion, | |
| | | | | In-class exercises | |
| 13 | XML & XSLT | 2,3,4 | Quiz, Lab, Final | Lecture, | [1,2,3,4] |
| | (continue) | | exam | Discussion, | |
| | | | | In-class exercises | |
| 14 | Ajax framework | 2,3 | Quiz, Lab | Lecture, | [1,2,3,4] |
| | 3 | | | Discussion, | |
| | | | | In-class exercises | |
| 15 | Existing web | 2,3 | Quiz, Lab, Final | Lecture, | [1,2,3,4] |
| | frameworks & final | | exam | Discussion, | |
| | review | | | In-class exercises | |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (20%) | | 30% | 40% | 30% |
| Midterm examination (30%) | 40\$ | 60% | | |
| Exercises/Quiz (10%) | 30% | 40% | 30% | |
| Final examination (40%) | | 50% | 50% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written | Repor | ts | | | | |
|---|-------|-------|----------|--|--|--|
| Student: HW/Assignment: | | | | | | |
| Date: Evaluator: | | ••• | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | | |
| Presentation (20%) | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | |
| Clear and easy to read | 10 | | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | | |
| TOTAL SCORE | 100 | | | | | |

5.2. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|--|--|--|--|--|--|
| Scor | Description | | | | |
| e | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are | | | | |
| | included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are | | | | |
| | included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | | | |
| | included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | |
| | missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milestone | | Benchmark |
|----------------|---|---|---|--|
| | 4 | 3 | 2 | 1 |
| | | Issue/ problem to | Issue/ problem to be considered critically is stated but description leaves some | |
| | Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information | be considered critically is stated, described, and clarified so that understanding is not seriously | terms undefined, ambiguities unexplored, boundaries undetermined, and/ or | Issue/ problem to be considered critically is stated without |
| Explanation | necessary for full | impeded by | backgrounds | clarification or |
| of issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/ evaluation to develop a | Information is taken from source(s) with enough interpretation/ evaluation to | Information is taken from source(s) with some interpretation/ evaluation, but not enough to | Information is taken from source(s) without any |
| Evidence | comprehensive | develop a | develop a | interpretation/ |
| Selecting and | analysis or | coherent analysis | coherent | evaluation. |
| using | synthesis. | or synthesis. | analysis or | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | synthesis. | experts are |
| investigate a | experts are | experts are | Viewpoints of | taken as fact, |
| point of view | questioned | subject to | experts are | without |
| or conclusion | thoroughly. | questioning. | taken as mostly | question. |

| | | | fact, with little questioning. | |
|---|---|--|--|---|
| Influence of context and | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a | Identifies own and others' assumptions and several relevant contexts when presenting a | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a |
| assumptions | position. Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are | Specific position (perspective, | Specific position (perspective, |
| Student's position (perspective, thesis/hypoth esis) | Others' points of view are synthesized within position (perspective, thesis/hypothesis). | acknowledged within position (perspective, thesis/ hypothesis). | thesis/ hypothesis) acknowledges different sides of an issue. | thesis/ hypothesis) is stated, but is simplistic and obvious. |
| | Conclusions and related outcomes (consequences and implications) are logical and reflect | Conclusion is logically tied to a range of information, including | logically tied to information (because information is chosen to fit the | Conclusion is inconsistently tied to some of the information discussed; |
| Conclusions and related outcomes (implications and consequences) | student's informed evaluation and ability to place evidence and perspectives discussed in priority order. | opposing viewpoints; related outcomes (consequences and implications) are identified clearly. | desired conclusion); some related outcomes (consequences and implications) | related outcomes (consequences and implications) are oversimplified. |

| | are identified | |
|--|----------------|--|
| | clearly. | |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| Oral communica | | trubric for evaluating presentation tasks: Milestone Benchmark | | | |
|----------------|--------------------|---|--------------------|---------------------|--|
| | Capstone | | | | |
| | 4 | 3 | 2 | 1 | |
| | Organizational | | | | |
| | pattern (specific | | | | |
| | introduction and | | | | |
| | conclusion, | Organizational | | | |
| | sequenced | pattern (specific | Organizational | | |
| | material within | introduction and | pattern (specific | | |
| | the body, and | conclusion, | introduction and | Organizational | |
| | transitions) is | sequenced | conclusion, | pattern (specific | |
| | clearly and | material within | sequenced | introduction and | |
| | consistently | the body, and | material within | conclusion, | |
| | observable and is | transitions) is | the body, and | sequenced | |
| | skillful and | clearly and | transitions) is | material within | |
| | makes the content | consistently | intermittently | the body, and | |
| | of the | observable | observable | transitions) is not | |
| | presentation | within the | within the | observable within | |
| Organization | cohesive. | presentation. | presentation. | the presentation. | |
| | | | Language | | |
| | Language choices | Language | choices are | | |
| | are imaginative, | choices are | mundane and | Language choices | |
| | memorable, and | thoughtful and | commonplace | are unclear and | |
| | compelling, and | generally support | and partially | minimally support | |
| | enhance the | the effectiveness | support the | the effectiveness | |
| | effectiveness of | of the | effectiveness of | of the | |
| | the presentation. | presentation. | the presentation. | presentation. | |
| | Language in | Language in | Language in | Language in | |
| | presentation is | presentation is | presentation is | presentation is not | |
| | appropriate to | appropriate to | appropriate to | appropriate to | |
| Language | audience. | audience. | audience. | audience. | |
| | Delivery | | Delivery | Delivery | |
| | techniques | Delivery | techniques | techniques | |
| | (posture, gesture, | techniques | (posture, gesture, | (posture, gesture, | |
| | eye contact, and | (posture, gesture, | eye contact, and | eye contact, and | |
| | vocal | eye contact, and | vocal | vocal | |
| | expressiveness) | vocal | expressiveness) | expressiveness) | |
| | make the | expressiveness) | make the | detract from the | |
| | presentation | make the | presentation | understandability | |
| | compelling, and | presentation | understandable, | of the | |
| | speaker appears | interesting, and | and speaker | presentation, and | |
| | polished and | speaker appears | appears | speaker appears | |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. | |
| Denvery | connaent. | comiortable. | tentanve. | uncomfortable. | |

| | A variety of types | | | | |
|------------|--------------------|-------------------|--------------------|----------------------|--|
| | of supporting | Supporting | | Insufficient | |
| | materials | materials | Supporting | supporting | |
| | (explanations, | (explanations, | materials | materials | |
| | examples, | examples, | (explanations, | (explanations, | |
| | illustrations, | illustrations, | examples, | examples, | |
| | statistics, | statistics, | illustrations, | illustrations, | |
| | analogies, | analogies, | statistics, | statistics, | |
| | quotations from | quotations from | analogies, | analogies, | |
| | relevant | relevant | quotations from | quotations from | |
| | authorities) make | authorities) make | relevant | relevant | |
| | appropriate | appropriate | authorities) make | authorities) make | |
| | reference to | reference to | appropriate | reference to | |
| | information or | information or | reference to | information or | |
| | analysis that | analysis that | information or | analysis that | |
| | significantly | generally | analysis that | minimally | |
| | supports the | supports the | partially supports | supports the | |
| | presentation or | presentation or | the presentation | presentation or | |
| | establishes the | establishes the | or establishes the | establishes the | |
| | presenter's | presenter's | presenter's | presenter's | |
| | credibility/ | credibility/ | credibility/ | credibility/ | |
| Supporting | authority on the | authority on the | authority on the | authority on the | |
| Material | topic. | topic. | topic. | topic. | |
| | Central message | | | | |
| | is compelling | | | | |
| | (precisely stated, | | Central message | | |
| | appropriately | Central message | is basically | Central message | |
| | repeated, | is clear and | understandable | can be deduced | |
| | memorable, and | consistent with | but is not often | but is not | |
| Central | strongly | the supporting | repeated and is | explicitly stated in | |
| Message | supported.) | material. | not memorable. | the presentation. | |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Information System Management

Course Code: IT094IU

1. General information

| Course designation | This course covers the concepts of information systems and their applications to business processes |
|---|---|
| Semester(s) in which the course is taught | 6 |
| Person responsible for the course | Dr. Tran Thanh Tung |
| Language | English |
| Relation to curriculum | Elective course (CS, DS) Specialization (required) (NE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Principles of Database Management |
| Course objectives | This course will aim to provide students with: The concepts of information systems and their applications to business processes. Use of computer-based information systems in functional areas of business. Understanding of computer and information technology, resources, management and end-user decision making, and system development. |
| Course learning outcomes | CLO 1. understand basic information system concepts as applied to business operations and management. CLO 2. identify the major components of a computer system, including hardware, software, operating systems and operating environments as they apply to information systems. CLO 3. develop basic MIS applications such as spreadsheet, database, and web development. |
| | Competency level Course learning outcome (CLO) |

| | | Knowledge | 1, 2 | | |
|------------------------------------|--|--|--|---------------------------|---------------|
| | | Skill | 3 | | |
| | | Attitude | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | | pic | (1000), 1 (1000), 0 (00 | Weight | Level |
| | | formation Systems in | Global Business; | 1 | Ι |
| | | obal E-Business and | | 1 | Ι |
| | Inf | ormation Systems, O | <u> </u> | 2 | Т |
| | | nical and Social Issue stems; | s in Information | 1 | T |
| | 1 1 | lecommunications, the reless Technology; | e Internet, and | 1 | T |
| | | | | | T,U |
| | | E-Commerce: Digital Markets, Digital 2 Goods; | | | T,U |
| | | Achieving Operational Excellence and Customer Intimacy: Enterprise Applications; | | | T,U |
| | | Building Information Systems; 2 | | 2 | T,U |
| | Ma | naging Knowledge; | | 1 | T |
| | En | hancing Decision Ma | king. | 1 | T |
| Examination forms | Mul | tiple-choice question | s, short-answer questio | ns | |
| Study and examination requirements | for their enco | he class sessions. Sturclass participation. Couraged. | attendance of 80 perce idents will be assessed Questions and commen n: Students must have | on the bas ts are stro | is of ngly |
| Reading list | | Information System Kenneth C. Laudon | n, Jane P. Laudon, Manas: Managing the Digital and Jane Laudon, Essemation Systems 11th, 2 | al Firm 14 entials of | th, 2016 |

3. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | X | | X | | |
| 2 | | X | | X | | |
| 3 | | X | | | | |

4. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-----|-----------------------|--------------------------------|-----------|
| 1 | Information Systems in Global Business; | 1 | Midterm exam | In-class activities | |
| 2 | Global E-Business and Collaboration; | 1 | Midterm exam | In-class activities | |
| 3 | Information Systems, Organizations and Strategy | 1,2 | Midterm exam, Quiz | In-class activities, Lab | |
| 4 | Ethical and Social Issues in Information Systems; | 1 | Midterm exam | | |
| 5 | Telecommunications, the Internet, and Wireless Technology; | 2 | Midterm exam | In-class activities, Lab | |
| 6 | Midterm | | | | |
| 7 | Foundations of Business Intelligence: Databases and Information Management | 2,3 | Final exam | In-class activities, Lab | |
| 8 | E-Commerce: Digital Markets, Digital Goods; | 1 | Final exam | In-class activities, Lab | |
| 9 | Achieving Operational Excellence and Customer Intimacy: Enterprise Applications; | 1 | Final exam | In-class activities, Lab | |
| 10 | Building Information Systems; | 2,3 | Final exam | In-class activities, Lab | |
| 11 | Managing Knowledge; | 1 | Final exam | | |
| 12 | Enhancing Decision Making. | 1 | Final exam | | |
| 13 | Final exam | | | | |

5. Assessment plan

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

| Assessment Type | CLO1 | CLO2 | CLO3 |
|--------------------------------------|------|------|------|
| Midterm examination (30%) | 40% | 30% | 20% |
| Projects/Presentations/ Report (20%) | | 40% | 60% |
| Final examination (40%) | 30% | 20% | 20% |
| Exercises/ Quiz (20%) | 30% | 10% | |

6. Rubrics (optional)

5.2. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|-------|----------------|----------|--|
| Student: | HW/A | HW/Assignment: | | |
| Date: | | | •• | |
| | Evalu | ator: | | |
| | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |
| Content clearly and logically organized, good | 5 | | | |
| transitions | | | | |
| Presentation (20%) | | | | |
| Correct spelling, grammar, and syntax | 10 | | | |
| Clear and easy to read | 10 | | | |
| Quality of Layout and Graphics (10%) | 10 | | | |
| TOTAL SCORE | 100 | | | |

5.3. Holistic rubric

| Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|--|-------------|--|--|--|
| Score | Description | | | |

| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response |
|---|---|
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Milest | one | Benchmark |
|-----------------------|--|--|--|---|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensivel y, delivering all relevant | Issue/ problem to be considered critically is stated, described, and clarified so that | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries | Issue/ problem to be considered critically is |
| | information necessary for | understanding is not seriously | undetermine d, and/ or | stated without clarification |
| Explanation of issues | full understanding. | impeded by omissions. | backgrounds unknown. | or description. |
| | Information is taken from source(s) with | Information is taken from source(s) with | Information is taken from source(s) | Information is taken from |
| Evidence | enough | enough | with some | source(s) |
| Selecting and | interpretation/ | interpretation/ | interpretation | without any |
| using | evaluation to | evaluation to | / evaluation, | interpretation/ |
| information to | develop a | develop a | but not | evaluation. |
| investigate a | comprehensive | coherent | enough to | Viewpoints of |
| point of view or | analysis or | analysis or | develop a | experts are |
| conclusion | synthesis. | synthesis. | coherent | taken as fact, |

| | Viewpoints of experts are questioned thoroughly. | Viewpoints of experts are subject to questioning. | analysis or synthesis. Viewpoints of experts are taken as | without question. |
|--|---|--|---|---|
| | | | mostly fact, with little questioning. | |
| | | | Questions some assumptions. Identifies | Shows an emerging |
| | Thoroughly (systematically and methodically) analyzes own | | several relevant contexts when presenting a | awareness of present assumptions (sometimes labels |
| | and others' assumptions and carefully evaluates the relevance of | Identifies own and others' assumptions and several relevant | position. May be more aware of others' assumptions | assertions as assumptions). Begins to identify some contexts |
| Influence of context and assumptions | contexts when presenting a position. | contexts when presenting a position. | than one's own (or vice versa). | when presenting a position. |
| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the | Specific | | |
| | complexities of an issue. Limits of position (perspective, thesis/ | position (perspective, thesis/hypothesi s) takes into account the | | |
| | hypothesis) are acknowledged. Others' points of view are | complexities of an issue. Others' points of view are | Specific position (perspective, thesis/ | Specific position (perspective, |
| Student's position (perspective, thesis/hypothesi s) | synthesized within position (perspective, thesis/ hypothesis). | acknowledged within position (perspective, thesis/ hypothesis). | hypothesis) acknowledge s different sides of an issue. | thesis/ hypothesis) is stated, but is simplistic and obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| _ | the | presentation. | the | Language in |
| Language | effectiveness | Language in | presentation. | presentation is |

| | of 4100 | anasantstian is | Language | # 04 0 m # 0 m # 0 4 0 |
|---------------------------------|-----------------|--------------------------------|----------------------|--------------------------|
| | | presentation is appropriate to | Language in | not appropriate |
| | _ | | presentation is | to audience. |
| | \mathcal{E} | | appropriate to | |
| presentation is | | | audience. | |
| appropriate to | | | | |
| | audience. | | | |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | | | |
| | types of | | | |
| | supporting | Supporting | Supporting | |
| | materials | materials | materials | Insufficient |
| | (explanations, | (explanations, | (explanations, | supporting |
| | examples, | examples, | examples, | materials |
| | illustrations, | illustrations, | illustrations, | (explanations, |
| | statistics, | statistics, | statistics, | examples, |
| | analogies, | analogies, analogies, | | illustrations, |
| | quotations | quotations quotations | | |
| | from relevant | from relevant | from relevant | statistics, |
| | | | | analogies, |
| | authorities) | authorities) make | authorities) make | quotations from relevant |
| | make | | | |
| | appropriate | appropriate | appropriate | authorities) |
| | reference to | reference to | reference to | make reference |
| | information or | information or | information or | to information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally | partially | minimally |
| | supports the | supports the | supports the | supports the |
| presentation or establishes the | | presentation or | presentation or | presentation or |
| | | establishes the | establishes the | establishes the |
| | presenter's | presenter's | presenter's | presenter's |
| g | credibility/ | credibility/ | credibility/ | credibility/ |
| Supporting | authority on | authority on | authority on | authority on the |
| Material | the topic. | the topic. | the topic. | topic. |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: System and Network Security

Course Code: IT117

1. General information

| 1. General information | 1 |
|---|---|
| Course designation | This course introduces students to the fundamentals of compute security in including software security, cryptography, network security and web security. |
| Semester(s) in which the course is taught | 7,9 |
| Person responsible for the course | MSc. Le Thanh Son |
| Language | English |
| Relation to curriculum | Elective (CE) Compulsory (NE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Computer Networks |
| Course objectives | This course introduces students to cryptography systems (symmetric and public key encryptions), basic information theory, authentication and authorization, database security, malicious software, denial of service attacks, intrusion detection and prevention systems, firewalls, buffer overflow attack and software security, Internet security protocols and standards, Internet authentication applications, and wireless security. |
| Course learning outcomes | CLO 1. Gain understanding of the cryptography concepts including symmetric key encryption, hash function, message authentication code, public key encryption, digital signature and digital envelope; CLO 2. Apply the concepts of authentication and authorization in implementing secure systems and networks; CLO 3. Understand and categorize the malicious software and their attacking mechanisms; CLO 4. Explore the buffer overflow attacks and fuzzing to find software vulnerabilities, and obtain the knowledge of software and operating system security; CLO 5. Understand and practice Internet security protocols and authentication applications; |

| | CLO | 6. Analyze the wirele | ess security. | | | | |
|------------------------------------|---|---|-------------------------------|------------|------------|--|--|
| | | Competency level | Course learning outcome (CLO) | come | | | |
| | | Knowledge | CLO1, CLO2, CLO3, | CLO5 | | | |
| | | Skill | CLO4, CLO6 | | | | |
| | | Attitude | | | | | |
| Content | of the Weig | e content and the leve tht: lecture session (3 thing levels: I (Introdu | | ize) | | | |
| | Top | oic | | Weigh t | Leve | | |
| | 1 1 | ptographic systems (s systems); | symmetric and public | 2 | T | | |
| | Aut | hentication and autho | orization; | 1 | T,U | | |
| | Mal | icious software; | | 1 | <u>T</u> | | |
| | Data | abase and cloud secur | rity; | 2 | <u>T,U</u> | | |
| | Den | ial of service attacks: | , | 1 | <u>T,U</u> | | |
| | | usion detection and p walls; | revention systems, | 1 | T | | |
| | Buffer overflow and software security; | | | 2 | T,U | | |
| | Operating system security; | | | 2 | T,U | | |
| | Internet security protocols; | | | 1 | <u>T</u> | | |
| | Inte | Internet authentication applications; | | | <u>T</u> | | |
| | Wir | eless security. | <u>1</u> | <u>T,U</u> | | | |
| Examination forms | Multiple-choice questions, short-answer questions | | | | | | |
| Study and examination requirements | the class encou | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | |
| Reading list | 1. | | and Lawrence Brown, C | Computer S | Security | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | X | X | | |
| 2 | | X | | | | |
| 3 | X | | | | | |

| 4 | X | | | |
|---|---|--|--|--|
| 5 | X | | | |
| 6 | X | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-----|-------------|-------------------------------|-----------|
| 1 | Cryptographic systems (symmetric and public key systems); | 1 | Quiz, Exam | Lecture, Exercises, Lab | [1] |
| 2 | Authentication and authorization; | 2 | Quiz, Exam | Lecture, Lab | [1] |
| 3 | Malicious software; | 3 | Quiz, Exam | Lecture, Lab | [1] |
| 4 | Database and cloud security; | 3 | Quiz, Exam | Lecture, Lab | [1] |
| 5 | Denial of service attacks; | 3 | Quiz, Exam | Lecture | [1] |
| 6 | Midterm | | | | |
| 7 | Intrusion detection and prevention systems, firewalls; | 2 | Quiz, Exam | Lecture | [1] |
| 8 | Buffer overflow and software security; | 4 | Quiz, Exam | Lecture, Lab | [1] |
| 9 | Operating system security; | 4 | Quiz, Exam | Lecture, Lab | [1] |
| 10 | Internet security protocols; | 5 | Quiz, Exam | Lecture, Exercises, | [1] |
| 11 | Internet authentication applications; | 5 | Quiz, Exam | Lecture, Exercises, | [1] |
| 12 | Wireless security. | 6 | Quiz, Exam | Lecture, Lab | [1] |
| 13 | Final exam | | | | |

4. Assessment plan

| • | Assessment plan | | | | | | |
|---|---------------------------|------|------|------|------|------|------|
| | Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 |
| | Midterm examination (30%) | 70% | 80% | 55% | | | |
| | Final examination (40%) | | | | 75% | 70% | 75% |
| | Exercises/ Quiz (30%) | 30% | 20% | 45% | 25% | 30% | 25% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.1.Grading checklist

| Grading checklist for Written | Repor | ts | | | | | |
|---|-------|-------|----------|--|--|--|--|
| Student: HW/Assignment: | | | | | | | |
| Date: Evaluator: | | | | | | | |
| | Max. | Score | Comments | | | | |
| Technical content (60%) | | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | | |
| principal content | | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | | |
| relevant background and prior work | | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | | |
| mastery | | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | | |
| Organization (10%) | | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | | | |
| Presentation (20%) | | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | | |
| Clear and easy to read | 10 | | | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | | | |
| TOTAL SCORE | 100 | | | | | | |

5.2.Holistic rubric

| I | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | | | |
|------|---|--|--|--|--|--|--|--|
| Scor | Description | | | | | | | |
| e | | | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | | | |
| 0 | No response/task not attempted | | | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | | 1 | T / 11 | |
|----------------|--------------------------|------------------------|-------------------|------------------|
| | | | Issue/ problem | |
| | | | to be considered | |
| | | | critically is | |
| | | | stated but | |
| | | | description | |
| | | Issue/ problem to | leaves some | |
| | Issue/ problem to be | be considered | terms | |
| | considered critically | critically is | undefined, | |
| | is stated clearly and | stated, described, | ambiguities | Issue/ problem |
| | described | and clarified so | unexplored, | to be |
| | | that | boundaries | considered |
| | comprehensively, | | | |
| | delivering all | understanding is | undetermined, | critically is |
| | relevant information | not seriously | and/ or | stated without |
| Explanation | necessary for full | impeded by | backgrounds | clarification or |
| of issues | understanding. | omissions. | unknown. | description. |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is taken | Information is | some | |
| | from source(s) with | taken from | interpretation/ | |
| | enough | source(s) with | evaluation, but | Information is |
| | interpretation/ | enough | not enough to | taken from |
| | evaluation to | interpretation/ | develop a | source(s) |
| | develop a | evaluation to | coherent | without any |
| Evidence | comprehensive | develop a | analysis or | interpretation/ |
| Selecting and | analysis or | coherent analysis | synthesis. | evaluation. |
| _ | = | _ | • | |
| using | synthesis. | or synthesis. | Viewpoints of | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | experts are | experts are |
| investigate a | experts are | experts are subject to | taken as mostly | taken as fact, |
| | point of view questioned | | fact, with little | without |
| or conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | | Shows an |
| | | | | emerging |
| | | | Questions some | awareness of |
| | Thoroughly | | assumptions. | present |
| | (systematically and | | Identifies | assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | | contexts when | labels |
| | others' assumptions | Identifies own | presenting a | assertions as |
| | and carefully | and others' | position. May | assumptions). |
| | evaluates the | assumptions and | be more aware | Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| assumptions | Poblation. | Poblacii. | (31 1100 101bu). | Poblation. |

| | Creation resition | | | |
|--------------------|-----------------------|---------------------|-------------------|-----------------|
| | Specific position | | | |
| | (perspective, thesis/ | | | |
| | hypothesis) is | d :c | | |
| | imaginative, taking | Specific position | | |
| | into account the | (perspective, | | |
| | complexities of an | thesis/hypothesis) | | |
| | issue. Limits of | takes into account | | |
| | position | the complexities | | |
| | (perspective, thesis/ | of an issue. | Specific | Specific |
| | hypothesis) are | Others' points of | position | position |
| | acknowledged. | view are | (perspective, | (perspective, |
| Student's | Others' points of | acknowledged | thesis/ | thesis/ |
| position | view are synthesized | within position | hypothesis) | hypothesis) is |
| (perspective, | within position | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | (perspective, thesis/ | thesis/ | different sides | simplistic and |
| esis) hypothesis). | | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | | logically tied to | |
| | | | information | |
| | Conclusions and | Conclusion is | (because | Conclusion is |
| | related outcomes | logically tied to a | information is | inconsistently |
| | (consequences and | range of | chosen to fit the | tied to some of |
| | implications) are | information, | desired | the information |
| | logical and reflect | including | conclusion); | discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubric for evaluating presentation tasks: | | | | | | | |
|--|-------------------|-------------------|-------------------|---------------------|--|--|--|
| | Capstone | Mile | stone | Benchmark | | | |
| | 4 | 3 | 2 | 1 | | | |
| | Organizational | | | | | | |
| | pattern (specific | Organizational | | | | | |
| | introduction and | pattern (specific | Organizational | | | | |
| | conclusion, | introduction and | pattern (specific | | | | |
| | sequenced | conclusion, | introduction and | Organizational | | | |
| | material within | sequenced | conclusion, | pattern (specific | | | |
| | the body, and | material within | sequenced | introduction and | | | |
| | transitions) is | the body, and | material within | conclusion, | | | |
| | clearly and | transitions) is | the body, and | sequenced | | | |
| | consistently | clearly and | transitions) is | material within | | | |
| | observable and is | consistently | intermittently | the body, and | | | |
| | skillful and | observable | observable | transitions) is not | | | |
| | makes the content | within the | within the | observable within | | | |
| Organization | of the | presentation. | presentation. | the presentation. | | | |

| | presentation | | | |
|------------|--------------------------|--------------------------|--------------------------|-------------------------------|
| | cohesive. | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | Language | |
| | Language choices | Language | choices are | |
| | are imaginative, | choices are | mundane and | Language choices |
| | memorable, and | thoughtful and | commonplace | are unclear and |
| | compelling, and | generally | and partially | minimally support |
| | enhance the | support the | support the | the effectiveness |
| | effectiveness of | effectiveness of | effectiveness of | of the |
| | the presentation. | the presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| Language | appropriate to audience. | appropriate to audience. | appropriate to audience. | appropriate to audience. |
| Language | | audience. | | |
| | Delivery techniques | Delivery | Delivery techniques | Delivery techniques |
| | (posture, gesture, | techniques | (posture, gesture, | (posture, gesture, |
| | eye contact, and | (posture, gesture, | eye contact, and | eye contact, and |
| | vocal | eye contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandability |
| | compelling, and | presentation | understandable, | of the |
| | speaker appears | interesting, and | and speaker | presentation, and |
| | polished and | speaker appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of types | Supporting | Supporting | |
| | of supporting | materials | materials | Insufficient |
| | materials | (explanations, | (explanations, | supporting |
| | (explanations, | examples, | examples, | materials |
| | examples, | illustrations, | illustrations, | (explanations, |
| | illustrations, | statistics, | statistics, | examples, |
| | statistics, | analogies, | analogies, | illustrations, |
| | analogies, | quotations from relevant | quotations from relevant | statistics, |
| | quotations from relevant | authorities) | authorities) make | analogies, quotations from |
| | authorities) make | make | appropriate | relevant |
| | appropriate | appropriate | reference to | authorities) make |
| | reference to | reference to | information or | reference to |
| | information or | information or | analysis that | information or |
| | analysis that | analysis that | partially supports | analysis that |
| | significantly | generally | the presentation | minimally |
| | supports the | supports the | or establishes the | supports the |
| | presentation or | presentation or | presenter's | presentation or |
| | establishes the | establishes the | credibility/ | establishes the |
| Supporting | presenter's | presenter's | authority on the | presenter's |
| Material | credibility/ | credibility/ | topic. | credibility/ |

| | authority on the topic. | authority on the topic. | | authority on the topic. |
|---------|--|--|--|---|
| Control | Central message is compelling (precisely stated, appropriately repeated, memorable, and | Central message is clear and consistent with | Central message is basically understandable but is not often | Central message can be deduced but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Scalable and Distributed Computing

Course Code: IT139

1. General information

| Course designation | Fundamental concepts in distributed computing and discuss system | | | |
|---|---|--|--|--|
| Course designation | designs enabling distributed applications | | | |
| Semester(s) in which the course is taught | 5,7 | | | |
| Person responsible for the course | Assoc. Prof. Vo Thi Luu Phuong | | | |
| Language | English | | | |
| Relation to curriculum | Compulsory (NE, DS) | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | |
| Workload (incl. contact hours, self-study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | |
| Required and recommended prerequisites for joining the course | Algorithms and Data Structure Fundamentals of Programming | | | |
| Course objectives | This course presents the theory, design, implementation, and analysis of distributed systems. Through classroom lectures, labs, projects and exercises, students learn the fundamentals of distributed systems, system models, remote procedure call, distributed objects, operating system support, security in distributed systems, distributed file systems, concurrency, transaction and synchronization, replication. The course also covers advanced topics related to cloud and distributed data processing technologies: data partitioning, storage schemes, stream processing, and parallel algorithms. Course introduces some modern Internet and cloud computing services running on multiple geographically distributed data centers: Google, Yahoo, Facebook, iTunes, Amazon, eBay, Bing, etc. | | | |
| Course learning outcomes | CLO 1. Understand the concept and design of distributed systems CLO 2. Apply distributed data processing models and technologies CLO 3. Communicate to the team to design the data pipeline that can be integrated with distributed system, CLO 4. Design and implement components of a scalable and distributed system (millions of users and petabytes of data) Competency level Course learning outcome (CLO) Knowledge CLO 1, CLO 2, CLO 3, CLO 4 | | | |

| | | Skill | CLO 2, CLO 4 | | |
|--|--|--|----------------------|---|------|
| | | Attitude | CLO 3 | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | Topic Weight Level | | | | |
| | Intro | oduction to Distribute lels | ed Systems, System | 1 | I, T |
| | Ren | note Procedure Call, I | Distributed Objects | 1 | I, T |
| | Ope Syst | rating System Supportems | rt, Distributed File | 1 | I, T |
| | Trar | saction and Synchro | nization | 1 | T, U |
| | Con | currency Control | | 1 | T, U |
| | Secu | ırity | | 1 | T, U |
| | Faul | t and Failure | | 1 | T, U |
| | Intro | oduction to MapRedu | ce | 1 | T, U |
| | Scal | Scalable K-means algorithms | | | T, U |
| | Graj | Graph and Random-walk algorithms | | | T, U |
| | Web services, XML, JSON, Node.js | | | 1 | T, U |
| | Peer | Peer-to-Peer | | | I, T |
| | | Selected seminar 1: Introduce some distributed pipeline in Industry. | | | I |
| | | Selected seminar 2: Introduce some scalable and distributed products used in Industry. | | | I |
| Examination forms Study and examination requirements | Multiple-choice questions, short-answer questions Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | points overall to pass this course. 1. G. Coulouris, J. Dollimore, T. Kindberg, G. Blair, Distributed Systems: Concepts and Design 5th, 2011 2. T. White, Hadoop: The Definitive Guide 4th, 2015 3. A.S. Tanenbaum, M.V. Steen, Distributed Systems: Principles and Paradigms 2nd, 2007 | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO |
|--|-----|

| CL O | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|---|---|---|---|---|---|
| 1 | X | | | | | |
| 2 | X | X | | | | |
| 3 | X | X | | | | X |
| 4 | | X | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessment | Learning | Resource |
|---------|---|-----|------------|-----------------------------------|-----------------------------|
| VV CCII | Topic | CLO | S | activities | s |
| 1 | Introduction to Distributed | 1 | | Lecture, Discussion | [1,2,3] |
| | Systems, System Models | | | | Chapter 1 |
| 2 | Remote Procedure Call, Distributed Objects | 1 | Exercises | Lecture, In-class exercises | [1,3] Chapter 2 |
| 3 | Operating System Support, Distributed File Systems | 1 | Exercises | Lecture, In-class exercises | [1,3] Chapter 3 |
| 4 | Transaction and Synchronization | 1,2 | Labs | Lecture, In-class exercises | [1,3] Chapter 3,4 |
| 5 | Concurrency Control | 1,2 | Labs | Lecture, In-class exercises | [1,3] Chapter 5,6 |
| 6 | Midterm | | | | |
| 7 | Security | 2,3 | Exercises | Lecture, In-class exercises | [1,3] Chapter 6,7 |
| 8 | Fault and Failure | 2,3 | Labs | Lecture, In-class exercises | [2] Chapter 5 |
| 9 | Introduction to MapReduce | 2,3 | Exercises | Lecture, In-class exercises | [2] Chapter 6,7 |
| 10 | Scalable K-means algorithms | 2,3 | Labs | Lecture, In-class exercises | Outside resources |
| 11 | Graph and Random-walk algorithms | 2,3 | Exercises | Lecture, In-class exercises | Outside resources |
| 12 | Web services, XML, JSON, Node.js | 3,4 | Labs | Lecture, In-class exercises | [1,3] Chapter 9,10,11 |
| 13 | Peer-to-Peer | 3,4 | Labs | Lecture, In-class exercises | [1,3] Chapter 12 |

| 14 | Selected seminar 1: Introduce some distributed pipeline in Industry. | 4 | Discussion | Outside resources |
|----|--|---|-------------|-------------------|
| 15 | Selected seminar 2: Introduce some scalable and distributed products used in Industry. | 4 | Discussion | Outside resources |
| 16 | Revision | | Review-test | |
| 17 | Final exam | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---------------------------|------|------|------|
| Labs (20%) | | 50% | 50% |
| Midterm examination (30%) | 50% | 50% | |
| Final examination (40%) | 20% | 50% | 30% |
| Exercises/ Quiz (10%) | 50% | 50% | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

5.1.Grading checklist

| Grading checklist for Written Reports | | | | | | |
|---|------|-------|----------|--|--|--|
| Student: HW/Assignment: | | | | | | |
| Date: Evaluator: | | | | | | |
| | Max. | Score | Comments | | | |
| Technical content (60%) | | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | | |
| principal content | | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | | |
| relevant background and prior work | | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | | |
| mastery | | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | | |
| Organization (10%) | | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | | |
| Presentation (20%) | | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | | |
| Clear and easy to read | 10 | | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | | |
| TOTAL SCORE | 100 | | | | | |

5.2.Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW |
|------|--|
| Scor | Description |
| e | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are |
| | included in response |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are |
| | included. |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are |
| | included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are |
| | missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric Critical thinking value rubric for evaluating questions in exams:

| Issue/ problem to be considered critically | Issue/ problem to be considered | Issue/ problem to be considered critically is stated but description leaves some | 1 |
|---|---|--|---|
| • | | to be considered critically is stated but description | |
| is stated clearly and described comprehensively, delivering all | critically is stated, described, and clarified so that understanding is | terms undefined, ambiguities unexplored, boundaries undetermined, | Issue/ problem to be considered critically is |
| relevant information | not seriously | and/ or | stated without |
| - | | • | clarification or description. |
| Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a | Information is taken from source(s) without any interpretation/ |
| - | 1 | coherent | evaluation. |
| synthesis. Viewpoints of experts are questioned | or synthesis. Viewpoints of experts are subject to | analysis or synthesis. Viewpoints of experts are | Viewpoints of experts are taken as fact, without question. |
| | is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding. Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are | stated clearly and described and clarified so that understanding is not seriously impeded by omissions. Information is taken from source(s) with enough interpretation/evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned stated, described, and clarified so that understanding is not seriously impeded by omissions. Information is taken Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are questioned | stated clearly and described, and clarified so that understanding is undetermined, and/ or backgrounds unknown. Information is taken from source(s) with enough interpretation/ evaluation to develop a analysis or synthesis. Viewpoints of experts are questioned stated, described, and clarified so unexplored, boundaries undetermined, and/ or backgrounds unknown. Information is taken from source(s) with some interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are questioned |

| | | | fact, with little | |
|---------------|-----------------------|-----------------------|---------------------------------|-----------------|
| | | | questioning. | |
| | | | | Shows an |
| | | | | emerging |
| | | | Questions some | awareness of |
| | Thoroughly | | assumptions. | |
| | | | Identifies | present |
| | (systematically and | | | assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | 7.1 1.01 | contexts when | labels |
| | others' assumptions | Identifies own | presenting a | assertions as |
| | and carefully | and others' | position. May | assumptions). |
| | evaluates the | assumptions and | be more aware | Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| | Specific position | | | |
| | (perspective, thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, taking | Specific position | | |
| | into account the | (perspective, | | |
| | complexities of an | thesis/hypothesis) | | |
| | issue. Limits of | takes into account | | |
| | position | the complexities | | |
| | (perspective, thesis/ | of an issue. | Specific | Specific |
| | hypothesis) are | Others' points of | position | position |
| | acknowledged. | view are | (perspective, | (perspective, |
| Student's | Others' points of | acknowledged | thesis/ | thesis/ |
| position | view are synthesized | within position | hypothesis) | hypothesis) is |
| - | • | - | * * | stated, but is |
| (perspective, | within position | (perspective, thesis/ | acknowledges different sides | , |
| thesis/hypoth | (perspective, thesis/ | | | simplistic and |
| esis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | | logically tied to | |
| | | | information | |
| | Conclusions and | Conclusion is | (because | Conclusion is |
| | related outcomes | logically tied to a | information is | inconsistently |
| | (consequences and | range of | chosen to fit the | tied to some of |
| | implications) are | information, | desired | the information |
| | logical and reflect | including | conclusion); | discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Milestone | | Benchmark |
|------------------------|--|--|---|---|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern (specific introduction and conclusion, | Organizational | | |
| | sequenced material within the body, and transitions) is clearly and consistently observable and is | pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and | Organizational pattern (specific introduction and conclusion, sequenced |
| Organization | skillful and makes the content of the presentation cohesive. | clearly and consistently observable within the presentation. | transitions) is intermittently observable within the presentation. | material within the body, and transitions) is not observable within the presentation. |
| | Language choices are imaginative, memorable, and compelling, and | Language choices are thoughtful and generally | Language choices are mundane and commonplace and partially | Language choices are unclear and minimally support |
| | enhance the effectiveness of the presentation. Language in | support the effectiveness of the presentation. Language in | support the effectiveness of the presentation. Language in | the effectiveness of the presentation. Language in |
| Language | presentation is appropriate to audience. Delivery | presentation is appropriate to audience. | presentation is appropriate to audience. Delivery | presentation is not appropriate to audience. Delivery |
| | techniques (posture, gesture, eye contact, and vocal | Delivery techniques (posture, gesture, eye contact, and | techniques (posture, gesture, eye contact, and vocal | techniques (posture, gesture, eye contact, and vocal |
| | expressiveness) make the presentation compelling, and speaker appears | vocal expressiveness) make the presentation interesting, and | expressiveness) make the presentation understandable, and speaker | expressiveness) detract from the understandability of the presentation, and |
| Delivery | polished and confident. A variety of types | speaker appears comfortable. Supporting | appears tentative. Supporting | speaker appears uncomfortable. Insufficient |
| | of supporting materials (explanations, examples, | materials (explanations, examples, illustrations, | materials (explanations, examples, illustrations, | supporting materials (explanations, examples, |
| Supporting Material | illustrations, statistics, analogies, | statistics, analogies, quotations from | statistics, analogies, quotations from | illustrations, statistics, analogies, |

| | quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic. |
|--------------------|--|--|--|--|
| Central Message | Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.) | Central message is clear and consistent with the supporting material. | Central message is basically understandable but is not often repeated and is not memorable. | Central message can be deduced but is not explicitly stated in the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**(Signature)

1 1 Kan

Assoc.Prof. Nguyen Van Sinh

Course Name: Business Process Analysis

Course Code: IT144

General information

| Course designation | The course aims to provide fundamental knowledge of business process analysis, improvement and evaluation. |
|---|---|
| Semester(s) in which the course is | 7 |
| Person responsible for the course | Assof. Pror.Dr. Vo Thi Luu Phuong |
| Language | English |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 195 hours. Lecture: 45 hours. Lab: 30 hours. Private study including examination preparation, specified in hours: 120 hours. Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | None |
| Course objectives | Every organization thrives to implement effective business processes to increase employee and customer satisfaction, enhance business performance, reduce costs and boost productivity. All activities including altering critical processes, merging or splitting business units require a consistent framework to manage the changes. The course aims to provide fundamental knowledge of business process analysis, improvement and evaluation. Various approaches, techniques and software tools used to analyze and manage business process improvement are also introduced in the course. |
| Course learning outcomes | CLO 1. Practice the Framework for Process Improvement CLO 2. Identify and analyze an organization's business process using different techniques such as ANSI, Swim Lane, Business Process Diagrams, UML, SIPOC, and Value Stream Maps CLO 3. Evaluate process improvement effectiveness |

| | Competency leve | l | Course learni | ing outcome (CLO) | |
|-------------------|---|--------|----------------|-------------------|--|
| | Knowledge | | 1, 2, 3 | | |
| | Skill | | 1, 3 | | |
| | Attitude | | | | |
| | | | | | |
| Content | The description of the contents should weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach | | e level. s) | · | |
| | | Weight | | Level | |
| | ience in Action | 1 | | I | |
| | Models and 3 Discovery | | | T, U | |
| | nt Types of Models | 4 | | T,U | |
| | Discovery ques and mance Checking | 3 | | T,U | |
| | nent of Process | 3 | | T,U | |
| | onal Support and 1 sions | | | I | |
| Examination forms | Multiple-choice questions, short-answer questions | | | | |
| Study and | Attendance: A minimum attendance of 80 percent is | | | | |
| examination | compulsory for the class sessions. Students will be assessed on | | | | |
| requirements | the basis of their class participation. Questions and comments | | | | |
| | are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | • | • | | | |

Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | | X | | | X | |
| 2 | | X | | | | |
| 3 | | X | X | | | |
| | | | | | | |

Planned learning activities and teaching methods

| Week | Topic | CLO | Assessmen ts | Learning activities | Resources |
|------|---|------|--------------------------------------|---------------------------------|-----------|
| 1 | Data Science in Action | 2 | Midterm | In-class activities | |
| 2 | Process Models and Process Discovery | 2, 5 | Midterm, Quiz, Project, Lab | In-class activities, quiz | |
| 3 | Midterm | | | | |
| 4 | Different Types of Process Models | 2 | Final, Project, Lab | In-class activities | |
| 5 | Process Discovery Technique s and Conforman ce Checking | 2, 3 | Final, Project, Quiz, Lab | In-class activities, Quiz | |
| 6 | Enrichmen t of Process Models | 2 | Final, Project, Lab | In-class activities | |
| 7 | Operationa 1 Support and Conclusion s | 2 | Final, Project, Lab | In-class activities | |
| 8 | Final exam | | | | |

Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|-----------------------------------|------|------|------|
| Labs (20%) | 20% | 20% | |
| Midterm examination (30%) | 50% | 40% | |
| Final examination (40%) | | 20% | 60% |
| Exercises/ Quiz/ Project (10%) | 30% | 20% | 40% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

2. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.4. Grading checklist

| Grading checklist for Written | Reports | | | | |
|--|---------|-------|----------|--|--|
| Student: HW/Assignment: | | | | | |
| Date: Evaluator: | | | | | |
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes principal | 10 | | | | |
| content | | | | | |
| Introduction demonstrates thorough knowledge of relevant | 15 | | | | |
| background and prior work | | | | | |
| Analysis and discussion demonstrate good subject mastery | 30 | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.5. Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|------|---|--|--|--|--|
| Scor | Description | | | | |
| e | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.6. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| Explanation of issues | Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding. | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions. | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/ or backgrounds unknown. | Issue/ problem to be considered critically is stated without clarification or description. |
|---|---|---|---|---|
| Evidence Selecting and using information to investigate a point of view or conclusion | Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly. | Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning. | Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning. | Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question. |
| Influence of context and assumptions | Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. | Identifies own and others' assumptions and several relevant contexts when presenting a position. | Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa). | Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position. |

| | Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. | Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are | Specific position (perspective, | Specific position (perspective, |
|---------------|--|--|---|---------------------------------|
| Student's | Others' points of | acknowledged | thesis/ | thesis/ |
| position | view are synthesized | within position | hypothesis) | hypothesis) is |
| (perspective, | within position | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | (perspective, thesis/ | thesis/ | different sides | simplistic and |
| esis) | hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is logically tied to information | |
| | Conclusions and | Conclusion is | (because | Conclusion is |
| | related outcomes | logically tied to a | information is | inconsistently |
| | (consequences and | range of | chosen to fit the | tied to some of |
| | implications) are | information, | desired | the information |
| | logical and reflect | including | conclusion); | discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubric for evaluating presentation tasks: | | | | | |
|--|-------------------|-------------------|-------------------|---------------------|--|
| | Capstone | Mile | stone | Benchmark | |
| | 4 | 3 | 2 | 1 | |
| | Organizational | | | | |
| | pattern (specific | Organizational | | | |
| | introduction and | pattern (specific | Organizational | | |
| | conclusion, | introduction and | pattern (specific | | |
| | sequenced | conclusion, | introduction and | Organizational | |
| | material within | sequenced | conclusion, | pattern (specific | |
| | the body, and | material within | sequenced | introduction and | |
| | transitions) is | the body, and | material within | conclusion, | |
| | clearly and | transitions) is | the body, and | sequenced | |
| | consistently | clearly and | transitions) is | material within | |
| | observable and is | consistently | intermittently | the body, and | |
| | skillful and | observable | observable | transitions) is not | |
| | makes the content | within the | within the | observable within | |
| Organization | of the | presentation. | presentation. | the presentation. | |

| | presentation cohesive. | | | |
|------------------------|---|---|---|--|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Eurgunge | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears |
| Delivery | confident. A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's | Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's |
| Supporting Material | credibility/ authority on the topic. | credibility/ authority on the topic. | credibility/ authority on the topic. | credibility/ authority on the topic. |

| | Central message is compelling | | | |
|---------|-------------------------------|-----------------|------------------|----------------------|
| | (precisely stated, | | Central message | |
| | appropriately | Central message | is basically | Central message |
| | repeated, | is clear and | understandable | can be deduced |
| | memorable, and | consistent with | but is not often | but is not |
| Central | strongly | the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**(Signature)

Assoc.Prof. Nguyen Van Sinh

Course Name: Big Data Analytics

Course Code: IT173IU

General information

| Course name - (In English): Big Data Analytics | |
|--|-----|
| - (In Vietnamese): Phân tích dữ liệu lớn | |
| Course The aim of this course is first to provide the students revision on the | |
| designation critical concepts and knowledges of big data, the goals of big data. | |
| Secondly, it gives the students the overview on the popular techniq | ues |
| and latest technologies used to deal with big data analytics. | |
| Course type General knowledge | |
| ☐ Fundamental | |
| ☐ ☑ Specialized knowledge | |
| Internship/Project/Thesis | |
| □ Others: | |
| | |
| Semester(s) in 7 | |
| which the | |
| course is taught | |
| Person Mai Hoang Bao An, PhD. | |
| responsible for | |
| the course | |
| Language English | |
| Relation to Compulsory | |
| curriculum | |
| Teaching Lecture, lesson, project, seminar. | |
| methods | |
| Workload (incl. (Estimated) Total workload: 182.5 hours | |
| contact hours, Contact hours (please specify whether lecture, exercise, laboratory | |
| self-study hours) session, etc.): Lecture: 37.5 hours + Laboratory: 25 hours | |
| Private study including examination preparation, specified in hours | j: |
| 120 hours | |
| Credit points 4 credits (Theory: 3 + Practice: 1) | |
| 6.18 ECTS | |
| Number of Theory: 45 | |
| periods Practice: 30 | |
| Required and Data Analysis | |
| recommended | |
| prerequisites for | |
| joining the | |
| course | |
| Course Big Data Analytics provides baseline general knowledge of the | |
| objectives techniques and technologies used in Data era of both small-to-med | ium |
| tabular data to Big Data solutions. It covers the development of | |
| solutions using the Hadoop ecosystem, including MapReduce, HD | FS, |
| Apache Spark programming frameworks. This course helps studen | |
| build a foundation for working with Apache Big Data solutions. | |

Course learning outcomes

CLO 1. Revise the knowledge of data pipeline, small-to-medium data, types of data and related use cases. Revision on the programming used to handle with data pipeline.

CLO 2. Get knowledge of selecting data solutions. Identify common tools and technologies that can be used to create Big Data solutions. CLO 3. Get knowledges on popular models of Big Data Analytics with

Spark. Design the MapReduce programming framework, including the map, shuffle and sort, and reduce components.

CLO 4. Get to know how to do the learning pipelines with Big Data. Implement Big Data solutions using different big data programming frameworks.

| Competency level | Course learning outcome (CLO) |
|-------------------------|-------------------------------|
| Knowledge | CLO 1, CLO 2, CLO 3, CLO 4 |
| Skill | CLO 2, CLO 3, CLO 4 |
| Attitude | CLO 3, CLO 4 |

Content

The description The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (3 hours)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

| Topic | Weight | Level |
|--|--------|-------|
| Revision on data pipeline concepts | 1 | I |
| Introduction to some successful data | | |
| solutions. | | |
| Introduction to Big Data | 1 | I, U |
| Introduction to necessary tools | | |
| Remind on EDA | 1 | T, U |
| Remind on Python and some related | | |
| libraries used to analyze data. | | |
| Advanced on programming used to | 1 | T, U |
| deal with data pipeline, Big Data. | | |
| Applications in Text Analytics | | |
| Support Visual Analytics in data | | |
| pipeline | | |
| Summary on data preparation | 1 | T, U |
| Databases for common data and | | |
| related contents | | |
| Introduction to Dask for handling with | 1 | T, U |
| Big data. | | |
| Practice with Dask | 2 | |
| Remind to Hadoop/MapReduce | 1 | T, U |
| Some examples with the concepts of | | |
| MapReduce in python. | | |
| Data preparation with pySpark | 2 | I, T |
| - Data manipulation | | |
| - Data preparation | | |
| - Miscellaneous | | |
| Machine Learning with Spark | 3 | T, U |
| - Regression | | |
| - Classification | | |
| Basic Text Mining with Spark | 1 | T, U |

| | A case study Some advanced topics: Apache Kafka | | | |
|---|--|--|--|--|
| Examination forms | Short-answer questions, Long-answer questions, projects | | | |
| Study and examination requirements Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | |
| Reading list | [1] Viktor Mayer-Schönberger, Kenneth Cukier., Big Data: A Revolution That Will Transform How We Live, Work, and Think., Harper Business; Reprint edition. [2] Sumit Pal., SQL on Big Data: Technology, Architecture, and Innovation., Apress; 1st edition. [3] Nandhini Abirami R, Seifedine Kadry, Amir H. Gandomi, Balamurugan Balusamy., Big Data: Concepts, Technology, and Architecture., Wiley; 1st edition. [4] Bill Chambers, Matei Zaharia., Spark: The Definitive Guide: Big Data Processing Made Simple., O'Reilly Media; 1st edition. | | | |

Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student

Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | X | X | X | | | |
| 3 | | X | | X | X | X |
| 4 | | | | | X | X |

Planned learning activities and teaching methods

| Week | Торіс | CLO | Assessments | Learning activities | Resources |
|------|--|------|-----------------|-----------------------------------|-------------------------|
| 1 | Revision on data pipeline concepts Introduction to some successful data solutions. | 1 | | Lecture, Discussion | [1] Chapter 1, 2 |
| 2 | Introduction to Big Data Introduction to necessary tools | 1, 2 | Exercises | Lecture, In-class exercises | [1,2] Chapter 2, 3 |
| 3 | Remind on EDA Remind on Python and some related libraries. | 1, 2 | Exercises | Lecture, In-class exercises | [1,2,3] Chapter 4, 5 |
| 4 | Advanced on programming used to deal with data pipeline, Big Data. Applications in Text Analytics Support Visual Analytics in data pipeline | 1, 2 | Exercises, labs | Lecture, In-class exercises | [2,3] Chapter 5, 6 |
| 5 | Summary on data preparation | 2, 3 | Exercises, labs | Lecture, | [2,3] Chapter 7 |

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|-------|---|---------|-----------------|-----------------------------------|--------------------------|
| | Databases for common data and related contents | | | In-class exercises | |
| 6 | Introduction to Dask for handling with Big data. | 2, 3 | Exercises, labs | Lecture, In-class exercises | [2,3] Chapter 8, 9 |
| 7-8 | Practice with Dask | 2, 3, 4 | Exercises, labs | Lecture, In-class exercises | [2,3] Chapter 10, 11 |
| 9 | Midterm | | | | |
| 10 | Remind to Hadoop/MapReduce Some examples with the concepts of MapReduce in python. | 2, 3, 4 | Exercises, labs | Lecture, In-class exercises | [4] Chapter 3, 4, 5 |
| 11-12 | Data preparation with pySpark - Data manipulation - Data preparation - Miscellaneous | 2, 3, 4 | Exercises, labs | Lecture, In-class exercises | [4] Chapter 6, 7, 8 |
| 13-15 | Machine Learning with Spark - Regression - Classification | 2, 3, 4 | Projects, labs | Lecture, In-class exercises | [4] Chapter 8, 9, 10, 11 |
| 16 | Basic Text Mining with Spark A case study Some advanced topics: Apache Kafka | 3, 4 | Seminar | Lecture, Discussion | [4] Chapter 12 |
| 17 | Final exam | | | | |

Assessment plan

| t plan | | | | |
|--------------------------------------|------|------|------|------|
| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
| Quiz (15%) | 20% | | 20% | 20% |
| Midterm examination (30%) | 50% | 50% | | |
| Projects/Presentations/ Report (15%) | 30% | | 30% | 30% |
| Final examination (40%) | | 50% | 50% | 50% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

5.1. Grading checklist

| Crading check | list for Written | Report | te | | |
|---|------------------|--------|----|----------|--|
| Student: HW/Assignment: Evaluator: | | | | | |
| | | | | Comments | |
| Technical content (60 | %) | | | | |
| Abstract clearly identifies purpose and sur | nmarizes | 10 | | | |
| principal content | | | | | |

| Introduction demonstrates thorough knowledge of relevant background and prior work | 15 | |
|--|-----|--|
| Analysis and discussion demonstrate good subject | 30 | |
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good transitions | 5 | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| I | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|------|--|--|--|--|--|--|
| Scor | Description | | | | | |
| e | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are | | | | | |
| | included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are | | | | | |
| | included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | | | | |
| | included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | | |
| | missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical inthicing | value rubic for evaluating questions in exams. | | | | | |
|--------------------|--|--------------------|------------------|------------------|--|--|
| | Capstone | Miles | tone | Benchmark | | |
| | 4 | 3 | 2 | 1 | | |
| Explanation | Issue/ problem to be | Issue/ problem to | Issue/ problem | Issue/ problem | | |
| of issues | considered critically | be considered | to be considered | to be | | |
| | is stated clearly and | critically is | critically is | considered | | |
| | described | stated, described, | stated but | critically is | | |
| | comprehensively, | and clarified so | description | stated without | | |
| | delivering all | that | leaves some | clarification or | | |
| | relevant information | understanding is | terms | description. | | |
| | necessary for full | not seriously | undefined, | | | |
| | understanding. | impeded by | ambiguities | | | |
| | | omissions. | unexplored, | | | |
| | | | boundaries | | | |
| | | | undetermined, | | | |
| | | | and/ or | | | |
| | | | backgrounds | | | |
| | | | unknown. | | | |

| Evidence | Information is taken | Information is | Information is | Information is |
|----------------|-----------------------|--------------------|-------------------|-----------------|
| Selecting and | from source(s) with | taken from | taken from | taken from |
| using | enough | source(s) with | source(s) with | source(s) |
| information to | interpretation/ | enough | some | without any |
| investigate a | evaluation to | interpretation/ | interpretation/ | interpretation/ |
| point of view | develop a | evaluation to | evaluation, but | evaluation. |
| or conclusion | comprehensive | develop a | not enough to | Viewpoints of |
| | analysis or | coherent analysis | develop a | experts are |
| | synthesis. | or synthesis. | coherent | taken as fact, |
| | Viewpoints of | Viewpoints of | analysis or | without |
| | experts are | experts are | synthesis. | question. |
| | questioned | subject to | Viewpoints of | |
| | thoroughly. | questioning. | experts are | |
| | | | taken as mostly | |
| | | | fact, with little | |
| | | | questioning. | |
| Influence of | Thoroughly | Identifies own | Questions some | Shows an |
| context and | (systematically and | and others' | assumptions. | emerging |
| assumptions | methodically) | assumptions and | Identifies | awareness of |
| | analyzes own and | several relevant | several relevant | present |
| | others' assumptions | contexts when | contexts when | assumptions |
| | and carefully | presenting a | presenting a | (sometimes |
| | evaluates the | position. | position. May | labels |
| | relevance of | | be more aware | assertions as |
| | contexts when | | of others' | assumptions). |
| | presenting a | | assumptions | Begins to |
| | position. | | than one's own | identify some |
| | | | (or vice versa). | contexts when |
| | | | | presenting a |
| | | | | position. |
| Student's | Specific position | Specific position | Specific | Specific |
| position | (perspective, thesis/ | (perspective, | position | position |
| (perspective, | hypothesis) is | thesis/hypothesis) | (perspective, | (perspective, |
| thesis/hypoth | imaginative, taking | takes into account | thesis/ | thesis/ |
| esis) | into account the | the complexities | hypothesis) | hypothesis) is |
| | complexities of an | of an issue. | acknowledges | stated, but is |
| | issue. Limits of | Others' points of | different sides | simplistic and |
| | position | view are | of an issue. | obvious. |
| | (perspective, thesis/ | acknowledged | | |
| | hypothesis) are | within position | | |
| | acknowledged. | (perspective, | | |
| | Others' points of | thesis/ | | |
| | view are synthesized | hypothesis). | | |
| | within position | | | |
| | (perspective, thesis/ | | | |
| | hypothesis). | | | |

| Conclusions | Conclusions and | Conclusion is | Conclusion is | Conclusion is |
|---------------|-----------------------|---------------------|-------------------|-----------------|
| and related | related outcomes | logically tied to a | logically tied to | inconsistently |
| outcomes | (consequences and | range of | information | tied to some of |
| (implications | implications) are | information, | (because | the information |
| and | logical and reflect | including | information is | discussed; |
| consequences | student's informed | opposing | chosen to fit the | related |
|) | evaluation and | viewpoints; | desired | outcomes |
| | ability to place | related outcomes | conclusion); | (consequences |
| | evidence and | (consequences | some related | and |
| | perspectives | and implications) | outcomes | implications) |
| | discussed in priority | are identified | (consequences | are |
| | order. | clearly. | and | oversimplified. |
| | | | implications) | |
| | | | are identified | |
| | | | clearly. | |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | | stone | Benchmark |
|--------------|---|--|--|---|
| | 4 | 3 | 2 | 1 |
| Organization | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation. | Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation. |
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |

| Dalimor | Daliman | Dalissams | Dalissami | Dalissams |
|------------|--------------------|--------------------|--------------------|----------------------|
| Delivery | Delivery | Delivery | Delivery | Delivery |
| | techniques | techniques | techniques | techniques |
| | (posture, gesture, | (posture, gesture, | (posture, gesture, | (posture, gesture, |
| | eye contact, and | eye contact, and | eye contact, and | eye contact, and |
| | vocal | vocal . | vocal | vocal |
| | expressiveness) | expressiveness) | expressiveness) | expressiveness) |
| | make the | make the | make the | detract from the |
| | presentation | presentation | presentation | understandability |
| | compelling, and | interesting, and | understandable, | of the |
| | speaker appears | speaker appears | and speaker | presentation, and |
| | polished and | comfortable. | appears | speaker appears |
| | confident. | | tentative. | uncomfortable. |
| Supporting | A variety of types | Supporting | Supporting | Insufficient |
| Material | of supporting | materials | materials | supporting |
| | materials | (explanations, | (explanations, | materials |
| | (explanations, | examples, | examples, | (explanations, |
| | examples, | illustrations, | illustrations, | examples, |
| | illustrations, | statistics, | statistics, | illustrations, |
| | statistics, | analogies, | analogies, | statistics, |
| | analogies, | quotations from | quotations from | analogies, |
| | quotations from | relevant | relevant | quotations from |
| | relevant | authorities) make | authorities) make | relevant |
| | authorities) make | appropriate | appropriate | authorities) make |
| | appropriate | reference to | reference to | reference to |
| | reference to | information or | information or | information or |
| | information or | analysis that | analysis that | analysis that |
| | analysis that | generally | partially supports | minimally |
| | significantly | supports the | the presentation | supports the |
| | supports the | presentation or | or establishes the | presentation or |
| | presentation or | establishes the | presenter's | establishes the |
| | establishes the | presenter's | credibility/ | presenter's |
| | presenter's | credibility/ | authority on the | credibility/ |
| | credibility/ | authority on the | topic. | authority on the |
| | authority on the | topic. | | topic. |
| | topic. | | | |
| Central | Central message | Central message | Central message | Central message |
| Message | is compelling | is clear and | is basically | can be deduced |
| | (precisely stated, | consistent with | understandable | but is not |
| | appropriately | the supporting | but is not often | explicitly stated in |
| | repeated, | material. | repeated and is | the presentation. |
| | memorable, and | | not memorable. | |
| | strongly | | | |
| | supported.) | | | |
| | | I | 1 | 1 |

Date revised: April 24, 2024

Ho Chi Minh City, 24/04/2024

Dean of the School of Computer Science and Engineering

(Signature)

Manh

Nguyen Van Sinh

Course Name: Decision support systems

Course Code: IT145IU

General information

| Course designation | Introduction to the decision support system (DSS), an interactive computer-based system (or subsystem) intended to help decision makers. DSS simulate cognitive decision-making functions of humans based on AI methods including the area of knowledge: Expert systems, Data mining, Machine learning, Connectionism, Logical reasoning. |
|---|---|
| Semester(s) in which the course is taught | semester |
| Person responsible for the course | Nguyen Van Sinh, Assoc.Prof. |
| Language | English |
| Relation to curriculum | Compulsory / elective / specialisation Names of other study programmes with which the module is shared |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignments. |
| Credit points | Number of credits : 4 Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Object-Oriented Programming |
| Course objectives | A Decision Support System (DSS) is an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge and/or models to identify and solve problems, complete decision process tasks, and make decisions. DSS simulate cognitive decision-making functions of humans based on artificial intelligence methodologies (including expert systems, data mining, machine learning, connectionism, logistical reasoning, etc.) in order to perform decision support functions. DSS is a general term for any computer application that enhances a person or group's ability to make decisions. Also, DSS refers to an academic field of research that involves designing and studying DSS in their context of use. |

| Course learning outcomes | CLO 1. Understand the goals and different forms of decision support, and gain knowledge of the practical issues of implementation CLO 2. Examine systems based on statistical and logical approaches to decision making that include statistical prediction, rule-based systems, case-based reasoning, neural networks, fuzzy logic, etc. CLO 3. Obtain an overview of the various computerized decision support techniques together with a detailed assessment of successful and unsuccessful applications developed CLO 4. Examine the actual and potential impact of the technology together with the challenges associated with this kind of application tency level Course learning outcome (e | | | | |
|--------------------------|---|-------|--------|----------------|--|
| | tency level Cou | | learni | ng outcome (CL | |
| | edge | | | | |
| | | | | | |
| | e | | | | |
| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | |
| | | We | ight | Level | |
| | Introduction to Decision Making and Decision Support | | | I, U | |
| | Models, Cognitive Tools and Decision Making | | | I, T, U | |
| | Decision support systems | | | I, T, U | |
| | Modeling and analysis | 3 | | I, T, U | |
| | Data warehousing, Data Acquisition, Data Mining, Business analysis, and visualization | | | I, T, U | |
| | Decision support system development | 3 | | I, T, U | |
| | Collaborative computing technologies: Group support systems | | | I, T, U | |
| | Review for Midterm Exam | 3 | | U | |
| | Enterprise Information Systems | 3 | | I, T, U | |
| | Knowledge management | 3 | | I, T, U | |
| | Artificial intelligent & Expert systems: Knowledge-Based systems | ems 3 | | I, T, U | |
| | Knowledge Acquisition, Representation and Reasoning | 3 | _ | I, T, U | |
| | Advanced Intelligent Systems | 3 | | I, T, U | |

| | | Ecommerce applications | 3 | I, T, U | |
|-----------------------|---|---|-------------|--------------|--|
| | | Review for final exam | 3 | U | |
| Examination for | ms Multiple-choice questions, short-ans | | wer questio | ons | |
| Study and examination | | Attendance: A minimum attendance of 80 percent is | | | |
| requirements | | compulsory for the class sessions. Students will be assessed on | | | |
| | | the basis of their class participation. Questions and comme | | and comments | |
| | | are strongly encouraged. | | | |
| | | Assignments/Examination: Students must have more than | | | |
| | | 50/100 points overall to pass this course. | | | |
| Reading list | | | | | |

Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | | X | | | | |
| 3 | | X | | | | |
| 4 | | | | X | | |

Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|---|-------|-------------|---------------------|-----------|
| 1 | Introduction to Decision Making and Decision Support | 1 | | | |
| 2 | Models, Cognitive Tools and Decision Making | 2,3 | | | |
| 3 | Decision support systems | 2,3 | | | |
| 4 | Modeling and analysis | 2,3,4 | | | |
| 5 | Data warehousing, Data Acquisition, Data Mining, Business analysis, and visualization | 2,3,4 | | | |
| 6 | Midterm | | | | |
| 7 | Decision support system development | 2,3,4 | | | |
| 8 | Collaborative computing | 2,3,4 | | | |

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--|-------|-------------|---------------------|-----------|
| | technologies: Group support systems | | | | |
| 9 | Enterprise Information Systems | 2,3,4 | | | |
| 10 | Knowledge management | 2,3,4 | | | |
| 11 | Artificial intelligent & Expert systems: Knowledge-Based systems | 2,3,4 | | | |
| 12 | Knowledge Acquisition, Representation and Reasoning | 2,3,4 | | | |
| 13 | Advanced Intelligent Systems | 2,3,4 | | | |
| 14 | Ecommerce applications | 2,3,4 | | | |
| 15 | Final exam | | | | |

Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (25%) | X | X | X | X |
| Midterm examination (30%) | x | X | | |
| Final examination (40%) | | X | X | X |
| Exercises/ Quiz (10%) | X | X | X | X |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

Rubrics (optional)

| 5.1.Grading (| checi | Klist | ŀ |
|---------------|-------|-------|---|
|---------------|-------|-------|---|

| 5.1.Graunig Checklist | | |
|-----------------------|---------------------------------------|-----------|
| | Grading checklist for Written Reports | |
| Student: | HW/Assignment: | • • • • • |

^{1.} When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

| Date: Evaluator: | | | | | |
|---|------|-------|----------|--|--|
| | Max. | Score | Comments | | |
| Technical content (60%) | | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | | |
| principal content | | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | | |
| relevant background and prior work | | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | | |
| mastery | | | | | |
| Summary and conclusions appropriate and complete | 5 | | | | |
| Organization (10%) | | | | | |
| Distinct introduction, body, conclusions | 5 | | | | |
| Content clearly and logically organized, good transitions | 5 | | | | |
| Presentation (20%) | | | | | |
| Correct spelling, grammar, and syntax | 10 | | | | |
| Clear and easy to read | 10 | | | | |
| Quality of Layout and Graphics (10%) | 10 | | | | |
| TOTAL SCORE | 100 | | | | |

5.2.Holistic rubric

| I | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|------|--|--|--|--|--|
| Scor | Description | | | | |
| e | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are | | | | |
| | included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are | | | | |
| | included. | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are | | | | |
| | included. | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are | | | | |
| | missing. | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | |
| 0 | No response/task not attempted | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3.Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|-------------|-----------------------|--------------------|------------------|------------------|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be | | Issue/ problem | |
| | considered critically | Issue/ problem to | to be considered | |
| | is stated clearly and | be considered | critically is | Issue/ problem |
| | described | critically is | stated but | to be |
| | comprehensively, | stated, described, | description | considered |
| | delivering all | and clarified so | leaves some | critically is |
| | relevant information | that | terms | stated without |
| Explanation | necessary for full | understanding is | undefined, | clarification or |
| of issues | understanding. | not seriously | ambiguities | description. |

| | T | | 1 1 | |
|----------------|-----------------------|--------------------|-------------------|-----------------|
| | | impeded by | unexplored, | |
| | | omissions. | boundaries | |
| | | | undetermined, | |
| | | | and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is taken | Information is | some | |
| | from source(s) with | taken from | interpretation/ | |
| | enough | source(s) with | evaluation, but | Information is |
| | interpretation/ | enough | not enough to | taken from |
| | evaluation to | interpretation/ | develop a | source(s) |
| | develop a | evaluation to | coherent | without any |
| Evidence | comprehensive | develop a | analysis or | interpretation/ |
| Selecting and | analysis or | coherent analysis | synthesis. | evaluation. |
| using | synthesis. | or synthesis. | Viewpoints of | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | experts are | experts are |
| investigate a | experts are | experts are | taken as mostly | taken as fact, |
| point of view | questioned | subject to | fact, with little | without |
| or conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | | Shows an |
| | | | | emerging |
| | | | Questions some | awareness of |
| | Thoroughly | | assumptions. | present |
| | (systematically and | | Identifies | assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | | contexts when | labels |
| | others' assumptions | Identifies own | presenting a | assertions as |
| | and carefully | and others' | position. May | assumptions). |
| | evaluates the | assumptions and | be more aware | Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| - | Specific position | | , | |
| | (perspective, thesis/ | Specific position | | |
| | hypothesis) is | (perspective, | | |
| | imaginative, taking | thesis/hypothesis) | | |
| | into account the | takes into account | | |
| | complexities of an | the complexities | | |
| | issue. Limits of | of an issue. | Specific | Specific |
| | position | Others' points of | position | position |
| | (perspective, thesis/ | view are | (perspective, | (perspective, |
| Student's | hypothesis) are | acknowledged | thesis/ | thesis/ |
| position | acknowledged. | within position | hypothesis) | hypothesis) is |
| (perspective, | Others' points of | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | view are synthesized | thesis/ | different sides | simplistic and |
| esis) | within position | hypothesis). | of an issue. | obvious. |

| | (perspective, thesis/hypothesis). | | | |
|---------------|--|---|--|---|
| | | | Conclusion is logically tied to information | |
| | Conclusions and related outcomes (consequences and implications) are logical and reflect | Conclusion is logically tied to a range of information, including | (because information is chosen to fit the desired conclusion); | Conclusion is inconsistently tied to some of the information discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Source: Association of American Colleges and Universities
Oral communication value rubric for evaluating presentation tasks:

| | Capstone Capstone | , , , , , , , , , , , , , , , , , , , | stone | Benchmark |
|-----------|-------------------------|---------------------------------------|----------------------|----------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern (specific | Organizational | Organizational |
| | sequenced material | introduction and | pattern (specific | pattern (specific |
| | within the body, and | conclusion, | introduction and | introduction and |
| | transitions) is clearly | sequenced material | conclusion, | conclusion, |
| | and consistently | within the body, | sequenced material | sequenced material |
| | observable and is | and transitions) is | within the body, | within the body, |
| | skillful and makes | clearly and | and transitions) is | and transitions) is |
| | the content of the | consistently | intermittently | not observable |
| Organizat | presentation | observable within | observable within | within the |
| ion | cohesive. | the presentation. | the presentation. | presentation. |
| | Language choices | | | |
| | are imaginative, | | Language choices | |
| | memorable, and | Language choices | are mundane and | Language choices |
| | compelling, and | are thoughtful and | commonplace and | are unclear and |
| | enhance the | generally support | partially support | minimally support |
| | effectiveness of the | the effectiveness of | the effectiveness of | the effectiveness of |
| | presentation. | the presentation. | the presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| _ | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| | Delivery techniques | Delivery | Delivery | Delivery |
| | (posture, gesture, | techniques | techniques | techniques |
| | eye contact, and | (posture, gesture, | (posture, gesture, | (posture, gesture, |
| D 11 | vocal | eye contact, and | eye contact, and | eye contact, and |
| Delivery | expressiveness) | vocal | vocal | vocal |

| 1 | make the | expressiveness) | expressiveness) | expressiveness) |
|-----------|------------------------|------------------------|---------------------|----------------------|
| | presentation | make the | make the | detract from the |
| | compelling, and | presentation | presentation | understandability |
| | speaker appears | interesting, and | understandable, | of the presentation, |
| | polished and | speaker appears | and speaker | and speaker |
| | confident. | comfortable. | appears tentative. | appears |
| | | | | uncomfortable. |
| | | | Supporting | Insufficient |
| | | Supporting | materials | supporting |
| | A variety of types of | materials | (explanations, | materials |
| | supporting materials | (explanations, | examples, | (explanations, |
| | (explanations, | examples, | illustrations, | examples, |
| | examples, | illustrations, | statistics, | illustrations, |
| | illustrations, | statistics, analogies, | analogies, | statistics, |
| | statistics, analogies, | quotations from | quotations from | analogies, |
| | quotations from | relevant | relevant | quotations from |
| | relevant authorities) | authorities) make | authorities) make | relevant |
| | make appropriate | appropriate | appropriate | authorities) make |
| | reference to | reference to | reference to | reference to |
| | information or | information or | information or | information or |
| | analysis that | analysis that | analysis that | analysis that |
| | significantly | generally supports | partially supports | minimally supports |
| | supports the | the presentation or | the presentation or | the presentation or |
| | presentation or | establishes the | establishes the | establishes the |
| | establishes the | presenter's | presenter's | presenter's |
| Supportin | presenter's | credibility/ | credibility/ | credibility/ |
| g | credibility/ authority | authority on the | authority on the | authority on the |
| Material | on the topic. | topic. | topic. | topic. |
| | Central message is | | | |
| | compelling | | Central message is | |
| | (precisely stated, | | basically | Central message |
| | appropriately | Central message is | understandable but | can be deduced but |
| | repeated, | clear and consistent | is not often | is not explicitly |
| Central | memorable, and | with the supporting | repeated and is not | stated in the |
| Message | strongly supported.) | material. | memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**(Signature)

Assoc.Prof. Nguyen Van Sinh

Course Name: Blockchain

Course Code: IT150IU

2. General information

| 2. General infor | |
|---|---|
| Course designation | Introduction to Blockchain technology |
| Semester(s) in which the course is taught | 6,7 |
| Person responsible for the course | Tran Thanh Tung, Dr. |
| Language | English |
| Relation to curriculum | Elective |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | None |
| Course objectives | This subject introduces the students the foundation of blockchain technology and its applications. Students will study blockchain concepts and principles how it works. This course covers relevant topics blockchain space. The course starts with the basics of blockchain, cryptography, fundamental understanding of bitcoins. Then, the applications of blockchain technology is introduced in different areas of finance, healthcare, supply chain, etc. A complete picture of the ecosystem surrounding blockchain technology and development trends are also discussed. |
| Course learning outcomes | CLO 1. Understand basic contents of blockchain technology. CLO 2. Explain different types of blockchain development: Ethereum, smart contract security, bitcoin CLO 3. Apply blockchain techniques to setup the development environment to writing and deploying smart contracts, the workhorse of blockchain applications, integrating cryptocurrency micropayments into web apps |

| | CLO 4. Work in a team t | | | • | |
|-------------------|--|---|-------------|----------------|--|
| | Competency level | CLO1 CLO1 | itcome (C | LO) | |
| | Knowledge | CLO1, CLO1 | | | |
| | Skill | CLO3, CLO4 | | | |
| | Attitude | CLO2 | | <u> </u> | |
| Content | | The description of the contents should clearly indicate the weighting of the content and the level. | | | |
| | Weight: lecture session (| | | | |
| | Teaching levels: I (Introd | | Utilize) | | |
| | Тор | | Weight | Level | |
| | Introduction | | 3 | I | |
| | Cryptography & crypt | tocurrencies | 3 | Т | |
| | How Bitcoin achieve | | 3 | I, T | |
| | Mechanics of Bitcoin | | 3 | T, U | |
| | How to store and use | Bitcoin | 3 | T, U | |
| | Bitcoin mining | | 3 | T | |
| | Bitcoin and Anonymin | ty | 3 | Т | |
| | Ethereum | • | 3 | I, T | |
| | Solidity | | | T, U | |
| | Token | | | I, T | |
| | Oracle | | 3 | I, T | |
| | Decentralized Applica | ations (Dapps) | 3 | T, U | |
| | Design pattern for blo | | 3 | T | |
| | Real-world application | | 3 | I, T | |
| Examination forms | Multiple-choice question | | ions | <u> </u> | |
| Study and | Attendance: A minimum | attendance of 80 per | cent is cor | npulsory | |
| examination | for the class sessions. Stu | | | | |
| requirements | their class participation. | Questions and commo | ents are st | rongly | |
| | encouraged. | 0. 1 | .1 | 7 0/100 | |
| | Assignments/Examination | | e more tha | an 50/100 | |
| Reading list | points overall to pass thi | s course. n, Joseph Bonneau, E | dward Fal | ton | |
| Reading list | Andrew Miller, and Stev | _ | | ten, | |
| | Cryptocurrency Technol | | | uction. | |
| | Princeton, 2016 | ogies. II comprehens | ive mirou | action. | |
| | | nopoulos, and Gavin | Wood Ph. | D. | |
| | | • | | | |
| | Mastering Ethereum: Building Smart Contracts and DApps. O'Reilly Media, 2018 | | | | |
| | • | Veber, and Mark Stap | les. Archit | ecture fo | |
| | Blockchain Applications | _ | | | |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | | | | |
| 2 | X | X | | | | |
| 3 | | X | | | | X |
| 4 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|------|--------------------------------------|------|-----------------------------|---|-----------|
| 1 | Introduction | 1 | Quiz | Teaching, Presentation | |
| 2 | Cryptography & cryptocurrencies | 1 | Quiz, In-class exercises | Teaching, Presentation | |
| 3 | How Bitcoin achieve decentralization | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 4 | Mechanics of Bitcoin | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 5 | How to store and use Bitcoin | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 6 | Bitcoin mining | 1, 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 7 | Bitcoin and Anonymity | 2 | Quiz, In-class exercises | Teaching, Presentation | |
| 8 | Midterm | | | | |
| 9 | Ethereum | 2,3 | Project | Teaching, Presentation | |
| 10 | Solidity | 2,3 | Project | Teaching, Presentation | |
| 11 | Token | 3,4 | Quiz, In-class exercises | Teaching, Presentation | |
| 12 | Oracle | 2,3 | Quiz, In-class exercises | Teaching, Presentation Group discussion | |
| 13 | Decentralized Applications (Dapps) | 3,4 | Quiz, In-class exercises | Teaching, Presentation | |

| Week | Торіс | CLO | Assessments | Learning activities | Resources |
|------|--|-----|-----------------------------|--|-----------|
| 14 | Design pattern for blockchain applications | 3,4 | Quiz, In-class exercises | Teaching, Presentation, In-class reading | |
| 15 | Real-world applications | 3,4 | Presentation | Teaching, Presentation Group discussion | |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|---------------------------|------|------|------|------|
| Labs (20%) | | | X | X |
| Midterm examination (30%) | X | X | | |
| Final examination (40%) | | X | X | |
| Exercises/ Quiz (10%) | X | | | |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

- 2. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←
 - 2. Rubrics (optional)

5.2. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|-------------|----------|----------|--|
| Student: | HW/A | Assignme | ent: | |
| Date: | • • • • • • | | •• | |
| | Evalu | ıator: | | |
| | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |

| Distinct introduction, body, conclusions | 5 | |
|---|-----|--|
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.3. Holistic rubric

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | |
|-------|--|--|--|--|
| Score | Description | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | |
| | are included in response | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | |
| | task are included. | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | |
| | are included. | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | |
| | are missing. | | | |
| 1 | Demonstrates no understanding of the problem. | | | |
| 0 | No response/task not attempted | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.4. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical inthiting vi | Capstone | | Milestone | |
|-----------------------|-------------------|-------------------|---------------|----------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ | |
| | | | problem to | |
| | | | be | |
| | | | considered | |
| | | | critically is | |
| | Issue/ problem | | stated but | |
| | to be considered | | description | |
| | critically is | Issue/ problem | leaves some | |
| | stated clearly | to be considered | terms | |
| | and described | critically is | undefined, | Issue/ |
| | comprehensivel | stated, | ambiguities | problem to be |
| | y, delivering all | described, and | unexplored, | considered |
| | relevant | clarified so that | boundaries | critically is |
| | information | understanding is | undetermine | stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |

| | | | Info | |
|------------------|------------------|----------------------------------|------------------------|-------------------------|
| | | | Information | |
| | | | is taken from | |
| | | | source(s) | |
| | | | with some | |
| | Information is | Information is | interpretation | |
| | taken from | taken from | / evaluation, | |
| | source(s) with | source(s) with | but not | |
| | enough | enough | enough to | Information is |
| | interpretation/ | interpretation/ | develop a | taken from |
| | evaluation to | evaluation to | coherent | source(s) |
| | develop a | develop a | analysis or | without any |
| Evidence | comprehensive | coherent | synthesis. | interpretation/ |
| Selecting and | analysis or | analysis or | Viewpoints | evaluation. |
| using | synthesis. | synthesis. | of experts are | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | taken as | experts are |
| investigate a | experts are | experts are | mostly fact, | taken as fact, |
| point of view or | questioned | subject to | with little | without |
| conclusion | thoroughly. | questioning. | questioning. | question. |
| | | 8. | Questions | 1 |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | | |
| | evaluates the | | aware of others' | Begins to identify some |
| | relevance of | assumptions and several relevant | | contexts |
| Influence of | | | assumptions than one's | when |
| Influence of | contexts when | contexts when | | |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| | Specific | Specific | | |
| | position | position | | |
| | (perspective, | (perspective, | Chasicia | |
| | thesis/ | thesis/hypothesi | Specific | Constitution |
| | hypothesis) is | s) takes into | position | Specific |
| | imaginative, | account the | (perspective, | position |
| C4 | taking into | complexities of | thesis/ | (perspective, |
| Student's | account the | an issue. Others' | hypothesis) | thesis/ |
| position | complexities of | points of view | acknowledge | hypothesis) is |
| (perspective, | an issue. Limits | are | s different | stated, but is |
| thesis/hypothesi | of position | acknowledged | sides of an | simplistic and |
| s) | (perspective, | within position | issue. | obvious. |

| | thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ | (perspective, thesis/ hypothesis). | | |
|---------------|--|---|--|---|
| Conclusions | hypothesis). Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and | Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes | Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes | Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| Oral communication value rubric for evaluating presentation tasks: | | | | |
|--|-----------------|-----------------|-----------------|---------------------|
| | Capstone | Mile | stone | Benchmark |
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | Organizational | | |
| | (specific | pattern | Organizational | |
| | introduction | (specific | pattern | |
| | and conclusion, | introduction | (specific | Organizational |
| | sequenced | and conclusion, | introduction | pattern (specific |
| | material within | sequenced | and conclusion, | introduction and |
| | the body, and | material within | sequenced | conclusion, |
| | transitions) is | the body, and | material within | sequenced |
| | clearly and | transitions) is | the body, and | material within |
| | consistently | clearly and | transitions) is | the body, and |
| | observable and | consistently | intermittently | transitions) is not |
| | is skillful and | observable | observable | observable |
| | makes the | within the | within the | within the |
| Organization | content of the | presentation. | presentation. | presentation. |

| | T | | | |
|------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|
| | presentation | | | |
| | cohesive. | | | |
| | Language | | | |
| | choices are | | | |
| | imaginative, | | Language | |
| | memorable, | Language | choices are | |
| | and | choices are | mundane and | Language |
| | compelling, | thoughtful and | commonplace | choices are |
| | and enhance | generally | and partially | unclear and |
| | the | support the | support the | minimally |
| | effectiveness | effectiveness | effectiveness of | support the |
| | of the | of the | the | effectiveness of |
| | presentation. | presentation. | presentation. | the presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is |
| | appropriate to | appropriate to | appropriate to | not appropriate |
| Language | audience. | audience. | audience. | to audience. |
| | Delivery | | | |
| | techniques | Delivery | Delivery | |
| | (posture, | techniques | techniques | Delivery |
| | gesture, eye | (posture, | (posture, | techniques |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, |
| | vocal | contact, and | contact, and | eye contact, and |
| | expressiveness) | vocal | vocal | vocal |
| | make the | expressiveness) | expressiveness) | expressiveness) |
| | presentation | make the | make the | detract from the |
| | compelling, | presentation | presentation | understandability |
| | and speaker | interesting, and | understandable, | of the |
| | appears | speaker | and speaker | presentation, and |
| | polished and | appears | appears | speaker appears |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. |
| Denvery | A variety of | Supporting | Supporting | Insufficient |
| | types of | materials | materials | supporting |
| | supporting | (explanations, | (explanations, | materials |
| | materials | examples, | examples, | (explanations, |
| | (explanations, | illustrations, | illustrations, | examples, |
| | _ | statistics, | | _ |
| | examples, | ' | statistics, | illustrations, |
| | illustrations, statistics, | analogies, | analogies, | statistics, |
| | · · | quotations from relevant | quotations from relevant | analogies, |
| | analogies, | | | quotations from relevant |
| | quotations from relevant | authorities) make | authorities) make | |
| | | | | authorities) make reference |
| | authorities) | appropriate | appropriate | |
| | make | reference to | reference to | to information or |
| C | appropriate | information or | information or | analysis that |
| Supporting | reference to | analysis that | analysis that | minimally |
| Material | information or | generally | partially | supports the |

| | analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | supports the presentation or establishes the presenter's credibility/ authority on the topic. | supports the presentation or establishes the presenter's credibility/ authority on the topic. | presentation or establishes the presenter's credibility/ authority on the topic. |
|---------|---|---|---|---|
| | Central message is compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Development and Operations (DevOps)

Course Code: IT156IU

1. General information

| 1. General information | 4011 |
|---|---|
| Course designation | This course is an introduction to DevOps to help students understand its principles and practices. Key concepts and terminology will be covered with real-life case studies, examples and practical exercises. Common and popular tools to achieve DevOps models will be introduced as well. |
| Semester(s) in which the course is taught | 7,8 |
| Person responsible for the course | Tran Thanh Tung, PhD. |
| Language | English |
| Relation to curriculum | Elective (NE) |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self- study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Software Engineering Computer Network |
| Course objectives | This course is an introduction to DevOps to help students understand its principles and practices. Key concepts and terminology will be covered with real-life case studies, example and practical exercises. Common and popular tools to achieve DevOps models will be introduced as well. |
| Course learning outcomes | CLO 1. Define and discuss the key concepts and principles of DevOps CLO 2 Explain the benefit of DevOps and continuous delivery CLO 3 Understand infrastructure automation, build and deployment automation, the transformation to DevOps models CLO 4. Work with common and popular DevOps tools |

| | Competency level | Course learning ou | tcome (CI | (O) |
|------------------------------------|--|------------------------|-------------|-------------|
| | Knowledge | 1,2 | | |
| | Skill | 3,4 | | |
| | Attitude | 4 | | |
| Content | The description of the coweighting of the content | • | indicate th | e |
| | Weight: lecture session (| (3 hours) | | |
| | Teaching levels: I (Intro | duce); T (Teach); U (U | | |
| | Topic | | Weight | Level |
| | Introduction to DevOps | 8 | 3 | I |
| | Introduction to Cloud C | Computing | 3 | I |
| | Linux Basics and Shell | Scripting | 3 | T,U |
| | Versioning and Build T | ool | 3 | T |
| | Automation: Continuou Continuous Deploymen | • | 3 | T |
| | Configuration Manager | nent | 3 | I,T |
| | Containers, Container v | vs Virtual Machine | 3 | I,T |
| | Deployment pipeline | | 3 | I,T |
| | Post production | | 3 | I,T |
| | Disaster recovery | | 3 | I |
| | Continuous Monitoring | for DevOps | 3 | I,T |
| | Infrastructure and deplo | | 3 | I |
| Examination forms | Short-answer questions | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than | | | |
| | 50/100 points overall to | | e more ma | |
| Reading list | [1] Jeffery D.Smith, Operations Anti-Patterns, DevOps Solutions, Manning Publications 2020 | | | |
| | [2] Nicole Forsgren, Accelerate: The Science of Lean Software and DevOps: Building and Scaling High Performing Technology Organizations, IT Revolution Press 2018 | | | |
| | [3] Jez Humble and Dav Software Releases the Automation, Addison-W | ough Build, Test, | and Dep | |

| [4] Paul M. Duvall, Steve Matyas, Andrew Glover. Continuous |
|---|
| Integration: Improving Software Quality and Reducing Risk, |
| Addison-Wesley Professional, 2007Len Bass and John Klein. |
| · · · · · · · · · · · · · · · · · · · |
| Deployment and Operations for Software Engineers, 2019. |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| CLO\SLO | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|---|-----|---|---|---|---|
| T | | | | | | |
| 1 | X | | | | | |
| 2 | | XXX | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessments | Learning activities | Resources |
|---------|---|-----|-------------|---------------------|-----------|
| 1 | Introduction to DevOps | | | | |
| 2,3 | Introduction to Cloud Computing | | | | |
| 4,5 | Linux Basics and Shell Scripting | | | | |
| 6 | Versioning and Build Tool | | | | |
| 7 | Automation: Continuous Integration, Continuous Deployment | | | | |
| 8 | Configuration Management | | | | |
| Midter | m exam | | | | |
| 9,10 | Containers, Container vs Virtual Machine | | | | |
| 11 | Deployment pipeline | | | | |
| 12 | Post production | | | | |
| 13 | Disaster recovery | | | | |
| 14 | Continuous Monitoring for DevOps | | | | |
| 15 | Infrastructure and deployment security | | | | |
| Final e | xam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 |
|--------------------------------------|------|------|------|------|
| Quiz (5%) | 10% | | 20% | 20% |
| Labs (10%) | 30% | 30% | | |
| Midterm examination (30%) | 50% | 40% | | |
| Projects/Presentations/ Report (15%) | 10% | | 30% | 30% |
| Final examination (40%) | | 30% | 50% | 50% |

5. Rubrics (optional)5.4. Grading checklist

| Grading checklist for Written Reports | | | | |
|--|-------|----------|----------|--|
| Student: | HW/A | Assignme | ent: | |
| Date: | | | •• | |
| | Evalu | ator: | | |
| | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |
| Analysis and discussion demonstrate good subject | 30 | | | |
| mastery | | | | |
| Summary and conclusions appropriate and complete | 5 | | | |
| Organization (10%) | | | | |
| Distinct introduction, body, conclusions | 5 | | | |
| Content clearly and logically organized, good | 5 | | | |
| transitions | | | | |
| Presentation (20%) | | | | |
| Correct spelling, grammar, and syntax | 10 | | | |
| Clear and easy to read | 10 | | | |
| Quality of Layout and Graphics (10%) | 10 | | | |
| TOTAL SCORE | 100 | | | |

5.5. **Holistic rubric**

| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | |
|-------|--|--|--|--|--|
| Score | Description | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | | |
| | are included in response | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | | |
| | task are included. | | | | |

| 3 | Demonstrates partial understanding of the problem. Most requirements of task |
|---|--|
| | are included. |
| 2 | Demonstrates little understanding of the problem. Many requirements of task |
| | are missing. |
| 1 | Demonstrates no understanding of the problem. |
| 0 | No response/task not attempted |

Note: this rubric is also used to evaluate questions in an exam.

5.6.

Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical inthiting va | Capstone | Milest | | Benchmark |
|-----------------------|--|---|--|--|
| | 4 | 3 | 2 | 1 |
| | Issue/ problem to be considered critically is stated clearly and described comprehensivel y, delivering all relevant information | Issue/ problem to be considered critically is stated, described, and clarified so that understanding is | Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermine | Issue/ problem to be considered critically is stated without |
| | necessary for | not seriously | d, and/ or | clarification |
| Explanation of | full | impeded by | backgrounds | or |
| issues | understanding. | omissions. | unknown. | description. |
| | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with enough interpretation/evaluation to develop a | Information is taken from source(s) with some interpretation / evaluation, but not enough to develop a | Information is taken from source(s) without any |
| Evidence | comprehensive | coherent | coherent | interpretation/ |
| Selecting and | analysis or | analysis or | analysis or | evaluation. |
| using | synthesis. | synthesis. | synthesis. | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | Viewpoints | experts are |
| investigate a | experts are | experts are | of experts are | taken as fact, |
| point of view or | questioned | subject to | taken as | without |
| conclusion | thoroughly. | questioning. | mostly fact, | question. |

| | | | rrith 1:441 a | |
|------------------|-------------------|-------------------|---------------|----------------|
| | | | with little | |
| | | | questioning. | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | Questions | |
| | | | some | |
| | | | assumptions. | Shows an |
| | | | Identifies | emerging |
| | Thoroughly | | several | awareness of |
| | (systematically | | relevant | present |
| | and | | contexts | assumptions |
| | methodically) | | when | (sometimes |
| | analyzes own | | presenting a | labels |
| | and others' | | position. | assertions as |
| | assumptions | Identifies own | May be more | assumptions). |
| | and carefully | and others' | aware of | Begins to |
| | evaluates the | assumptions and | others' | identify some |
| | relevance of | several relevant | assumptions | contexts |
| Influence of | contexts when | contexts when | than one's | when |
| context and | presenting a | presenting a | own (or vice | presenting a |
| assumptions | position. | position. | versa). | position. |
| ussumptions | Specific | position. | versu). | position. |
| | position | | | |
| | (perspective, | | | |
| | thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, | | | |
| | taking into | | | |
| | account the | Specific | | |
| | complexities of | position | | |
| | an issue. Limits | (perspective, | | |
| | of position | thesis/hypothesi | | |
| | (perspective, | s) takes into | | |
| | thesis/ | account the | | |
| | hypothesis) are | complexities of | Specific | |
| | acknowledged. | an issue. Others' | position | Specific |
| | Others' points of | points of view | (perspective, | position |
| | view are | are | thesis/ | (perspective, |
| Student's | synthesized | acknowledged | hypothesis) | thesis/ |
| position | within position | within position | acknowledge | hypothesis) is |
| (perspective, | (perspective, | (perspective, | s different | stated, but is |
| thesis/hypothesi | thesis/ | thesis/ | sides of an | simplistic and |
| s) | hypothesis). | hypothesis). | issue. | obvious. |

| | | | Conclusion | |
|---------------|-------------------|-------------------|----------------|----------------|
| | | | is logically | |
| | Conclusions | | tied to | |
| | and related | Conclusion is | information | Conclusion is |
| | outcomes | logically tied to | (because | inconsistently |
| | (consequences | a range of | information | tied to some |
| | and | information, | is chosen to | of the |
| | implications) | including | fit the | information |
| | are logical and | opposing | desired | discussed; |
| | reflect student's | viewpoints; | conclusion); | related |
| | informed | related | some related | outcomes |
| Conclusions | evaluation and | outcomes | outcomes | (consequence |
| and related | ability to place | (consequences | (consequence | s and |
| outcomes | evidence and | and | s and | implications) |
| (implications | perspectives | implications) | implications) | are |
| and | discussed in | are identified | are identified | oversimplifie |
| consequences) | priority order. | clearly. | clearly. | d. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------------|-----------------|-----------------|------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern | | | |
| | (specific | | | |
| | introduction | Organizational | | |
| | and conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | Organizational |
| | the body, and | and conclusion, | introduction | pattern (specific |
| | transitions) is | sequenced | and conclusion, | introduction and |
| | clearly and | material within | sequenced | conclusion, |
| | consistently | the body, and | material within | sequenced |
| | observable and | transitions) is | the body, and | material within |
| | is skillful and | clearly and | transitions) is | the body, and |
| | makes the | consistently | intermittently | transitions) is not |
| | content of the | observable | observable | observable |
| | presentation | within the | within the | within the |
| Organization | cohesive. | presentation. | presentation. | presentation. |
| | Language | Language | Language | Language |
| | choices are | choices are | choices are | choices are |
| | imaginative, | thoughtful and | mundane and | unclear and |
| | memorable, | generally | commonplace | minimally |
| | and | support the | and partially | support the |
| | compelling, | effectiveness | support the | effectiveness of |
| | and enhance | of the | effectiveness of | the presentation. |
| Language | the | presentation. | the | Language in |

| | -cc+: | T: | | | |
|-------------|--|-----------------------|--|--------------------|--|
| | effectiveness | Language in | presentation. | presentation is | |
| | of the | presentation is | Language in | not appropriate | |
| | presentation. | appropriate to | presentation is | to audience. | |
| | Language in | audience. | appropriate to | | |
| | presentation is | | audience. | | |
| | appropriate to | | | | |
| | audience. | | | | |
| | Delivery | | | | |
| | techniques | Delivery | Delivery | | |
| | (posture, | techniques | techniques | Delivery | |
| | gesture, eye | (posture, | (posture, | techniques | |
| | contact, and | gesture, eye | gesture, eye | (posture, gesture, | |
| | vocal | contact, and | contact, and | eye contact, and | |
| | expressiveness) | vocal | vocal | vocal | |
| | make the | expressiveness) | expressiveness) | expressiveness) | |
| | presentation | make the | make the | detract from the | |
| | compelling, | presentation | presentation | understandability | |
| | and speaker | interesting, and | understandable, | of the | |
| | appears | speaker | and speaker | presentation, and | |
| | polished and | appears | appears | speaker appears | |
| Delivery | confident. | comfortable. | tentative. | uncomfortable. | |
| | A variety of | | | | |
| | types of | | | | |
| | supporting | Supporting | Supporting | | |
| | materials | materials | materials | Insufficient | |
| | (explanations, | (explanations, | (explanations, | supporting | |
| | examples, | examples, | examples, | materials | |
| | illustrations, | illustrations, | illustrations, | (explanations, | |
| | statistics, | statistics, | statistics, | examples, | |
| | analogies, | analogies, analogies, | | illustrations, | |
| | quotations | | quotations | statistics, | |
| | from relevant | from relevant | from relevant | analogies, | |
| | authorities) | authorities) | authorities) | quotations from | |
| make | | make | make | relevant | |
| appropriate | appropriate | appropriate | appropriate | authorities) | |
| | reference to | reference to | reference to | make reference | |
| in | information or | information or | information or | to information or | |
| | analysis that | analysis that | analysis that | analysis that | |
| | significantly | generally | partially | minimally | |
| | supports the presentation or establishes the | | supports the presentation or establishes the est | supports the | |
| | | | | presentation or | |
| | | | | establishes the | |
| presenter's | | presenter's | presenter's | presenter's | |
| | credibility/ | credibility/ | credibility/ | credibility/ | |
| Supporting | authority on | authority on | authority on | authority on the | |
| Material | the topic. | the topic. | the topic. | topic. | |

| | Central | | | |
|---------|---------------|-----------------|------------------|-------------------|
| | message is | | | |
| | compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| | repeated, | clear and | understandable | but is not |
| | memorable, | consistent with | but is not often | explicitly stated |
| Central | and strongly | the supporting | repeated and is | in the |
| Message | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: UI Design and Evaluation

Course Code: IT158IU

1. General information

| Course designation | This course provides students with fundamental interaction principles between human and computers. | | | | | |
|---|--|------------------|--|--------|--|--|
| Semester(s) in which the course is taught | 7,8 | | | | | |
| Person responsible for the course | MSc. Dao Tran Hoang Chau | | | | | |
| Language | English | | | | | |
| Relation to curriculum | Elective (CS) | | | | | |
| Teaching methods | Lecture, lesson, project, seminar. | | | | | |
| Workload (incl. contact hours, self- study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 | | | | | |
| Credit points | Number of credits: 4 Lecture: 3 Laboratory: 1 | | | | | |
| Required and recommended prerequisites for joining the course | None | | | | | |
| Course objectives | This course provides students with fundamental interaction principles between human and computers. | | | | | |
| Course learning outcomes | CLO 1. Know how to gather requirements. CLO 2 Apply human-computer interaction principles in user interface design process CLO 3 Choose the appropriate interface evaluation method CLO 4. Understand different design principles for mobile applications and the Web. | | | | | |
| | | ompetency vel | Course learning outcome (CLO) | | | |
| | Kı | nowledge | 2, 3, 4 | | | |
| | Sk | till | 1 | | | |
| | At | titude | 1 | | | |
| Content | The descript content and | • | ents should clearly indicate the weighting o | of the | | |

| | Weight: | lecture session (3 hours) | | | | | |
|------------------------------------|---|---|--------------------------|------------------|--|--|--|
| | Teachin | Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
| | | Topic | Weight | Level | | | |
| | | Human factors | | I | | | |
| | | Human perception and cognition principles | 2 | Т | | | |
| | | User-centered design | 2 | T,U | | | |
| | | Requirements gathering techniques | 1 | T,U | | | |
| | | Interface design process | 2 | T,U | | | |
| | | Prototyping techniques | 2 | T,U | | | |
| | | Interface evaluation methodology | 1 | T,U | | | |
| | | Interaction styles and techniques | 1 | Т | | | |
| | | HCI for mobile applications and the Web | 2 | T,U | | | |
| | | Typography | 1 | T,U | | | |
| Examination forms | Short-ar | nswer questions | | | | | |
| Study and examination requirements | class ses particips Assignm | nce: A minimum attendance of 80 percerssions. Students will be assessed on the bation. Questions and comments are strongents/Examination: Students must have reto pass this course. | pasis of theigly encoura | r class aged. | | | |
| Reading list | [1] Debbie Stone, Caroline Jarrett, Mark Woodroffe, Shailey Minocha, User Interface Design and Evaluation, 1 st Edition, Morgan Kaufmann, 2005 [2] Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Human-Computer Interaction, 3 rd Edition, Prenctice Hall, 2004 [3] Gerard Jounghyun Kim, Human-Computer Interaction, Fundamentals and Practice, CRC Press, 2015 | | | | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | | | X | | | |
| 2 | X | | | | X | |
| 3 | | X | | | X | |
| 4 | | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessmen ts | Learning activities | Resources |
|------|---------------|-----|-----------------|---------------------|-----------|
| 1 | Human factors | 1 | Midterm | In-class | |
| | | | exam | activities | |

| 2,3 | Human perception and cognition principles | 2 | Midterm exam | In-class activities |
|----------|---|------|--|---------------------|
| 4,5 | User-centered design | 2 | Midterm exam, Project, Lab quiz | In-class activities |
| 6 | Requirements gathering techniques | 1 | Midterm exam, Project | In-class activities |
| 7,8 | Interface design process | 2 | Midterm exam, Project | In-class activities |
| Midterr | n exam | | | |
| 9,10 | Prototyping techniques | 2 | Project | In-class activities |
| 11 | Interface evaluation methodology | 3 | Final exam, Project | In-class activities |
| 12 | Interaction styles and techniques | 3 | Final exam | In-class activities |
| 13,14 | HCI for mobile applications and the Web | 4 | Lab quiz | In-class activities |
| 15 | Typography | 2, 4 | Final exam, Project | In-class activities |
| Final ex | am | | | |

4. Assessment plan

| sincin pian | | | | |
|--------------------------------------|----------|------|------|------|
| Assessment Type | CLO 1 | CLO2 | CLO3 | CLO4 |
| Quiz (5%) | 10% | | 20% | 20% |
| Labs (10%) | 30% | 30% | | |
| Midterm examination (30%) | 50% | 40% | | |
| Projects/Presentations/ Report (15%) | 10% | | 30% | 30% |
| Final examination (40%) | | 30% | 50% | 50% |

5. Rubrics (optional)

5.1.Grading checklist

| 5.1. Grading checklist | | | | |
|--|----------|-------|----------|--|
| Grading checklist for Writt | en Repor | ts | | |
| Student: HW/Assignment: | | | | |
| Date: Evaluator: | | | | |
| | Max. | Score | Comments | |
| Technical content (60%) | | | | |
| Abstract clearly identifies purpose and summarizes | 10 | | | |
| principal content | | | | |
| Introduction demonstrates thorough knowledge of | 15 | | | |
| relevant background and prior work | | | | |

| Analysis and discussion demonstrate good subject | 30 | |
|---|-----|--|
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good transitions | 5 | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2.Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | |
|------|---|--|--|--|--|--|
| Scor | Description | | | | | |
| e | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | |
| 0 | No response/task not attempted | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3.Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Critical ininking | it thinking value rubric for evaluating questions in exams: | | | | | | |
|-------------------|---|--------------------|------------------|------------------|--|--|--|
| | Capstone | Miles | tone | Benchmark | | | |
| | 4 | 3 | 2 | 1 | | | |
| | | | Issue/ problem | | | | |
| | | | to be considered | | | | |
| | | | critically is | | | | |
| | | | stated but | | | | |
| | | | description | | | | |
| | | Issue/ problem to | leaves some | | | | |
| | Issue/ problem to be | be considered | terms | | | | |
| | considered critically | critically is | undefined, | | | | |
| | is stated clearly and | stated, described, | ambiguities | Issue/ problem | | | |
| | described | and clarified so | unexplored, | to be | | | |
| | comprehensively, | that | boundaries | considered | | | |
| | delivering all | understanding is | undetermined, | critically is | | | |
| | relevant information | not seriously | and/ or | stated without | | | |
| Explanation | necessary for full | impeded by | backgrounds | clarification or | | | |
| of issues | understanding. | omissions. | unknown. | description. | | | |

| | 1 | | т.с: | |
|----------------|-----------------------|--------------------|-------------------|-----------------|
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is taken | Information is | some | |
| | from source(s) with | taken from | interpretation/ | |
| | enough | source(s) with | evaluation, but | Information is |
| | interpretation/ | enough | not enough to | taken from |
| | evaluation to | interpretation/ | develop a | source(s) |
| | develop a | evaluation to | coherent | without any |
| Evidence | comprehensive | develop a | analysis or | interpretation/ |
| Selecting and | analysis or | coherent analysis | synthesis. | evaluation. |
| using | synthesis. | or synthesis. | Viewpoints of | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | experts are | experts are |
| investigate a | experts are | experts are | taken as mostly | taken as fact, |
| _ | _ | _ | fact, with little | without |
| point of view | questioned | subject to | , | |
| or conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | | Shows an |
| | | | | emerging |
| | | | Questions some | awareness of |
| | Thoroughly | | assumptions. | present |
| | (systematically and | | Identifies | assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | | contexts when | labels |
| | others' assumptions | Identifies own | presenting a | assertions as |
| | and carefully | and others' | position. May | assumptions). |
| | evaluates the | assumptions and | be more aware | Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| <u> </u> | Specific position | positioni | (61 (100 (6150)) | position |
| | (perspective, thesis/ | | | |
| | hypothesis) is | | | |
| | imaginative, taking | Specific position | | |
| | into account the | (perspective, | | |
| | | 'L I | | |
| | complexities of an | thesis/hypothesis) | | |
| | issue. Limits of | takes into account | | |
| | position | the complexities | Cracifia | Charific |
| | (perspective, thesis/ | of an issue. | Specific | Specific |
| | hypothesis) are | Others' points of | position | position |
| G() () | acknowledged. | view are | (perspective, | (perspective, |
| Student's | Others' points of | acknowledged | thesis/ | thesis/ |
| position | view are synthesized | within position | hypothesis) | hypothesis) is |
| (perspective, | within position | (perspective, | acknowledges | stated, but is |
| thesis/hypoth | (perspective, thesis/ | thesis/ | different sides | simplistic and |
| esis) | hypothesis). | hypothesis). | of an issue. | obvious. |

| | | | Conclusion is | |
|---------------|-----------------------|---------------------|-------------------|-----------------|
| | | | logically tied to | |
| | | | information | |
| | Conclusions and | Conclusion is | (because | Conclusion is |
| | related outcomes | logically tied to a | information is | inconsistently |
| | (consequences and | range of | chosen to fit the | tied to some of |
| | implications) are | information, | desired | the information |
| | logical and reflect | including | conclusion); | discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Miles | stone | Benchmark |
|--------------|----------------------|--------------------|--------------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | Organizational | | |
| | introduction and | pattern (specific | Organizational | |
| | conclusion, | introduction and | pattern (specific | |
| | sequenced material | conclusion, | introduction and | Organizational |
| | within the body, and | sequenced | conclusion, | pattern (specific |
| | transitions) is | material within | sequenced | introduction and |
| | clearly and | the body, and | material within | conclusion, |
| | consistently | transitions) is | the body, and | sequenced |
| | observable and is | clearly and | transitions) is | material within |
| | skillful and makes | consistently | intermittently | the body, and |
| | the content of the | observable | observable | transitions) is not |
| | presentation | within the | within the | observable within |
| Organization | cohesive. | presentation. | presentation. | the presentation. |
| | | | Language | |
| | Language choices | Language | choices are | |
| | are imaginative, | choices are | mundane and | Language choices |
| | memorable, and | thoughtful and | commonplace | are unclear and |
| | compelling, and | generally | and partially | minimally support |
| | enhance the | support the | support the | the effectiveness |
| | effectiveness of the | effectiveness of | effectiveness of | of the |
| | presentation. | the presentation. | the presentation. | presentation. |
| | Language in | Language in | Language in | Language in |
| | presentation is | presentation is | presentation is | presentation is not |
| | appropriate to | appropriate to | appropriate to | appropriate to |
| Language | audience. | audience. | audience. | audience. |
| | Delivery techniques | Delivery | Delivery | Delivery |
| | (posture, gesture, | techniques | techniques | techniques |
| | eye contact, and | (posture, gesture, | (posture, gesture, | (posture, gesture, |
| | vocal | eye contact, and | eye contact, and | eye contact, and |
| Delivery | expressiveness) | vocal | vocal | vocal |

| | make the | expressiveness) | expressiveness) | expressiveness) |
|------------|------------------------|------------------|--------------------|----------------------|
| | presentation | make the | make the | detract from the |
| | compelling, and | presentation | presentation | understandability |
| | speaker appears | interesting, and | understandable, | of the |
| | polished and | speaker appears | and speaker | presentation, and |
| | confident. | comfortable. | appears | speaker appears |
| | | | tentative. | uncomfortable. |
| | | Supporting | | |
| | | materials | | Insufficient |
| | | (explanations, | Supporting | supporting |
| | A variety of types | examples, | materials | materials |
| | of supporting | illustrations, | (explanations, | (explanations, |
| | materials | statistics, | examples, | examples, |
| | (explanations, | analogies, | illustrations, | illustrations, |
| | examples, | quotations from | statistics, | statistics, |
| | illustrations, | relevant | analogies, | analogies, |
| | statistics, analogies, | authorities) | quotations from | quotations from |
| | quotations from | make | relevant | relevant |
| | relevant authorities) | appropriate | authorities) make | authorities) make |
| | make appropriate | reference to | appropriate | reference to |
| | reference to | information or | reference to | information or |
| | information or | analysis that | information or | analysis that |
| | analysis that | generally | analysis that | minimally |
| | significantly | supports the | partially supports | supports the |
| | supports the | presentation or | the presentation | presentation or |
| | presentation or | establishes the | or establishes the | establishes the |
| | establishes the | presenter's | presenter's | presenter's |
| | presenter's | credibility/ | credibility/ | credibility/ |
| Supporting | credibility/ authority | authority on the | authority on the | authority on the |
| Material | on the topic. | topic. | topic. | topic. |
| | Central message is | | | |
| | compelling | | Central message | |
| | (precisely stated, | Central message | is basically | Central message |
| | appropriately | is clear and | understandable | can be deduced |
| | repeated, | consistent with | but is not often | but is not |
| Central | memorable, and | the supporting | repeated and is | explicitly stated in |
| Message | strongly supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022 **Dean of School of Computer Science and Engineering**

Assoc.Prof. Nguyen Van Sinh

Course Name: Theoretical Models in Computing

Course Code: IT131

1. General information

| Course designation | , | course is oriented to t | hose undergraduate students who require | | | |
|---|---|---|---|--|--|--|
| Course designation | | king knowledge of n | | | | |
| Semester(s) in which the course is taught | 3 | | | | | |
| Person responsible for the course | Dr. H | a Viet Uyen Synh | | | | |
| Language | Engli | sh | | | | |
| Relation to curriculum | Comp | pulsory | | | | |
| Teaching methods | Lectu | re, lesson, project, se | minar. | | | |
| Workload (incl. contact hours, self-study hours) | Conta | ontact hours: 45 (lecture) + 30 (laboratory) ivate study including examination preparation, specified in hours: | | | | |
| Credit points | Lectu | Number of credits : 4 Lecture: 3 Laboratory: 1 | | | | |
| Required and recommended prerequisites for joining the course | | | | | | |
| Course objectives | This course is oriented to those undergraduate students who require a working knowledge of numerical methods. Topics to be covered include solving nonlinear equations and linear systems, interpolation and least square method, numerical evaluation of derivatives, integral and solution of differential equations. The focus will be on understanding the solving techniques and the engineering meaning of diver problems, and not on rigorous profs. | | | | | |
| Course learning outcomes | CLO 1. Solve numerically nonlinear equations by bisection, iterative and Newton methods. CLO 2. Solve big linear systems by exact and iterative methods. CLO 3. Fit data by interpolation polynomials, Spline ◆ polynomials and least square methods. CLO 4. Evaluate numerically derivatives and integrals. CLO 5. Solve numerically Boundary value problems by Euler, Euler improved and Finite Difference methods. CLO 6. Study diverse engineering problems by numerical methods | | | | | |
| | | Competency | Course learning outcome | | | |
| | | level | (CLO) | | | |
| | | Knowledge | 1,2,3,4,5 | | | |
| | | Skill | 6 | | | |
| | | Attitude | | | | |

| Content | The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Teach); U (Utilize) | | | | | |
|------------------------------------|---|------------|---------|--|--|--|
| | Topic | Weigh | Leve | | | |
| | Chapter 1. Introduction | 3 | I | | | |
| | Chapter 2. Errors & Taylor Series | 3 | T,U | | | |
| | Chapter 3. Roots of Non-linear Equations | 3 | T,U | | | |
| | Chapter 4. Linear Algebraic Equations 6 | | | | | |
| | Chapter 5. Optimization 6 | | | | | |
| | Chapter 6. Curve Fitting & Interpolation | 6 | T,U | | | |
| | Chapter 7. Numerical Differentiation and Integration | 6 | T,U | | | |
| | Chapter 8. Ordinary Differential Equations | 6 | T,U | | | |
| | Chapter 9. Partial Differential Equations | 6 | T,U | | | |
| Examination forms | Multiple-choice questions, short-answer question | S | | | | |
| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their | | | | | |
| | class participation. Questions and comments are strongly encouraged. | | | | | |
| | Assignments/Examination: Students must have more than 50/100 points overall to pass this course. | | | | | |
| Reading list | Steven C. Chapra, Raymond P. Canale, N for engineers 6th, 2008 | umerical n | nethods | | | |

2. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | X | | | | |
| 2 | X | | | | | |
| 3 | X | | | | | |
| 4 | | X | | | | |
| 5 | X | | | | | |
| 6 | | X | | | | |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessment s | Learning activities | Resource s |
|------|--|-----|--------------------|----------------------------|---------------|
| 1 | Chapter 1. Introduction | | | lecture, exercises | |
| 2 | Chapter 2. Errors & Taylor Series | 1 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 3 | Chapter 3. Roots of Non-linear Equations | 1 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 4 | Chapter 4. Linear Algebraic Equations | 2 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 5 | Chapter 5. Optimization | 3 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 6 | Midterm | | | | |
| | Chapter 6. Curve Fitting & Interpolation | 4 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 7 | Chapter 7. Numerical Differentiation and Integration | 5 | Quiz, Lab, Exam | lecture, exercises, lab | |
| 8 | Chapter 8. Ordinary Differential Equations | 6 | Quiz, Exam | lecture, exercises, lab | |
| 9 | Chapter 9. Partial Differential Equations | 6 | Quiz, Exam | lecture, exercises, lab | |
| 10 | Final exam | | | | |

3. Assessment plan

| Assessment Type | CLO 1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 |
|---------------------------|----------|------|------|------|------|------|
| Quiz (10%) | 20% | 20% | 20% | 20% | 20% | 20% |
| Labs (20%) | 30% | 30% | 30% | 30% | 30% | 30% |
| Midterm examination (30%) | 50% | 50% | 50% | | | |
| Final examination (40%) | | | | 50% | 50% | 50% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

1. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted. ←

Rubrics (optional)

| 5.1.Grading checklist |
|-----------------------|
|-----------------------|

| continuing contenting | | | | | | | |
|---------------------------------------|---------------------|--|--|--|--|--|--|
| Grading checklist for Written Reports | | | | | | | |
| Student: | HW/Assignment: | | | | | | |
| Date: | Evaluator: | | | | | | |
| | Max. Score Comments | | | | | | |

| Technical content (60%) | | |
|---|-----|--|
| Abstract clearly identifies purpose and summarizes | 10 | |
| principal content | | |
| Introduction demonstrates thorough knowledge of | 15 | |
| relevant background and prior work | | |
| Analysis and discussion demonstrate good subject | 30 | |
| mastery | | |
| Summary and conclusions appropriate and complete | 5 | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good transitions | 5 | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2.Holistic rubric

|] | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | | | | |
|------|---|--|--|--|--|--|--|
| Scor | Description | | | | | | |
| e | | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | | |
| 0 | No response/task not attempted | | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3.Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | Milestone | | |
|-------------|-----------------------|--------------------|------------------|------------------|--|
| | 4 | 3 | 2 | 1 | |
| | | Issue/ problem to | Issue/ problem | | |
| | Issue/ problem to be | be considered | to be considered | | |
| | considered critically | critically is | critically is | | |
| | is stated clearly and | stated, described, | stated but | Issue/ problem | |
| | described | and clarified so | description | to be | |
| | comprehensively, | that | leaves some | considered | |
| | delivering all | understanding is | terms | critically is | |
| | relevant information | not seriously | undefined, | stated without | |
| Explanation | necessary for full | impeded by | ambiguities | clarification or | |
| of issues | understanding. | omissions. | unexplored, | description. | |

| | | | boundaries | |
|-----------------------------|---|---------------------------|------------------------------|-------------------------------|
| | | | undetermined, | |
| | | | and/ or | |
| | | | backgrounds | |
| | | | unknown. | |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is taken | Information is | some | |
| | from source(s) with | taken from | interpretation/ | IC |
| | enough | source(s) with | evaluation, but | Information is taken from |
| | interpretation/ evaluation to | enough interpretation/ | not enough to develop a | source(s) |
| | develop a | evaluation to | coherent | without any |
| Evidence | comprehensive | develop a | analysis or | interpretation/ |
| Selecting and | analysis or | coherent analysis | synthesis. | evaluation. |
| using | synthesis. | or synthesis. | Viewpoints of | Viewpoints of |
| information to | Viewpoints of | Viewpoints of | experts are | experts are |
| investigate a | experts are | experts are | taken as mostly | taken as fact, |
| point of view | questioned | subject to | fact, with little | without |
| or conclusion | thoroughly. | questioning. | questioning. | question. |
| | | | | Shows an |
| | | | | emerging |
| | Themore alaly | | Questions some | awareness of |
| | Thoroughly (systematically and | | assumptions. Identifies | present assumptions |
| | methodically) | | several relevant | (sometimes |
| | analyzes own and | | contexts when | labels |
| | others' assumptions | Identifies own | presenting a | assertions as |
| | and carefully | and others' | position. May | assumptions). |
| | evaluates the | assumptions and | be more aware | Begins to |
| | relevance of | several relevant | of others' | identify some |
| Influence of | contexts when | contexts when | assumptions | contexts when |
| context and | presenting a | presenting a | than one's own | presenting a |
| assumptions | position. | position. | (or vice versa). | position. |
| | Specific position (perspective, thesis/ | Specific position | | |
| | hypothesis) is | (perspective, | | |
| | imaginative, taking | thesis/hypothesis) | | |
| | into account the | takes into account | | |
| | complexities of an | the complexities | | |
| | issue. Limits of | of an issue. | Specific | Specific |
| | position | Others' points of | position | position |
| | (perspective, thesis/ | view are | (perspective, | (perspective, |
| Student's | hypothesis) are | acknowledged | thesis/ | thesis/ |
| position | acknowledged. | within position | hypothesis) | hypothesis) is |
| (perspective, thesis/hypoth | Others' points of view are synthesized | (perspective, thesis/ | acknowledges different sides | stated, but is simplistic and |
| esis) | within position | hypothesis). | of an issue. | obvious. |
| Colo) | within position | nyponicsis). | or an issue. | obvious. |

| | (perspective, thesis/hypothesis). | | | |
|---------------|-----------------------------------|---------------------|-------------------|-----------------|
| | | | Conclusion is | |
| | | | logically tied to | |
| | | | information | |
| | Conclusions and | Conclusion is | (because | Conclusion is |
| | related outcomes | logically tied to a | information is | inconsistently |
| | (consequences and | range of | chosen to fit the | tied to some of |
| | implications) are | information, | desired | the information |
| | logical and reflect | including | conclusion); | discussed; |
| Conclusions | student's informed | opposing | some related | related |
| and related | evaluation and | viewpoints; | outcomes | outcomes |
| outcomes | ability to place | related outcomes | (consequences | (consequences |
| (implications | evidence and | (consequences | and | and |
| and | perspectives | and implications) | implications) | implications) |
| consequences | discussed in priority | are identified | are identified | are |
|) | order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Milesto | | Benchmark |
|-----------|-----------------------------------|-------------------------------------|----------------------------------|-----------------------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational pattern | | Organizational pattern (specific | |
| | (specific introduction | | introduction and | Organizational |
| | and conclusion, | Organizational pattern | conclusion, | pattern (specific |
| | sequenced material | (specific introduction | sequenced | introduction and |
| | within the body, and | and conclusion, | material within | conclusion, |
| | transitions) is clearly | sequenced material | the body, and | sequenced |
| | and consistently | within the body, and | transitions) is | material within |
| | observable and is | transitions) is clearly | intermittently | the body, and |
| | skillful and makes the | and consistently | observable | transitions) is not |
| Organizat | content of the | observable within the | within the | observable within |
| ion | presentation cohesive. | presentation. | presentation. | the presentation. |
| | | | Language choices are mundane and | Language choices |
| | Language choices are imaginative, | Language choices are thoughtful and | commonplace and partially | are unclear and minimally support |
| | memorable, and | generally support the | support the | the effectiveness |
| | compelling, and | effectiveness of the | effectiveness of | of the |
| | enhance the | presentation. | the presentation. | presentation. |
| | effectiveness of the | Language in | Language in | Language in |
| | presentation. Language | presentation is | presentation is | presentation is not |
| _ | in presentation is | appropriate to | appropriate to | appropriate to |
| Language | appropriate to audience. | audience. | audience. | audience. |
| | Delivery techniques | Delivery techniques | Delivery | Delivery |
| | (posture, gesture, eye | (posture, gesture, eye | techniques | techniques |
| | contact, and vocal | contact, and vocal | (posture, gesture, | (posture, gesture, |
| Delivery | expressiveness) make | expressiveness) make | eye contact, and | eye contact, and |

| | the presentation | the presentation | vocal | vocal |
|-----------|--------------------------|----------------------------|--------------------|----------------------|
| | compelling, and | interesting, and | expressiveness) | expressiveness) |
| | speaker appears | speaker appears | make the | detract from the |
| | polished and confident. | comfortable. | presentation | understandability |
| | F | | understandable, | of the |
| | | | and speaker | presentation, and |
| | | | appears | speaker appears |
| | | | tentative. | uncomfortable. |
| | | | | Insufficient |
| | | | Supporting | supporting |
| | | | materials | materials |
| | | | (explanations, | (explanations, |
| | | | examples, | examples, |
| | | | illustrations, | illustrations, |
| | | | statistics, | statistics, |
| | A variety of types of | Supporting materials | analogies, | analogies, |
| | supporting materials | (explanations, | quotations from | quotations from |
| | (explanations, | examples, | relevant | relevant |
| | examples, illustrations, | illustrations, statistics, | authorities) make | authorities) make |
| | statistics, analogies, | analogies, quotations | appropriate | reference to |
| | quotations from | from relevant | reference to | information or |
| | relevant authorities) | authorities) make | information or | analysis that |
| | make appropriate | appropriate reference | analysis that | minimally |
| | reference to information | to information or | partially supports | supports the |
| | or analysis that | analysis that generally | the presentation | presentation or |
| | significantly supports | supports the | or establishes the | establishes the |
| | the presentation or | presentation or | presenter's | presenter's |
| Supportin | establishes the | establishes the | credibility/ | credibility/ |
| g | presenter's credibility/ | presenter's credibility/ | authority on the | authority on the |
| Material | authority on the topic. | authority on the topic. | topic. | topic. |
| | Central message is | | Central message | |
| | compelling (precisely | | is basically | Central message |
| | stated, appropriately | Central message is | understandable | can be deduced |
| | repeated, memorable, | clear and consistent | but is not often | but is not |
| Central | and strongly | with the supporting | repeated and is | explicitly stated in |
| Message | supported.) | material. | not memorable. | the presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Security Technology and Implementation

Course Code: IT165IU

1. General information

| Course designation | The course will concentrate on security technologies that can be employed to safeguard and maintain a network. The course will also cover risk management, business continuity and recovery planning, operations security, access control systems, and software development security. |
|---|---|
| Semester(s) in which the course is taught | 7,9 |
| Person responsible for the course | Dr. Le Hai Duong |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, project, seminar. |
| Workload (incl. contact hours, self- study hours) | Total workload: 195 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): 45 (lecture) + 30 (laboratory) Private study including examination preparation, specified in hours: 120 |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 |
| Required and recommended prerequisites for joining the course | Computer Networks |
| Course objectives | This course introduces students to information security principles, cryptography systems (symmetric and public key encryptions), risk management, security architecture and design, business continuity operations security, access control systems, protecting TCP/IP network, firewalls, virtual private network, IPSec, software development security. |

| Course learning outcomes | CLO 1. Gain understanding of information security and the cryptography concepts including symmetric key encryption, hash function, message authentication code, public key encryption, digital signature and digital envelope; CLO 2. Apply the concepts of authentication and authorization in implementing secure systems and networks; CLO 3. Analyze and evaluate security risk and security design; CLO 4. Understand and apply software development security; CLO 5. Apply security technologies in operations. | | | | |
|------------------------------------|---|---|---|---------|----------|
| | | Competency level | Course learning ou (CLO) | tcome | |
| | | Knowledge | CLO1, CLO2, CLO4 | 4, CLO5 | |
| | | Skill | CLO2, CLO3, CLO4 | 4, CLO6 | |
| | | Attitude | | | |
| Content | weigh Weig | nting of the content ht: lecture session | | | e |
| | To | pic | | Weigh | Leve |
| | T 6 | | | t | l T |
| | I + | ormation security p | | 1 | Т |
| | I - | vernance and risk i | | 1 | T,U T |
| | | curity architecture a siness continuity ar | and design; nd disaster recovery | 1 | T,U |
| | _ | nning; | | | |
| | | eration security; | | 2 | T,U |
| | | | as and methodology; | 1 | T |
| | | yptography; | | 2 | T,U |
| | | erview network and urity; | d telecommunications | 1 | T,U |
| | Ba | sic security infrastr | uctures and routers; | 1 | T |
| | Fir | ewalls | | 1 | T,U |
| | | rusion detection systems | stems and intrusion | 1 | Т |
| | Vii | tual private netwoi | k and IPSec; | 1 | T |
| | So | ftware Developmer | nt security. | 1 | T,U |
| Examination forms | Multi | ple-choice question | ns, short-answer question | ons | |
| Study and examination requirements | | | n attendance of 80 perce udents will be assessed | | _ |

| | their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 | | |
|--------------|--|--|--|
| | points overall to pass this course. | | |
| Reading list | 2. William Stallings and Lawrence Brown, Computer Security - Principles and Practice 4th edition, 2018 | | |
| | 3. Mark S. Merkow and Jim Breithaupt, Information Security: Principles and Practices, 2nd edition, 2014. | | |

3. Learning Outcomes Matrix

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|---|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | X | | X | X | | |
| 2 | | X | | | | |
| 3 | X | | | | | |
| 4 | X | | | | | |
| 5 | X | | | | | |
| 6 | X | | | | | |

4. Planned learning activities and teaching methods

| Wee | Topic | CLO | Assessments | Learning | Resour |
|------|---|-----|-------------|-------------------------------|--------|
| k | | | | activities | ces |
| 1 | Information security principles | 1 | Quiz, Exam | Lecture, Exercises, Lab | [1,2] |
| 2 | Governance and risk management; | 3 | Quiz, Exam | Lecture, Lab | [2] |
| 3 | Security architecture and design; | 3 | Quiz, Exam | Lecture, Lab | [2] |
| 4 | Business continuity and disaster recovery planning; | 3 | Quiz, Exam | Lecture, Lab | [2] |
| 5,6 | Operation security; | 5 | Quiz, Exam | Lecture, Lab | [2] |
| 7 | Access control systems and methodology; | 2 | | Lecture, Lab | |
| | Midterm exam | | | | |
| 8, 9 | Cryptography; | 1 | Quiz, Exam | Lecture | [1] |
| 10 | Overview network and telecommunications; | 5 | Quiz, Exam | Lecture, Lab | [2] |

| 11 | Basic security infrastructures and routers; | 5 | Quiz, Exam | Lecture, Lab | [2] |
|----|--|---|------------|------------------------|-------|
| 12 | Firewalls | 5 | Quiz, Exam | Lecture, Exercises, | [1,2] |
| 13 | Intrusion detection systems and intrusion protection systems | 5 | Quiz, Exam | Lecture, Exercises, | [1,2] |
| 14 | Virtual private network and IPSec; | 5 | Quiz, Exam | Lecture, Lab | [1,2] |
| 15 | Software Development security. | 4 | Quiz, Exam | Lecture | [2] |
| | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 |
|---------------------------|------|------|------|------|------|
| Midterm examination (30%) | 30% | 80% | 55% | | 10% |
| Final examination (40%) | 40% | | | 75% | 60% |
| Exercises/ Quiz (30%) | 30% | 20% | 45% | 25% | 30% |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

2. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.↔

5. Rubrics (optional)

5.1. Grading checklist
Grading checklist for Written Reports

| Grading checklist for written Reports | | | | | |
|---------------------------------------|----------------|------|-------|----------|--|
| Student: | HW/Assignment: | | | | |
| | Evaluator: | | | | |
| Date: | | | | | |
| | | | | | |
| | | Max. | Score | Comments | |
| Technical content (| (60%) | | | | |
| Abstract clearly identifies purpose | and | 10 | | | |
| summarizes principal content | | | | | |
| Introduction demonstrates thoroug | h knowledge | 15 | | | |
| of relevant background and prior v | work | | | | |
| Analysis and discussion demonstra | ate good | 30 | | | |
| subject mastery | | | | | |
| | | | | | |

| Summary and conclusions appropriate and | 5 | |
|---|-----|--|
| complete | | |
| Organization (10%) | | |
| Distinct introduction, body, conclusions | 5 | |
| Content clearly and logically organized, good | 5 | |
| transitions | | |
| Presentation (20%) | | |
| Correct spelling, grammar, and syntax | 10 | |
| Clear and easy to read | 10 | |
| Quality of Layout and Graphics (10%) | 10 | |
| TOTAL SCORE | 100 | |

5.2. Holistic rubric

| Н | Holistic rubric for evaluating the entire document, e.g., | | | | | | |
|-------|---|--|--|--|--|--|--|
| Score | exercises/quizzes/HW Score Description | | | | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task are included in response | | | | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of task are included. | | | | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task are included. | | | | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task are missing. | | | | | | |
| 1 | Demonstrates no understanding of the problem. | | | | | | |
| 0 | No response/task not attempted | | | | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| | Capstone | Miles | tone | Benchmark |
|--------|----------------------|-------------------|----------------|------------------|
| | 4 | 3 | 2 | 1 |
| | | | Issue/ problem | |
| | | | to be | |
| | Issue/ problem to | | considered | |
| | be considered | Issue/ problem | critically is | |
| | critically is stated | to be considered | stated but | |
| | clearly and | critically is | description | |
| | described | stated, | leaves some | Issue/ problem |
| | comprehensively, | described, and | terms | to be |
| | delivering all | clarified so that | undefined, | considered |
| Explan | relevant | understanding is | ambiguities | critically is |
| ation | information | not seriously | unexplored, | stated without |
| of | necessary for full | impeded by | boundaries | clarification or |
| issues | understanding. | omissions. | undetermined, | description. |

| | | | and/ or | |
|--------------------|---|-----------------------------------|----------------------------|--------------------------------|
| | | | backgrounds | |
| | | | unknown. | |
| | | | | |
| | | | Information is | |
| | | | taken from | |
| | | | source(s) with | |
| | Information is | Information is | some | |
| Eviden | taken from | taken from | interpretation/ | |
| ce | source(s) with | source(s) with | evaluation, but | |
| Selectin | enough | enough | not enough to | Information is |
| g and | interpretation/ | interpretation/ | develop a | taken from |
| using | evaluation to | evaluation to | coherent | source(s) |
| informa tion to | develop a | develop a coherent | analysis or | without any |
| investig | comprehensive analysis or | analysis or | synthesis. Viewpoints of | interpretation/ evaluation. |
| ate a | synthesis. | synthesis. | experts are | Viewpoints of |
| point of | Viewpoints of | Viewpoints of | taken as | experts are |
| view or | experts are | experts are | mostly fact, | taken as fact, |
| conclus | questioned | subject to | with little | without |
| ion | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | Shows an |
| | | | some | emerging |
| | | | assumptions. | awareness of |
| | Thoroughly | | Identifies | present |
| | (systematically and | | several | assumptions |
| | methodically) | | relevant | (sometimes labels |
| | analyzes own and others' | Identifies own | contexts when presenting a | assertions as |
| Influen | assumptions and | and others' | position. May | assumptions). |
| ce of | carefully evaluates | assumptions and | be more aware | Begins to |
| context | the relevance of | several relevant | of others' | identify some |
| and | contexts when | contexts when | assumptions | contexts when |
| assump | presenting a | presenting a | than one's own | presenting a |
| tions | position. | position. | (or vice versa). | position. |
| | Specific position | Specific | | |
| G ₄ 3 | (perspective, | position | | |
| Studen | thesis/ hypothesis) | (perspective, | Smaoifi s | Coocific |
| t's | is imaginative, | thesis/hypothesi s) takes into | Specific | Specific |
| positio n | taking into account the complexities of | account the | position (perspective, | position (perspective, |
| (perspe | an issue. Limits of | complexities of | thesis/ | thesis/ |
| ctive, | position | an issue. Others' | hypothesis) | hypothesis) is |
| thesis/h | (perspective, | points of view | acknowledges | stated, but is |
| ypothe | thesis/ hypothesis) | are | different sides | simplistic and |
| sis) | are acknowledged. | acknowledged | of an issue. | obvious. |

| | Others' points of view are synthesized within position (perspective, thesis/ hypothesis). | within position (perspective, thesis/ hypothesis). | | |
|---------|---|---|----------------|-----------------|
| | | | Conclusion is | |
| | | Conclusion is | logically tied | |
| | | logically tied to | to information | |
| | Conclusions and | a range of | (because | Conclusion is |
| Conclu | related outcomes | information, | information is | inconsistently |
| sions | (consequences and | including | chosen to fit | tied to some of |
| and | implications) are | opposing | the desired | the information |
| related | logical and reflect | viewpoints; | conclusion); | discussed; |
| outcom | student's informed | related | some related | related |
| es | evaluation and | outcomes | outcomes | outcomes |
| (implic | ability to place | (consequences | (consequences | (consequences |
| ations | evidence and | and | and | and |
| and | perspectives | implications) | implications) | implications) |
| conseq | discussed in | are identified | are identified | are |
| uences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| | Capstone | Mile | stone | Benchmark |
|--------|-------------------|-----------------|-----------------|---------------------|
| | 4 | 3 | 2 | 1 |
| | Organizational | | | |
| | pattern (specific | | | |
| | introduction and | Organizational | | |
| | conclusion, | pattern | Organizational | |
| | sequenced | (specific | pattern | |
| | material within | introduction | (specific | |
| | the body, and | and conclusion, | introduction | Organizational |
| | transitions) is | sequenced | and conclusion, | pattern (specific |
| | clearly and | material within | sequenced | introduction and |
| | consistently | the body, and | material within | conclusion, |
| | observable and | transitions) is | the body, and | sequenced |
| | is skillful and | clearly and | transitions) is | material within |
| | makes the | consistently | intermittently | the body, and |
| | content of the | observable | observable | transitions) is not |
| Organi | presentation | within the | within the | observable within |
| zation | cohesive. | presentation. | presentation. | the presentation. |

| | | | Ιτ | |
|----------|--------------------------|--------------------------|--------------------------|--------------------------|
| | T | T | Language | |
| | Language | Language | choices are | |
| | choices are | choices are | mundane and | T |
| | imaginative, | thoughtful and | commonplace | Language choices |
| | memorable, and | generally | and partially | are unclear and |
| | compelling, and | support the | support the | minimally support |
| | enhance the | effectiveness of | effectiveness of | the effectiveness |
| | effectiveness of | the | the | of the |
| | the presentation. | presentation. | presentation. | presentation. |
| | Language in . | Language in | Language in . | Language in |
| _ | presentation is | presentation is | presentation is | presentation is not |
| Langu | appropriate to | appropriate to | appropriate to | appropriate to |
| age | audience. | audience. | audience. | audience. |
| | Delivery | 5 11 | Delivery | 5 11 |
| | techniques | Delivery | techniques | Delivery |
| | (posture, | techniques | (posture, | techniques |
| | gesture, eye | (posture, | gesture, eye | (posture, gesture, |
| | contact, and | gesture, eye | contact, and | eye contact, and |
| | vocal | contact, and | vocal | vocal |
| | expressiveness) | vocal | expressiveness) | expressiveness) |
| | make the | expressiveness) | make the | detract from the |
| | presentation | make the | presentation | understandability |
| | compelling, and | presentation | understandable, | of the |
| D II | speaker appears | interesting, and | and speaker | presentation, and |
| Deliver | polished and | speaker appears | appears | speaker appears |
| <u>y</u> | confident. | comfortable. | tentative. | uncomfortable. |
| | A variety of | Supporting materials | Supporting materials | Insufficient |
| | types of | | | |
| | supporting materials | (explanations, | (explanations, | supporting materials |
| | | examples, illustrations, | examples, illustrations, | |
| | (explanations, examples, | statistics, | statistics, | (explanations, examples, |
| | illustrations, | analogies, | analogies, | illustrations, |
| | statistics, | quotations from | quotations from | statistics, |
| | analogies, | relevant | relevant | analogies, |
| | quotations from | authorities) | authorities) | quotations from |
| | relevant | make | make | relevant |
| | authorities) | appropriate | appropriate | authorities) make |
| | make | reference to | reference to | reference to |
| | appropriate | information or | information or | information or |
| | reference to | analysis that | analysis that | analysis that |
| | information or | generally | partially | minimally |
| | analysis that | supports the | supports the | supports the |
| Suppor | significantly | presentation or | presentation or | presentation or |
| ting | supports the | establishes the | establishes the | establishes the |
| Materi | presentation or | presenter's | presenter's | presenter's |
| al | establishes the | credibility/ | credibility/ | credibility/ |
| uı | comonisines the | orogrounty/ | orogionity/ | orogionity/ |

| | presenter's credibility/ authority on the topic. | authority on the topic. | authority on the topic. | authority on the topic. |
|--------|--|-------------------------|-------------------------|-------------------------|
| | Central message | | | |
| | is compelling | | | |
| | (precisely | | Central | |
| | stated, | Central | message is | Central message |
| | appropriately | message is | basically | can be deduced |
| Centra | repeated, | clear and | understandable | but is not |
| 1 | memorable, and | consistent with | but is not often | explicitly stated |
| Messag | strongly | the supporting | repeated and is | in the |
| e | supported.) | material. | not memorable. | presentation. |

Date revised: February 15, 2022

Ho Chi Minh City, 15/02/2022

Dean of School of Computer Science and Engineering

Assoc.Prof. Nguyen Van Sinh

Course Name: Software Quality Verification and Validation

Course Code: IT166IU

1. General information

| 1. Covered designation | | | | |
|---|--|---------------------|---|-------|
| 1. Course designation | | | | |
| Semester(s) in which the course is taught | 7,9 | | | |
| Person responsible for the course | Tran Than | h Tung, Dr. | | |
| Language | English | | | |
| Relation to curriculum | Elective | | | |
| Teaching methods | Lecture, le | esson, project, sem | inar. | |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: Contact hours (please specify whether lecture, exercise, laboratory session, etc.): Private study including examination preparation, specified in hours: Student responsibility: Students are expected to spend at least 8 hours per week for self – studying. This time should be made up of reading, working on exercises and problems and group assignment. | | | |
| Credit points | Number of credits: 4 (ECTS: 6.18) Lecture: 3 Laboratory: 1 | | | |
| Required and recommended prerequisites for joining the course | Object-Ori | iented Programmi | ng | |
| Course objectives | testing. Str | rategies and techni | ification, validation iques are presented r planning software | l for |
| Course learning outcomes | CLO 1. Describe and explain how testing activities involve within software development process. CLO 2. Understand and apply best practices for software testing. CLO 3. Create test cases based on system requirement | | | |
| | | Competency | Course | |
| | | level | learning | |
| | | | outcome | |
| | | | (CLO) | |
| | | Knowledge | CLO1, CLO2 | |
| | | Skill | CLO2, CLO3 | |
| | | Attitude | CLO2 | |

| | • • | | • | indicate |
|--|--|---|--|---|
| - | | | evel. | |
| _ | | | ch): U (I | Itilize) |
| | Topic | Weight | Level | |
| | Software Testing Overview | 3 | I | |
| | Software Testing Foundations | 3 | Т | |
| | Software Testing Activities | 3 | T | |
| | Model-Driven Test Design | 3 | T, U | |
| | Test Automation | 3 | T, U | |
| | Testing First Approach | 3 | Т | |
| | Criteria-Based Test Design | 3 | T | |
| | Input Space Partitioning | 3 | Т | |
| | Graph Coverage | 3 | T | |
| | Logic Coverage | 3 | T | |
| | Writing Test Plans | 3 | T, U | |
| | Test implementation | 3 | T, U | |
| Short-ansv | ver questions | | | |
| | | | _ | |
| _ | | | | |
| | | | | |
| | | | | |
| | | | | - 111010 |
| 4. Paul Ammann, Jeff Offutt; Introduction to Software Testing, 2nd, 2017 | | | | to |
| | | | | |
| | | Explorato | ry Softw | are |
| | Short-ansy Attendanc compulsor assessed o Questions Assignment than 50/10 4. Pau Sof 5. Jam | the weighting of the content Weight: lecture session (3 he) Teaching levels: I (Introduce) Software Testing Overview Software Testing Foundations Software Testing Activities Model-Driven Test Design Test Automation Testing First Approach Criteria-Based Test Design Input Space Partitioning Graph Coverage Logic Coverage Writing Test Plans Test implementation Short-answer questions Attendance: A minimum atte compulsory for the class ses assessed on the basis of their Questions and comments are Assignments/Examination: State of the content of | the weighting of the content and the let Weight: lecture session (3 hours) Teaching levels: I (Introduce); T (Tea Topic Weight Software 3 Testing Overview Software 3 Testing Foundations Software 3 Testing Foundations Software 3 Testing Activities Model-Driven 3 Test Design Test Osign Test Design Testing First Approach Criteria-Based 3 Test Design Input Space 3 Partitioning Graph 3 Coverage Logic 3 Coverage Vriting Test 3 Plans Test 4 Plans Test 4 Plans Test 5 Plans Test 6 Plans Test 7 Plans Test 8 Plans Test 9 Plans Test Plans Plan | Teaching levels: I (Introduce); T (Teach); U (U Topic Weight Level Software 3 I Testing Overview Software 3 T Testing Foundations Software 3 T Testing Activities Model-Driven 3 T, U Test Design Test 3 T, U Automation Testing First 3 T Approach Criteria-Based 3 T Test Design Input Space 3 T Partitioning Graph 3 T Coverage Logic 3 T Coverage Writing Test 3 T, U Plans Test 3 T, U Short-answer questions Attendance: A minimum attendance of 80 percompulsory for the class sessions. Students with assessed on the basis of their class participatio Questions and comments are strongly encoura. Assignments/Examination: Students must have than 50/100 points overall to pass this course. 4. Paul Ammann, Jeff Offutt; Introduction Software Testing, 2nd, 2017 5. James A. Whittaker; Exploratory Softw |

| 6. | Glendford J. Myers, Tom Badgett, Corey |
|----|---|
| | Sandler; The art of Software Testing, 2012. |

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (SLO) (1-6) is shown in the following table:

| | SLO | | | | | |
|-----|-----|-----|---|---|---|---|
| CLO | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | XX | | | | | |
| 2 | | XXX | | | | |
| 3 | | | | | | X |

3. Planned learning activities and teaching methods

| Week | Topic | CLO | Assessment | Learning activities | Resources |
|------|------------------------------------|-----|-----------------------|---|-----------|
| 1 | Software Testing Overview | 1 | Quiz | Lecture | |
| 2 | Software Testing Foundations | 1 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 3 | Software Testing Activities | 2 | Quiz | Lecture, Discussion | [2] |
| 4 | Model- Driven Test Design | 1,2 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 5 | Test Automation | 2,3 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 6 | Test Automation – Tools | 1,2 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 7 | Testing First Approach | 2,3 | Lab, Quiz, Midterm | Lecture, Discussion | |
| 8 | Criteria- Based Test Design | 2,3 | Lab, Quiz, Midterm | Lecture, Discussion, In class exercises | [1,3] |
| 9 | Midterm | | | | |

| 10 | Input Space Partitioning – Part 1 | 1,2 | Lab, Quiz, Final | Lecture, Discussion, In class exercises | [1,3] |
|----|---|-----|---------------------|---|---------|
| 11 | Input Space Partitioning – Part 2 | 2,3 | Lab, Quiz, Final | Lecture, Discussion | [1,2,3] |
| 12 | Graph Coverage | 1,2 | Lab, Quiz, Final | Lecture, Discussion, In class exercises | [1,3] |
| 13 | Logic Coverage | 2,3 | Lab, Quiz, Final | Lecture, Discussion | [1,3] |
| 14 | Writing Test Plans | 1,2 | Lab, Quiz, Final | Lecture, Discussion, In class exercises | [2,3] |
| 15 | Test implementat ion | 2,3 | Lab, Quiz, Final | Lecture, Discussion | [2,3] |
| 16 | Final exam | | | | |

4. Assessment plan

| Assessment Type | CLO1 | CLO2 | CLO3 |
|---|------|------|------|
| Quiz (5%) | X | X | |
| Labs (20%) | | X | |
| Midterm examination (30%) | X | X | X |
| Projects/Presentations/ Report (10%) | | X | X |
| Final examination (40%) | X | X | X |

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

2. When calculating contact time, each contact hour is counted as a full hour because the organisation of the schedule, moving from room to room, and individual questions to lecturers after the class, all mean that about 60 minutes should be counted.↔

5. Rubrics (optional)

5.1. Grading checklist

| Grading checklist for Written Reports | | | | |
|---------------------------------------|----------------|--|--|--|
| Student: | HW/Assignment: | | | |
| | Evaluator: | | | |

| Date: | | | |
|---|------|-------|----------|
| | | | |
| | Max. | Score | Comments |
| Technical content (60%) | | | |
| Abstract clearly identifies purpose and | 10 | | |
| summarizes principal content | | | |
| Introduction demonstrates thorough knowledge | 15 | | |
| of relevant background and prior work | | | |
| Analysis and discussion demonstrate good | 30 | | |
| subject mastery | | | |
| Summary and conclusions appropriate and | 5 | | |
| complete | | | |
| Organization (10%) | | | |
| Distinct introduction, body, conclusions | 5 | | |
| Content clearly and logically organized, good | 5 | | |
| transitions | | | |
| Presentation (20%) | | | |
| Correct spelling, grammar, and syntax | 10 | | |
| Clear and easy to read | 10 | | |
| Quality of Layout and Graphics (10%) | 10 | | |
| TOTAL SCORE | 100 | | |

5.2. Holistic rubric

| | Hombite Lubite | | | |
|-------|--|--|--|--|
| Holis | Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW | | | |
| Score | Description | | | |
| 5 | Demonstrates complete understanding of the problem. All requirements of task | | | |
| | are included in response | | | |
| 4 | Demonstrates considerable understanding of the problem. All requirements of | | | |
| | task are included. | | | |
| 3 | Demonstrates partial understanding of the problem. Most requirements of task | | | |
| | are included. | | | |
| 2 | Demonstrates little understanding of the problem. Many requirements of task | | | |
| | are missing. | | | |
| 1 | Demonstrates no understanding of the problem. | | | |
| 0 | No response/task not attempted | | | |

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

| Capstone | Milestone | | Benchmark |
|----------|-----------|---|-----------|
| 4 | 3 | 2 | 1 |

| | | | Issue/ problem to be | |
|---------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| | | | considered | |
| | | | critically is stated but | |
| | Issue/ problem to | | description | |
| | be considered critically is stated | Issue/ problem to be considered | leaves some terms | |
| | clearly and | critically is | undefined, | |
| | described | stated, | ambiguities | |
| | comprehensively, | described, and | unexplored, | Issue/ problem |
| | delivering all relevant | clarified so that understanding is | boundaries undetermined, | to be considered critically is |
| Explana | information | not seriously | and/ or | stated without |
| tion of | necessary for full | impeded by | backgrounds | clarification or |
| issues | understanding. | omissions. | unknown. Information is | description. |
| | | | taken from | |
| | | | source(s) with | |
| D • 1 | Information is | Information is | some | |
| Evidenc e | taken from source(s) with | taken from source(s) with | interpretation/ evaluation, but | |
| Selecting | enough | enough | not enough to | |
| and | interpretation/ | interpretation/ | develop a | Information is |
| using | evaluation to | evaluation to | coherent | taken from |
| informati on to | develop a comprehensive | develop a coherent | analysis or synthesis. | source(s) without any |
| investiga | analysis or | analysis or | Viewpoints of | interpretation/ |
| te a | synthesis. | synthesis. | experts are | evaluation. |
| point of | Viewpoints of | Viewpoints of | taken as | Viewpoints of |
| view or conclusi | experts are questioned | experts are subject to | mostly fact, with little | experts are taken as fact, without |
| on | thoroughly. | questioning. | questioning. | question. |
| | | | Questions | G1 |
| | | | some assumptions. | Shows an emerging |
| | Thoroughly | | Identifies | awareness of |
| | (systematically and | | several | present |
| | methodically) | | relevant | assumptions |
| | analyzes own and others' | Identifies own | contexts when presenting a | (sometimes labels assertions |
| Influenc | assumptions and | and others' | position. May | as assumptions). |
| e of | carefully evaluates | assumptions and | be more aware | Begins to |
| context | the relevance of | several relevant | of others' | identify some |
| and | contexts when | contexts when | assumptions than one's own | contexts when |
| assumpt ions | presenting a position. | presenting a position. | (or vice versa). | presenting a position. |
| 10110 | position. | position. | (SI TICO VOIBU). | Position. |

| | Specific position | | | |
|-----------|----------------------|-------------------|-----------------|-------------------|
| | (perspective, | | | |
| | thesis/ hypothesis) | Specific | | |
| | is imaginative, | position | | |
| | taking into account | _ | | |
| | | (perspective, | | |
| | the complexities of | thesis/hypothesi | | |
| | an issue. Limits of | s) takes into | | |
| | position | account the | | |
| | (perspective, | complexities of | G '.C' | |
| Student' | thesis/ hypothesis) | an issue. Others' | Specific | |
| S | are acknowledged. | points of view | position | Specific position |
| position | Others' points of | are | (perspective, | (perspective, |
| (perspec | view are | acknowledged | thesis/ | thesis/ |
| tive, | synthesized within | within position | hypothesis) | hypothesis) is |
| thesis/hy | position | (perspective, | acknowledges | stated, but is |
| pothesis | (perspective, | thesis/ | different sides | simplistic and |
|) | thesis/ hypothesis). | hypothesis). | of an issue. | obvious. |
| | | | Conclusion is | |
| | | Conclusion is | logically tied | |
| | | logically tied to | to information | |
| | Conclusions and | a range of | (because | |
| | related outcomes | information, | information is | |
| Conclusi | (consequences and | including | chosen to fit | Conclusion is |
| ons and | implications) are | opposing | the desired | inconsistently |
| related | logical and reflect | viewpoints; | conclusion); | tied to some of |
| outcome | student's informed | related | some related | the information |
| s | evaluation and | outcomes | outcomes | discussed; |
| (implica | ability to place | (consequences | (consequences | related outcomes |
| tions | evidence and | and | and | (consequences |
| and | perspectives | implications) | implications) | and |
| consequ | discussed in | are identified | are identified | implications) are |
| ences) | priority order. | clearly. | clearly. | oversimplified. |

Oral communication value rubric for evaluating presentation tasks:

| t communication value rubite for evaluating presentation tasks. | | | | | |
|---|-------------------|-----------------|-----------------|---------------------|--|
| | Capstone | Milestone | | Benchmark | |
| | 4 | 3 | 2 | 1 | |
| | Organizational | Organizational | Organizational | | |
| | pattern (specific | pattern | pattern | Organizational | |
| | introduction and | (specific | (specific | pattern (specific | |
| | conclusion, | introduction | introduction | introduction and | |
| | sequenced | and conclusion, | and conclusion, | conclusion, | |
| | material within | sequenced | sequenced | sequenced material | |
| | the body, and | material within | material within | within the body, | |
| | transitions) is | the body, and | the body, and | and transitions) is | |
| | clearly and | transitions) is | transitions) is | not observable | |
| Organiz | consistently | clearly and | intermittently | within the | |
| ation | observable and | consistently | observable | presentation. | |

| | is skillful and makes the content of the presentation cohesive. | observable within the presentation. | within the presentation. | |
|----------------|--|---|--|--|
| Language | Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience. | Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience. |
| Delivery | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative. | Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable. |
| Supporti | A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to | Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to | Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or |
| ng Material | appropriate reference to | information or analysis that | information or analysis that | analysis that minimally supports |

| | information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic. | generally supports the presentation or establishes the presenter's credibility/ authority on the topic. | partially supports the presentation or establishes the presenter's credibility/ authority on the topic. | the presentation or establishes the presenter's credibility/ authority on the topic. |
|--------------------|---|--|--|--|
| Control | Central message is compelling (precisely stated, appropriately repeated, memorable, and | Central message is clear and consistent with | Central message is basically understandable but is not often | Central message can be deduced but is not explicitly |
| Central Message | strongly supported.) | the supporting material. | repeated and is not memorable. | stated in the presentation. |

Date revised: August 29th, 2023

Ho Chi Minh City, 29/08/2023

Dean of School of Computer Science and Engineering π

Assoc.Prof. Nguyen Van Sinh

ĐẠI HỌC QUỐC GIA THÀNH PHÓ HÒ CHÍ MINH **TRƯỜNG ĐẠI HỌC QUỐC TẾ**

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM Độc lập - Tự do - Hạnh phúc

Phụ lục III

BẢNG MÔ TẢ SỐ TÍN CHỈ THỰC TẬP CỦA CTĐT ĐƯỢC THỂ HIỆN CỤ THỂ THEO MÔN HỌC ĐỂ ĐẢM BẢO 8TC THỰC TẬP THEO QUY ĐỊNH TẠI THÔNG TƯ 17/2021/TT-BGDĐT

(Kèm theo Quyết định số /QĐ-ĐHQT ngày tháng năm 2024 của Hiệu trưởng Trường Đại học Quốc tế)

Chương trình kỹ sư Công nghệ thông tin - chuyên ngành Kỹ Thuật Mạng có tổng cộng 10 tín chỉ thực tập:

- Thực tập công nghiệp cho kỹ sư (IT174IU): 07 tín chỉ
- Thực tập tốt nghiệp (IT083IU): 03 tín chỉ

Chương trình kỹ sư Công nghệ thông tin - chuyên ngành Kỹ Thuật Máy Tính có tổng cộng 10 tín chỉ thực tập:

- Thực tập công nghiệp cho kỹ sư (IT174IU): 07 tín chỉ
- Thực tập tốt nghiệp (IT083IU): 03 tín chỉ