

## **BSc (Hons) Degree Programme in Information Security**

Code: 46407; Full-time, Credit-based

**Programme Booklet  
(2023/24)**

Department of Electrical and Electronic Engineering

**Bachelor of Science (Honours) Degree Programme in  
Information Security**

Full-time Credit-based

Code: 46407

Programme Booklet

2023/2024

## **BSc(HONS) IN INFORMATION SECURITY (FULL-TIME)**

### Contents

|  | <u>Page</u> |
|--|-------------|
| 1. General Information   | 1           |
| 2. Rationale, Aims and Intended Learning Outcomes of the Programme           | 2           |
| 3. Entrance Requirements   | 6           |
| 4. Programme, Subjects, and Credits  | 7           |
| 5. Specified Progression Pattern   | 13          |
| 6. Curriculum Map  | 15          |
| 7. Capstone Project  | 16          |
| 8. Work-Integrated Education (WIE)   | 17          |
| 9. Departmental Undergraduate Programme Committee                            | 21          |
| 10. Normal Duration for Completion of a Programme                            | 21          |
| 11. Student Status   | 22          |
| 12. Subject Registration and Withdrawal                                      | 23          |
| 13. Study Load   | 23          |
| 14. Subject Exemption  | 24          |
| 15. Credit Transfer  | 25          |
| 16. Deferment of Study   | 27          |
| 17. Principles of Assessment   | 28          |
| 18. Assessment Methods   | 28          |
| 19. Subject Results  | 29          |
| 20. Board of Examiners (BoE)   | 30          |
| 21. Progression / Academic Probation / Deregistration                        | 31          |
| 22. Appeal against Assessment Results  | 32          |
| 23. Retaking of Subjects   | 32          |
| 24. Exceptional Circumstances  | 33          |
| 25. Grading  | 35          |
| 26. Graduation Requirements for BSc (Hons) in Information Security Programme | 38          |
| 27. Guidelines for Award Classification                                      | 40          |
| 28. Recording of Disciplinary Actions in Students' Records                   | 42          |

|     |  | <u>Page</u> |
|-----|--|-------------|
| 29. | SYLLABI  |             |
|     | <u>LEVEL 1</u>   |             |
|     | CLC1104C/P University Chinese  | 44          |
|     | ELC1011 Practical English for University Studies                       | 47          |
|     | ELC1013 English for University Studies                                 | 50          |
|     | <u>LEVEL 2</u>   |             |
|     | ELC2014 Advanced English for University Studies                        | 53          |
|     | <u>LEVEL 3</u>   |             |
|     | AMA3100 Numbers, Combinatorics, and Statistics                         | 55          |
|     | CLC3241P Professional Communication in Chinese                         | 57          |
|     | COMP3334 Computer Systems Security                                     | 59          |
|     | COMP3335 Database Security   | 62          |
|     | COMP3421 Web Application Design and Development                        | 64          |
|     | COMP3512 Legal Aspects, Professionalism and Ethics of Computing        | 67          |
|     | EIE3117 Integrated Project   | 69          |
|     | EIE3120 Network Technologies and Security                              | 73          |
|     | EIE3333 Data and Computer Communications                               | 76          |
|     | EIE3343 Computer Systems Principles                                    | 79          |
|     | ELC3531 Professional Communication in English for Engineering Students | 82          |
|     | <u>LEVEL 4</u>   |             |
|     | COMP4127 Information Systems Audit and Control                         | 85          |
|     | COMP4142 E-Payment and Cryptocurrency                                  | 87          |
|     | COMP4334 Principles and Practice of Internet Security                  | 90          |
|     | COMP4433 Data Mining and Data Warehousing                              | 93          |
|     | COMP4442 Service and Cloud Computing                                   | 97          |
|     | COMP4512 Intellectual Property Protection and Management               | 100         |
|     | COMP4913 COMP Capstone Project   | 102         |

|            | <u>Page</u>                               |     |
|------------|---|-----|
| EIE4113    | Wireless and Mobile Systems               | 105 |
| EIE4114    | Digital Forensics for Crime Investigation | 107 |
| EIE4116    | Surveillance Studies and Technologies     | 110 |
| EIE4117    | EIE Capstone Project                      | 113 |
| EIE4118    | Intrusion Detection and Penetration Test  | 116 |
| EIE4121    | Machine Learning in Cyber-security        | 119 |
| Appendix 1 |   | 122 |
| Appendix 2 |   | 123 |

*This Programme Booklet is subject to review and changes which the Department can decide to make from time to time. Students will be informed of the changes as and when appropriate.*

## 1. GENERAL INFORMATION

### 1.1 Cohort of Intakes and readership

This programme booklet is the Programme Requirement Document (PRD) for the 2023/24 cohort. Just in case any updated information is necessary after the publication of this booklet, students are requested to refer to the URL <https://www.polyu.edu.hk/eee/study/information-for-current-students/programme-documents/> for the most updated information. Should there be any discrepancy between the contents of this booklet and University regulations, University regulations always prevail.

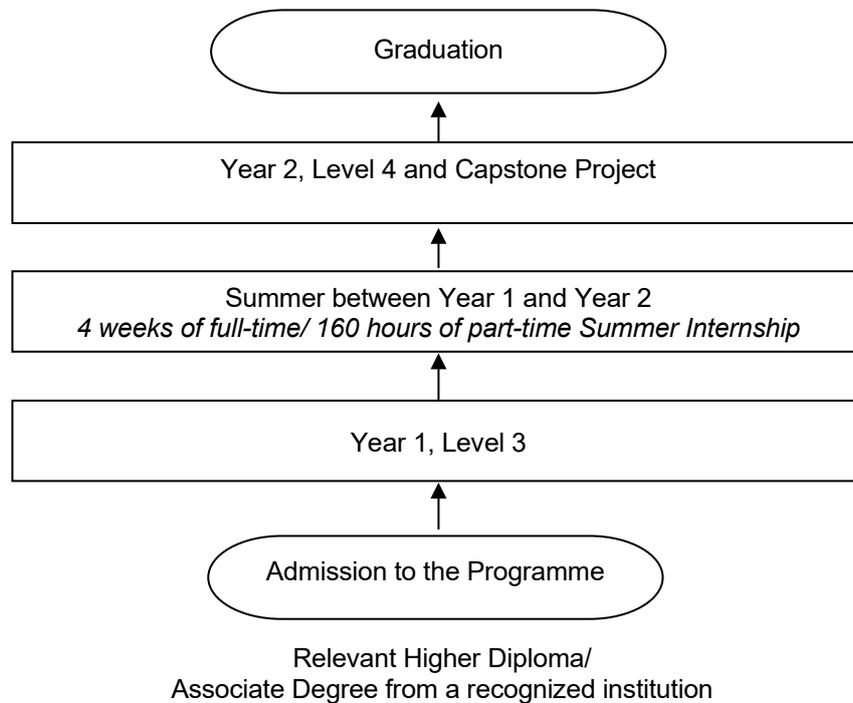
### 1.2 Programme Information

|                              |   |
|------------------------------|---|
| <b>Title of Programme</b>    | <b>Bachelor of Science (Honours) Degree in Information Security</b>   |
| Offering Departments         | Department of Electrical and Electronic Engineering (EEE)<br>Department of Computing (COMP)   |
| Administrative Host          | Department of Electrical and Electronic Engineering (EEE)   |
| Programme Structure          | Credit-based  |
| Final Award                  | Bachelor of Science (Honours) in Information Security<br>資訊安全 (榮譽) 理學士學位  |
| Mode of Attendance           | Full-time   |
| Normal Duration              | 2 years   |
| Total Credits for Graduation | Academic Credits: 64<br>WIE Training Credits: 2   |
| Professional Recognition     | The programme has been granted full accreditation by the Hong Kong Institution of Engineers (HKIE). Graduates of the programme will satisfy the academic requirements for Corporate membership of the HKIE. |

### 1.3 Modes of Attendance

A mode of study is characterized by the credits and subjects required and the progression pattern in Year 1 and Year 2.

Under the full-time mode, students will normally pursue their study by going through Year 1 and Year 2 in full time and then graduate at the end of Year 2 after having satisfied all programme requirements.



## 2. RATIONALE, AIMS AND INTENDED LEARNING OUTCOMES OF THE PROGRAMME

### 2.1 Background and Rationale

The recent advance in information and communication technologies (ICT) has brought people great convenience in their daily life. Information has become one of the most valuable assets to any country and any business which requires careful protection. To protect data security and privacy and to safeguard against the risk of potentially devastating security attacks and misuses have thus become a vital concern to all countries and organizations. With the cross-border, open-platform, highly-interconnected nature of the cyberworld, the impacts of security attacks and misuses are far-reaching, and would require integral effort from all parties involved in order to effectively combat these attacks.

In Hong Kong, since the pace of globalization continues to accelerate, supported by domestic consumption as well as the *Mainland and Hong Kong Closer Economic*

*Partnership Arrangement (CEPA)*, the manpower requirement in ICT will follow a growing trend in the long run. However, the further transition to knowledge society and the shifting of the ICT sector towards Cloud Computing and mobile communications requires ICT employees to acquire new skills and knowledge particularly in the area of information security. There is a need to launch relevant degree programmes to satisfy the urgent needs of the society. This programme will thus cover both large-scale and small-scale information security issues which are facing by individuals, organisations, and the society, and provide the necessary training to students so that they will be capable of preventing security threats and solving security problems in different settings.

## 2.2 Aims

This Programme aims at producing graduates with:

1. a wide range of professional knowledge and skills relevant to Information Security;
2. creativity and innovation;
3. adaptability to changing technology and society; and
4. all-rounded attributes.

## 2.3 Relationship of Programme Aims to University Missions

The University has the following missions:

1. To pursue impactful research that benefits the world.
2. To nurture critical thinkers, effective communicators, innovative problem solvers and socially responsible global citizens.
3. To foster a University community in which all members can excel in their aspirations with a strong sense of belonging and pride.

The following table illustrates the relationship between Programme Aims and University Missions:

| Programme Aims | University Missions |   |   |
|----------------|---------------------|---|---|
|                | 1                   | 2 | 3 |
| 1              | X                   | X | X |
| 2              | X                   | X |   |
| 3              | X                   | X |   |
| 4              |                     | X | X |

## 2.4 Institutional Learning Outcomes

It is PolyU's educational mission to nurture competent professionals who are also critical thinkers, effective communicators, innovative problem solvers, lifelong learners, ethical leaders and socially responsible global citizens. The institutional learning outcomes for these attributes are provided as follows:

1. **Competent professional:** Graduates should be able to integrate and to apply in-depth discipline knowledge and specialised skills that are fundamental to functioning effectively as an entry-level professional (*professional competence*); understand the global trends and opportunities related to their professions (*global outlook*); and demonstrate entrepreneurial spirit and skills in their work, including the discovery and use of opportunities, and experimentation with novel ideas (*entrepreneurship*).
2. **Critical thinker:** Graduates should be able to examine and critique the validity of information, arguments, and different viewpoints, and reach sound judgments on the basis of credible evidence and logical reasoning.
3. **Effective communicator:** Graduates should be able to comprehend and communicate effectively in English, and Chinese where appropriate, orally and in writing, in professional and day-to-day contexts.
4. **Innovative problem solver:** Graduates should be able to identify and define problems in both professional and day-to-day contexts, and produce innovative solutions to solve problems.
5. **Lifelong learner:** Graduates should be able to recognise the need for continual learning and self-improvement, and be able to plan, manage and evaluate their own learning in pursuit of self-determined goals.
6. **Ethical leader:** Graduates should have an understanding of leadership and be prepared to serve as a leader and a team player (*leadership and teamwork*); demonstrate self-leadership and psychosocial competence in pursuing personal and professional development (*intrapersonal competence*); be capable of building and maintaining relationship and resolving conflicts in group work situations (*interpersonal competence*); and demonstrate ethical reasoning in professional and day-to-day contexts (*ethical reasoning*).

7. **Socially responsible global citizen:** Graduates should have the capacity for understanding different cultures and social development needs in the local, national and global contexts (*interest in culture and social development*); and accept their responsibilities as professionals and citizens to society, their own nation and the world (*social, national, and global responsibility*).

## 2.5 Intended Learning Outcomes of the BSc (Hons) in Information Security

Programme Outcomes are the attributes of the graduates who have completed the Programme successfully. These attributes are classified into two broad categories. Category A embraces such attributes as knowledge, skills, abilities, attitudes that are related to Information Security. Category B embraces all-roundedness attributes possessed by the graduates to support their further development.

On successful completion of the Programme, students should be able to:

### Category A: Professional/Academic Knowledge and Skills

1. apply knowledge of mathematics and science appropriate to the discipline of Information Security;
2. apply knowledge of Information Security to the abstraction and conceptualisation of Information and Communications Technology (ICT) models;
3. analyse an Information Security problem, and identify and define the requirements appropriate to its solution;
4. design, implement, and evaluate an Information Security system, process, component, or program to meet desired needs with appropriate consideration for public health and safety, social and environmental considerations; and
5. use current techniques, skills, and tools necessary for the practices in Information Security with an understanding of the limitations.

### Category B: Attributes for All-Roundedness

6. function effectively on teams to accomplish a common goal;
7. have an understanding of professional, ethical, legal, security and social issues and responsibilities;
8. communicate effectively with a range of audiences;
9. analyse the local and global impact of Information Security on individuals, organisations, and society; and
10. recognise the need for and engage in continuing professional development.

### 2.5.1 Relationship of Programme Outcomes to Programme Aims

| Programme Outcomes | Programme Aims |   |   |   |
|--------------------|----------------|---|---|---|
|                    | 1              | 2 | 3 | 4 |
| 1                  | X              |   | X |   |
| 2                  | X              | X | X |   |
| 3                  | X              | X | X |   |
| 4                  | X              | X | X |   |
| 5                  | X              |   | X |   |
| 6                  |                |   |   | X |
| 7                  | X              |   | X | X |
| 8                  |                |   |   | X |
| 9                  | X              |   | X | X |
| 10                 |                |   | X | X |

### 2.5.2 Relationship of Intended Learning Outcomes of the Programme to Institutional Learning Outcomes

| Programme Outcomes | Institutional Learning Outcomes |   |   |   |   |   |   |
|--------------------|---------------------------------|---|---|---|---|---|---|
|                    | 1                               | 2 | 3 | 4 | 5 | 6 | 7 |
| 1                  | X                               |   |   | X |   |   |   |
| 2                  | X                               | X |   | X |   |   |   |
| 3                  | X                               | X |   | X |   |   |   |
| 4                  | X                               |   |   | X |   |   |   |
| 5                  | X                               |   |   |   |   |   |   |
| 6                  |                                 |   | X |   |   | X |   |
| 7                  | X                               |   |   |   |   | X | X |
| 8                  | X                               | X | X | X |   |   |   |
| 9                  |                                 | X |   |   | X |   | X |
| 10                 |                                 |   |   |   | X |   |   |

## 3. ENTRANCE REQUIREMENTS

### 3.1 University General Minimum Entrance Requirements

- A Higher Diploma /Associate Degree from a recognized institution

### 3.2 Programme-specific Minimum Entrance Requirements

- An Associate Degree or Higher Diploma from a recognised institution in Information Technology, Computer Studies, Computing, Engineering, Electronic Engineering, Information Engineering, Communication Engineering, Electrical Engineering, Computer Engineering or other similar disciplines.

## 4. PROGRAMME, SUBJECTS, AND CREDITS

### 4.1 Programme Specified Subjects

Most subjects to be studied at Year 1 and Year 2 are of standard credit value carrying 3 credits each, except for some subjects, such as Capstone Project, Professional Communication, etc. which carry credits other than 3. A student is expected to spend about 35 to 45 hours of study (inclusive of class contact and other study effort) to earn a credit. Table 4.1 lists the subjects, their credit values, and the category they belong to (Compulsory or Elective). All discipline-specific subjects shown as compulsory are non-deferrable and must be taken in accordance to the progression pattern. The subjects offered will be updated from time to time according to the need of society and the profession. The specified progression pattern stated in Section 5 is subject to change due to general changes in the University's rules and regulations and reviews by the Department.

Students are required to complete a minimum of 64 or more academic credits to satisfy the degree requirements. The exact minimum number of academic credits required will depend on the academic background of the students. The subjects contributing to the 64 academic credits are listed in Table 4.1. Please refer to Section 26 for detailed information on the requirements for graduation.

Table 4.1 Subjects Category and Credits of BSc (Hons) in INS

**Year 1 and Year 2 Curricula**

| Subject Code                                 | Subject Title   | Credit | Category of Subjects                                   |
|--|---|--------|--|
| <b>General University Requirements (GUR)</b> |   |        |  |
| -  | Cluster-Area Requirement I (CAR-English Language)                                 | 3      | COM  |
| -  | Cluster-Area Requirement II (CAR M)   | 3      | COM  |
| -  | Service-Learning  | 3      | COM  |
| -  | Language and Communication Requirement I, II and III (LCR I, LCR II and LCR III)* | 0-9    | COM  |
| EEE1Q01                                      | Essential Components of General Education   | 0      | COM  |
| <b>Discipline-Specific Requirement (DSR)</b> |   |        |  |
| AMA3100                                      | Number, Combinatorics and Statistics  | 3      | COM  |
| CLC3241P                                     | Professional Communication in Chinese   | 2      | COM  |
| COMP3334                                     | Computer Systems Security   | 3      | COM  |
| COMP3335                                     | Database Security   | 3      | COM  |
| COMP3421                                     | Web Application Design and Development  | 3      | COM  |
| COMP3512                                     | Legal Aspects, Professionalism and Ethics of Computing                            | 3      | COM  |
| EIE3117                                      | Integrated Project  | 3      | COM  |
| EIE3120                                      | Network Technologies and Security   | 3      | COM  |
| EIE3333                                      | Data and Computer Communications  | 3      | COM  |
| EIE3343                                      | Computer Systems Principles   | 3      | COM  |
| ELC3531                                      | Professional Communication in English for Engineering Students                    | 2      | COM  |
| COMP4127                                     | Information Systems Audit and Control   | 3      | ELE<br>(Select any 2 subjects out of these 5 subjects) |
| COMP4142                                     | E-Payment and Cryptocurrency  | 3      |  |
| COMP4334                                     | Principles and Practice of Internet Security                                      | 3      |  |
| COMP4433                                     | Data Mining and Data Warehousing  | 3      |  |
| COMP4512                                     | Intellectual Property Protection and Management                                   | 3      |  |
| COMP4442                                     | Service and Cloud Computing   | 3      | COM  |
| COMP4913                                     | Capstone Project  | 6      | COM (Select any 1 subject out of these 2 subjects)     |
| EIE4117                                      | Capstone Project  |        |  |
| EIE4113                                      | Wireless and Mobile Systems   | 3      | COM  |
| EIE4114                                      | Digital Forensics for Crime Investigation   | 3      | ELE<br>(Select any 2 subjects out of these 4 subjects) |
| EIE4116                                      | Surveillance Studies and Technologies   | 3      |  |
| EIE4118                                      | Intrusion Detection and Penetration Test  | 3      |  |
| EIE4121                                      | Machine Learning in Cyber-Security  | 3      |  |
| EIE3189                                      | Summer Internship<br>(4 weeks of full-time/ 160 hours of part-time)               | 2      | TRN/WIE  |

Note:

|         |  |
|---------|--|
| AMA     | Department of Applied Mathematics  |
| CLC     | Chinese Language Centre  |
| COM     | Compulsory   |
| COMP    | Department of Computing  |
| EEE/EIE | Department of Electrical and Electronic Engineering  |
| ELC     | English Language Centre  |
| ELE     | Elective   |
| TRN     | Training   |
| WIE     | Work-Integrated Education  |
| *       | Students are also required to fulfil the Language and Communication Requirements (LCR) as set out in Section 4.2 below in order to be eligible for graduation. |

#### 4.2 Language and Communication Requirements (LCR)

Students are required to fulfil the four major components of the overall English and Chinese language requirements below in order to be eligible for graduation:

- (i) Language and Communication Requirements (LCR) in English (6 credits) and Chinese (3 credits), as stated in Sections 4.2.1 and 4.2.2 below;
- (ii) Writing Requirement, as stated in Section 4.2.3 below;
- (iii) Reading Requirement, as stated in Section 4.2.4 below; and
- (iv) Discipline-Specific Language Requirement, as stated in Section 4.2.5 below.

Students not meeting the equivalent standard of the Undergraduate Degree LCR will be required to take degree LCR subjects on top of the normal curriculum requirement. The Department will refer to the guidelines provided by the Language Centres (ELC and CLC) to determine whether a new student has met the equivalent standard.

##### 4.2.1 English

All undergraduate students must successfully complete two 3-credit English language subjects as stipulated by the University (Table A), according to their English language proficiency level. These subjects are designed to suit students' different levels of English language proficiency at entry, as determined by their HKDSE score or the English Language Centre (ELC) entry assessment (when no HKDSE score is available, e.g. in the case of non-local students).

Students entering the University with specified attainment grades in certain public examinations can be given credit transfer or exemption for one or both LCR English subjects.

*Table A: English LCR subjects (each 3 credits)*

| English language competence level/ Subject | <i>Practical English for University Studies</i> | <i>English for University Studies</i> | Any LCR Proficient level elective subject in English (Table B) |
|--|---|---------------------------------------|--|
| HKDSE Level 4 and above or equivalent      | --  | Subject 1                             | Subject 2  |
| HKDSE Level 3 or equivalent                | Subject 1                                       | Subject 2                             | --   |

*Table B: Proficient level elective subjects for DSE Level 4 students and above (or equivalent) (each 3 credits)*

|  |   |
|--|---|
| LCR Proficient level elective subjects | Advanced English for University Studies     |
|  | Advanced English Reading and Writing Skills |
|  | English in Literature and Film              |
|  | Persuasive Communication                    |

#### 4.2.2 Chinese

All undergraduate students are required to successfully complete one 3-credit Chinese language subject successfully as stipulated by the University, according to their Chinese language proficiency level. (Table C).

*Table C: Chinese LCR subjects*

| Categories of students  | Required subject                      |
|---|---------------------------------------|
| For Chinese speaking students   | A Chinese LCR subject                 |
| For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below | One subject from <b>Table D</b> below |

*Table D: Chinese LCR subjects for non-Chinese speakers or students whose Chinese standards are at junior secondary level or below*

| Subject (3 credits)  | Pre-requisite/exclusion  |
|--|--|
| Chinese I (for non-Chinese speaking students)  | For non-Chinese speaking students at beginners' level  |
| Chinese II (for non-Chinese speaking students)   | <ul style="list-style-type: none"> <li>• For non-Chinese speaking students; and</li> <li>• Students who have completed Chinese I or equivalent</li> </ul>                              |
| Chinese III (for non-Chinese speaking students)  | <ul style="list-style-type: none"> <li>• For non-Chinese speaking students at higher competence levels; and</li> <li>• Students who have completed Chinese II or equivalent</li> </ul> |
| Chinese IV (for Non-Chinese speaking students)   | <ul style="list-style-type: none"> <li>• For non-Chinese students at intermediate competence levels; and</li> <li>• Students who have completed Chinese III or equivalent</li> </ul>   |
| Chinese Literature – Linguistics and Cultural Perspectives (for non-Chinese speaking students) | For non-Chinese speaking students at higher competence levels  |

Students who have obtained verified qualifications or certain results in some public examinations [e.g. HKDSE, HKALE, JEE, GSAT(Taiwan)] may be granted credit transfer/exemption for the Chinese LCR subject.

#### 4.2.3 Writing Requirement in CAR Subjects

In addition to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take, pass one subject that requires a substantial piece of writing in English and one subject that requires a substantial piece of writing in Chinese. Students who are non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Chinese Writing requirement.

#### 4.2.4 Reading Requirement in CAR Subjects

All students must, among the CAR subjects they take, must pass one subject that requires the reading of an extensive text in English and one subject that requires the reading of an extensive text in Chinese. Students who are non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Chinese Reading requirement.

A list of approved CAR subjects for meeting the Writing Requirement (with a “W” designation) and for meeting the Reading Requirement (with an “R” designation) is shown at: <https://www.polyu.edu.hk/ous/GURSubjects/CAR.php>

#### 4.2.5 Discipline-Specific Language Requirement

In addition to the LCR mentioned in Sections 4.2.1 to 4.2.4 above, students also have to complete the subject “Professional Communication” (2 credits in English and 2 credits in Chinese) as the discipline-specific language requirements.

Students who are non-Chinese speakers or those whose Chinese standards are at junior secondary level or below will be exempted from the Discipline-Specific Chinese Language requirement, i.e. CLC3241P Professional Communication in Chinese. These students must take 1 subject of any level **recommended by CLC/EEE** to make up for the minimum total credit requirement.

## 5. SPECIFIED PROGRESSION PATTERN

5.1 The following curriculum is for students with relevant Higher Diploma/Associate Degree from a recognized institution <sup>Note a, f</sup>. All subjects are 3 credits unless otherwise stated.

| Year 1  |  |
|---|--|
| Semester 1 (15 credits)   | Semester 2 (17 credits)  |
| EEE1Q01 Essential Components of General Education (0 credit)        |  |
| AMA3100 Number, Combinatorics and Statistics                        | COMP3334 Computer Systems Security   |
| COMP3335 Database Security  | COMP3421 Web Application Design and Development                                    |
| EIE3120 Network Technologies and Security                           | COMP3512 Legal Aspects, Professionalism and Ethics of Computing                    |
| EIE3333 Data and Computer Communications                            | ELC3531 Professional Communication in English for Engineering Students (2 credits) |
| CAR-English Language <sup>Note b</sup>                              | EIE3117 Integrated Project   |
|   | EIE3343 Computer Systems Principles  |
| <b>Semester 3: EIE3189 Summer Internship (2 training credits)</b>   |  |
| Year 2  |  |
| Semester 1 (17 credits)   | Semester 2 (15 credits)  |
| COMP4913 Capstone Project/EIE4117 Capstone Project (6 credits)      |  |
| CLC3241P Professional Communication in Chinese (2 credits)          | COMP4442 Service and Cloud Computing   |
| EIE4113 Wireless and Mobile Systems                                 | Technical Elective 2 <sup>Note c</sup> / CAR M <sup>Note b, d</sup>                |
| Service-Learning  | Technical Elective 3 <sup>Note c</sup>   |
| Technical Elective 1 <sup>Note c</sup>                              | Technical Elective 4 <sup>Note c</sup>   |
| CAR M <sup>Note b, d</sup> / Technical Elective 2 <sup>Note c</sup> |  |

**Total Number of Credits: 64 academic credits** <sup>Note e</sup> + 2 training credits

Note a: This is an example only which shows a possible study pattern for graduates with relevant Higher Diploma/Associate Degree from a recognized institution. The exact study pattern varies from student to student depending on his/her academic background.

Note b: The study pattern for the subjects is indicative only. Students may take these subjects according to their own schedules. However, CAR – English Language should be completed in the first year of study. Students are recommended to consult their Academic Advisor for guidance and planning if necessary.

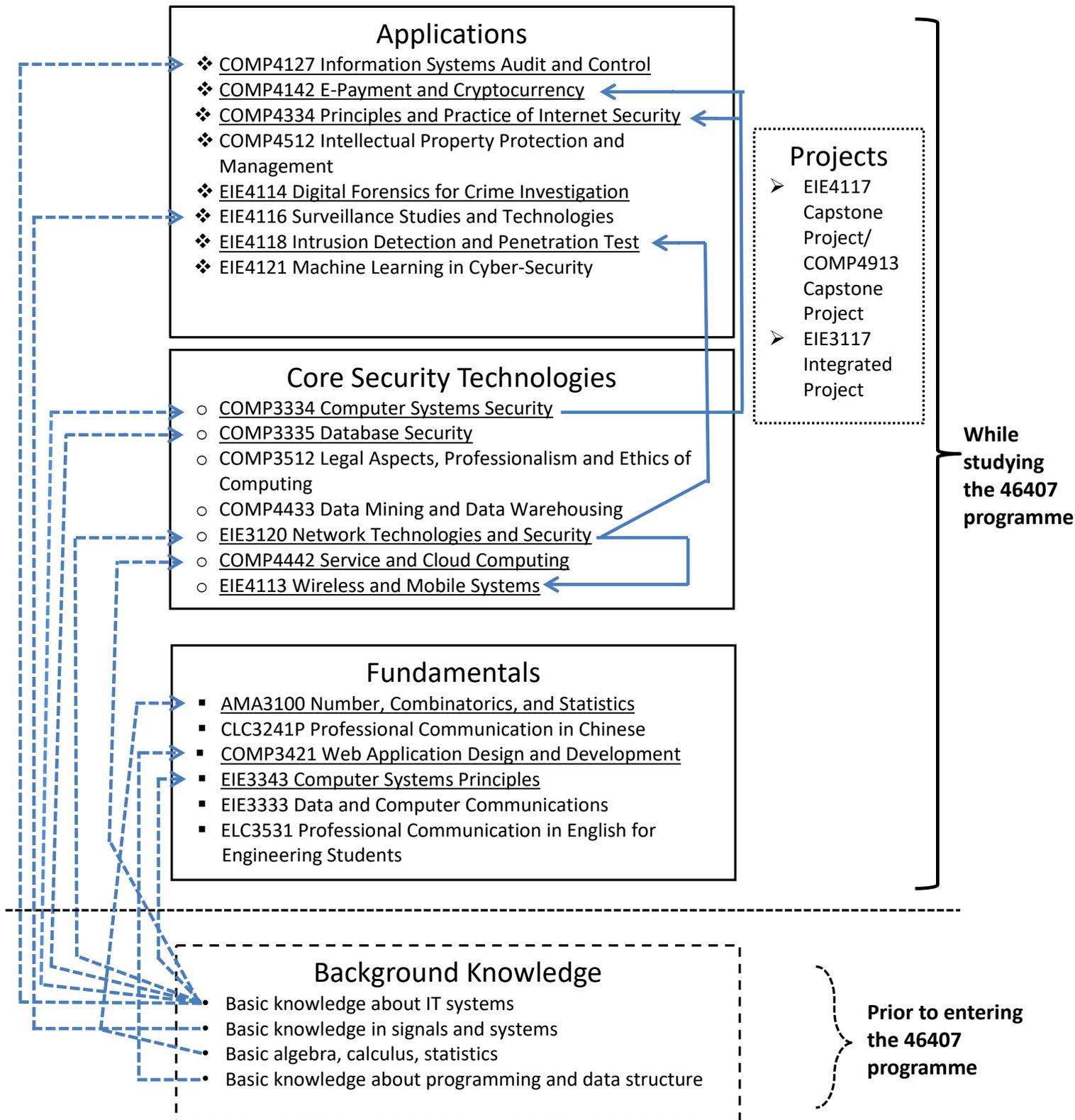
Note c: At least 3 technical electives must be at level 4 or above.

Note d: Students also need to fulfil the Chinese reading and writing requirements (CR/CW), if such requirements have not been fulfilled in previous studies.

Note e: General University Requirement (GUR): 9 credits;  
Discipline-Specific Requirement (DSR): 55 credits.

Note f: The credits required and progression pattern presented above are for students who have met the 9-credit Undergraduate Degree LCR subject requirements based upon their previous studies. Students not meeting the equivalent standard of the Undergraduate Degree LCR will be required to take the required LCR subjects. Details on the Undergraduate Degree LCR subjects are given in section 4.2 of this booklet.

5.2 The subjects of the programme can be categorized into 4 main groups: (i) Fundamentals; (ii) Core Security Technologies; (iii) Applications; and (iv) Projects. Students are assumed to have acquired the relevant background knowledge from their previous study before joining the programme. The diagram below shows the relationship among subjects: if a subject is a pre-requisite of another subject, an arrow is drawn from the former subject to the latter subject.



## 6. CURRICULUM MAP

### 6.1 Alignment of Subjects with Programme Intended Learning Outcomes:

|   | Programme Outcomes |       |       |       |       |     |       |       |     |       |
|---|--------------------|-------|-------|-------|-------|-----|-------|-------|-----|-------|
|   | 1                  | 2     | 3     | 4     | 5     | 6   | 7     | 8     | 9   | 10    |
| <b>A. GENERAL UNIVERSITY REQUIREMENTS (GUR)</b>                             |                    |       |       |       |       |     |       |       |     |       |
| <b>Cluster-Area Requirements (CAR) (3 Subjects)</b>                         |                    |       |       |       |       |     |       |       |     |       |
| CAR-English Language (Human Nature, Relations and Development with English) |                    |       |       |       |       |     | T,P   | T,P   |     | T,P   |
| CAR M (Chinese History and Culture)   |                    |       |       |       |       |     | T     | T,P,M |     |       |
| <b>Other Requirements</b>   |                    |       |       |       |       |     |       |       |     |       |
| SL - Service-Learning   |                    |       |       |       |       | T,P |       | T,P   |     |       |
| <b>B. DISCIPLINE-SPECIFIC REQUIREMENTS (DSR)</b>                            |                    |       |       |       |       |     |       |       |     |       |
| <b>Compulsory - Mathematics and Science Subjects</b>                        |                    |       |       |       |       |     |       |       |     |       |
| AMA3100 Number, Combinatorics, and Statistics                               | T,P,M              | T,P,M |       |       |       |     |       |       |     |       |
| <b>Compulsory - Computer Science and Engineering Subjects</b>               |                    |       |       |       |       |     |       |       |     |       |
| COMP3334 Computer Systems Security  |                    | T,P,M | T,P,M |       |       |     |       |       | T   | T,P   |
| COMP3335 Database Security  |                    |       | T,P,M | T,P,M |       | T,P |       |       | T   |       |
| COMP3421 Web Application Design and Development                             |                    | T,P   | T,P   | T,P   |       |     | P,M   |       | P,M |       |
| COMP4442 Service and Cloud Computing  |                    | T,P,M | T,P,M |       | T,P,M |     |       |       |     |       |
| EIE3117 Integrated Project  |                    | T,P   | T,P   | T,P   | T     | T,M |       | T,P   | T,P | T,M   |
| EIE3120 Network Technologies and Security                                   | T,P                | T,P   | T,P   | T,P,M | T,P,M |     |       | T     | T   | T     |
| EIE3333 Data and Computer Communications                                    | T                  | T,P   | T     |       |       |     |       | T     |     |       |
| EIE3343 Computer Systems Principles   |                    | P     | T     |       |       |     |       |       |     | T     |
| EIE4113 Wireless and Mobile Systems   |                    |       | T     |       | T,P   |     |       |       | T,M |       |
| <b>Compulsory - Capstone Project (Select Any 1)</b>                         |                    |       |       |       |       |     |       |       |     |       |
| COMP4913 Capstone Project   | P,M                | P,M   | P,M   | P,M   | P,M   |     |       | P,M   | P,M | P,M   |
| EIE4117 Capstone Project  | P,M                | P,M   | P,M   | P,M   | P,M   |     |       | P,M   | P,M | P,M   |
| <b>Compulsory - Complementary Subjects</b>                                  |                    |       |       |       |       |     |       |       |     |       |
| CLC3241P Professional Communication in Chinese                              |                    |       |       |       |       |     |       | T,P,M |     |       |
| COMP3512 Legal Aspects, Professionalism and Ethics of Computing             |                    |       |       |       |       |     | T,P,M | P,M   |     | T,P,M |
| ELC3531 Professional Communication in English for Engineering Students      |                    |       |       |       |       |     |       | T,P,M |     |       |
| <b>Compulsory – Training through Work Experience</b>                        |                    |       |       |       |       |     |       |       |     |       |
| EIE3189 Summer Internship   |                    |       |       | P,M   |       | P,M | P,M   | P,M   | P,M |       |
| <b>Elective - Computer Science and Engineering Subjects (Select Any 2)</b>  |                    |       |       |       |       |     |       |       |     |       |
| COMP4127 Information Systems Audit and Control                              |                    |       |       | T,P,M | T,P,M | T,P | T,P,M |       | T,P |       |
| COMP4142 E-Payment and Cryptocurrency                                       | T                  |       | T     | T,M   | T,M   | P,M |       |       | T   |       |
| COMP4334 Principles and Practice of Internet Security                       |                    | T,P   | T,P   |       |       |     | P,M   |       |     |       |
| COMP4433 Data Mining and Data Warehousing                                   | T                  |       | T     |       | T,P   |     |       |       |     | T,P,M |

|  | Programme Outcomes |   |     |   |       |   |       |       |     |     |
|--|--------------------|---|-----|---|-------|---|-------|-------|-----|-----|
|  | 1                  | 2 | 3   | 4 | 5     | 6 | 7     | 8     | 9   | 10  |
| COMP4512 Intellectual Property Protection and Management                   |                    |   |     |   | T,P,M |   | T,P,M |       | T,M | T,P |
| <b>Elective - Computer Science and Engineering Subjects (Select Any 2)</b> |                    |   |     |   |       |   |       |       |     |     |
| EIE4114 Digital Forensics for Crime Investigation                          |                    |   | T,M |   |       |   |       | T,P,M | T   |     |
| EIE4116 Surveillance Studies and Technologies                              | T,M                | T |     |   | T,P   |   | T     |       | T   |     |
| EIE4118 Intrusion Detection and Penetration Test                           |                    |   | T,P |   | T,M   |   |       | T     | T   |     |
| EIE4121 Machine Learning in Cyber-Security                                 | T,P                |   |     |   | T,P,M |   |       | P,M   |     |     |

Note:

Programme Outcomes:

1. Apply knowledge of mathematics and science appropriate to the discipline of Information Security.
2. Apply knowledge of Information Security to the abstraction and conceptualisation of Information and Communications Technology (ICT) models.
3. Analyse an Information Security problem, and identify and define the requirements appropriate to its solution.
4. Design, implement, and evaluate an Information Security system, process, component, or program to meet desired needs with appropriate consideration for public health and safety, social and environmental considerations.
5. Use current techniques, skills, and tools necessary for the practices in Information Security with an understanding of the limitations.
6. Function effectively on teams to accomplish a common goal.
7. Have an understanding of professional, ethical, legal, security and social issues and responsibilities.
8. Communicate effectively with a range of audiences.
9. Analyse the local and global impact of Information Security on individuals, organisations, and society.
10. Recognise the need for and engage in continuing professional development.

T: Teach

P: Practise

M: Measured

+: Support of outcomes depends on particular project/subject design and requirements

## 7. CAPSTONE PROJECT

The Capstone Project is considered to be of great importance. This is reflected in the number of credits it carries, being 6 credits which are equivalent to two standard-sized subjects. Furthermore, the result of the Capstone Project will be very important when the Board of Examiners considers the award classification of a student. Normally, the Board of Examiners will expect a very good grade for the Capstone Project when a student is to be awarded a high Honours classification.

One of the important features of the Capstone Project is “learning by doing”. It is intended to be a platform for the students to develop their intellectual and innovative abilities and to give them the opportunities to integrate and apply the knowledge and analytical skills gained in previous stages of study. It should also provide students with opportunities to develop their problem-solving skills and communication skills. The process from concept to final implementation and testing, through problem identification and the selection of appropriate solutions will be practised by the students.

## 7.1 Project Management

Normally each student will be assigned one project under the supervision of an academic staff member so that he/she will work independently to achieve the project objectives. In other cases, several students may work on different aspects of a large-scale project.

The assignment of projects is expected to be completed by the month of June preceding the beginning of the final year of study. Guidelines for Capstone Project are given to students at the beginning of the final year.

## 7.2 Project Assessment

Assessment of the Capstone Project focuses in three main areas: project reports, oral presentations and work done over the whole project period. Assessment will be done by the project supervisor and an assessor. The Project Management Team, which is composed of the Programme Leader and staff members from teaching sections, will oversee the overall standard of assessment of the projects. The Project Management Team will also oversee the daily operation, such as fixing the dates of project report submission, oral presentation, demonstration, etc.

## 8. WORK-INTEGRATED EDUCATION (WIE)

8.1 WIE is a mandatory component of the Programme. There are a few routes or options for the students to pursue Work-Integrated Education (WIE). These options include the summer internship, the One-year Internship Scheme (OIS) and other workplace training opportunities provided by the University or found by students themselves, etc.

### 8.2 Credits Requirement

In order to graduate from this programme, students must attain a minimum of two WIE training credits within the period of study. Following the Faculty of Engineering's guideline, students will be awarded one WIE training credit for acquiring two weeks' full-time training. WIE training credits will not be counted towards the Grade Point Average (GPA) or the Weighted GPA (WGPA). After assessing the training performance, a Pass or a Fail grade will be awarded to the student on his/her WIE component.

### 8.3 Intended Learning Outcomes of WIE

Since WIE can take different forms and be applied to different kinds of job, the learning outcomes to be achieved vary depending on the job nature and its duration engaged by the student. However, based on the experience gained, WIE can bring a lot of advantages to students' learning both in the profession-specific areas and in their all-round development. The intended learning outcomes of WIE are elaborated in the following paragraph.

On successful completion of the WIE component, the students will be able to:

- (i) Apply knowledge and skills learned from the Programme on the job in a broad context of information security profession.
- (ii) Recognize the operation and requirement of real-life business, leading to the development of entrepreneurship, global outlook, professional ethics, social and cultural understanding.
- (iii) Recognize the expectation of employers, hence leading to better employability.
- (iv) Develop their all-round attributes such as interpersonal skills and leadership.
- (v) Develop their critical and creative thinking, and problem-solving skills while taking into account various real-life constraints, helping them to pursue life-long learning and continuing professional development.

### 8.4 WIE Options

WIE component under the Programme can be in several forms, including summer internship, One-year Internship Scheme (OIS) and other job opportunities.

#### 8.4.1 Summer Internship (4 weeks of full-time/ 160 hours of part-time)

By taking summer internship, students will work in an ICT-related organization during summer months for at least one month. Students can learn the operation and requirements of real-life ICT industry, and have the chance to apply the knowledge and skills learned from the Programme to a broad context of an ICT profession.

#### 8.4.2 One-year Internship Scheme (OIS)

The OIS lasts for 1 year. Under the OIS, the students will pursue Year 1 in full time and then engage in industrial training in Year 2. After the industrial training year, the students will pursue their final-year study in full time again. Normally the

students will graduate at the end of Year 3 after having satisfied all programme requirements.

Students who would like to join the OIS are required to submit an application to the Department prior to the commencement of the industrial training. They can choose to take subject(s) in a semester during the industrial training year but they will be required to pay a flat tuition fee.

#### 8.4.3 Other Job Opportunities

It is possible that students find ICT-related jobs for themselves. This kind of job opportunity will be judged by the Department whether it is helpful to the students in achieving the intended learning outcomes of WIE and relevant to the ICT profession. The students and the Academic Advisor/WIE Coordinators will work collaboratively with regard to the job selection and the subsequent training contents.

The Department will constantly monitor the progress of student's training. At the end of the training, an assessment will be made on the achievement of learning outcomes.

### 8.5 Guidelines for Operation and Supervision of WIE

The Department adopts a set of strategies to support students' learning in the workplace. The followings are the details of the operation at different stages.

#### 8.5.1 Preparation

The Department will actively align with the industry to get WIE placement opportunities for students. It is important for students to be fully aware of the benefits brought by WIE. Students will be asked to attend employment seminars as early as possible. Through this type of arrangement, students in all years will be well prepared for job hunting and employment in advance. Students will also be able to realize the benefits for engaging in WIE and the importance of taking an active role in completing the training with the best effort.

#### 8.5.2 Operation

There will be WIE Coordinators overseeing all matters related to WIE activities under the Programme. The WIE Coordinators are the academic staff members of the Department responsible for the organization and operation of WIE activities.

To guide the students and monitor their progress in taking the WIE, each student will be assigned an academic advisor from the Department. The student and his/her Academic Advisor will jointly plan the WIE details, such as job selection, training plan, logging of activities, reporting, and assessment.

In the case that the student finds job placement(s) on his/her own, the Academic Advisor will work with the student to design the learning outcomes if the placement is suitable to be recognized as a WIE activity. The Academic Advisor will make frequent contacts with the student and, if appropriate, the employer to monitor the progress of the student.

Each student will be guided by his/her Academic Advisor when conducting the WIE training. The student's work will be monitored continuously and an assessment will be given when the WIE placement is completed.

### 8.5.3 Assessment of the WIE Component(s)

The objective of assessment is to determine what the student has achieved through WIE. The actual type of work and duration will vary from case to case. Hence, an assessment framework is set out in the following as a general guideline.

#### (i) *Continuous Assessment*

The Academic Advisor may visit the student during the training period so that the Academic Advisor and the employer will be able to discuss the student's performance together. This will give better feedback on the student's performance before the training is completed.

#### (ii) *Report*

After the training is completed, the student is required to submit a report to the Academic Advisor. The details to be contained in the report should be commensurate with the training duration. It contains a brief reflective writing on the training received, the objectives that have been achieved, and the experience gained. The student may also conduct a self-evaluation on his/her own performance. The report must be endorsed by the student's employer before its submission.

(iii) *Employer Evaluation*

At the end of the training period, the employer will provide an evaluation of the student's performance, assessing the student's work and all-round development.

(iv) *Overall Assessment*

An overall assessment of the student's performance will be made by the Academic Advisor by considering all the assessment components as stated in Section 8.5.3(i)-(iii). A pass grade will be given to the student upon satisfactory completion of the WIE component; otherwise a failure grade will be given.

## **9. DEPARTMENTAL UNDERGRADUATE PROGRAMME COMMITTEE**

9.1 The composition of the Departmental Undergraduate Programme Committee (DUPC) is decided by the Head of Department. Normally, the DUPC consists of Programme Leaders of all degree and higher diploma programmes hosted by the Department, Head of Department, representative from the Departmental Learning and Teaching Committee, teaching staff representatives, representatives from major serving departments and student representatives. The Committee is responsible for programme review and development.

9.2 The DUPC will collect and consider, on a regular basis, the views of students and other key stakeholders on the relevance and currency of the syllabi, the standards of the examinations, the development of the programme, the adequacy of resources and the local and worldwide trends related to learning and teaching, for the continuous improvement of the programme.

## **10. NORMAL DURATION FOR COMPLETION OF A PROGRAMME**

10.1 Students should complete the programme within the normal duration of the programme as specified in the Programme Requirement Document. Those who exceed the normal duration of the programme will be de-registered from the programme unless prior approval has been obtained from relevant authorities. The study period of a student shall exclude deferment granted for justifiable reasons, and the semester(s) when the student has been approved to undertake internship. Any semester in which the students are allowed to take zero subject will be counted towards their total period of registration.

- 10.2 Students who have been registered for the normal duration of the programme may request extension of their studies for up to one year with the approval of the relevant Heads of Department. Applications for extension of study period beyond one year and up to two years will require the approval from Faculty Board Chairman.
- 10.3 Students who have exceeded the normal duration of the programme for more than two years and have been de-registered can submit an appeal to the Academic Appeals Committee to request further extension. If the appeal fails, the student shall be de-registered.

## 11. STUDENT STATUS

- 11.1 Students' eligibility for the range of services provided by the University will be governed by the students' status, which is determined with reference to the mode of attendance of the programmes enrolled and/or the study load as described in Sections 11.2 to 11.5 below.

### Full-time students:

- 11.2 Students enrolling on this programme with a study load of 9 credits or more in a semester are classified as *full-time* students. Students who wish to change their study load to less than 9 credits in a semester will have to seek prior approval from their Department.
- 11.3 Full-time local students enrolled on UGC-funded programmes are eligible to apply for financial assistance from the Government in the form of grant and loan. Government grant and loan may not be granted beyond the normal period of registration for the programme.

### Self-paced students:

- 11.4 Students who wish to study at their own pace instead of following the specified progression pattern will have to seek prior approval from their Department. These students are referred to as self-paced students.

### Subject-based students:

- 11.5 Students who wish to take individual subjects, but do not wish to register as a candidate for an award, are classified as subject-based students.

## 12. SUBJECT REGISTRATION AND WITHDRAWAL

- 12.1 In addition to programme registration, students need to register for subjects at specified periods prior to the commencement of a semester. An add/drop period will also be scheduled for each semester. Students may apply for withdrawal of their registration on a subject after the add/drop period, if they have a genuine need to do so. The application should be made to the relevant programme offering Department and will require the approval of both the subject teacher and the host Department Programme Leader concerned (or an alternate academic staff authorised by the programme offering Department). Applications submitted after the commencement of the examination period will not be considered. Once the application of subject withdrawal is approved, the tuition fee paid for the subject will be forfeited and the withdrawal status of the subject will be shown in the examination result notification and transcript of studies, but will not be counted in the calculation of the GPA.
- 12.2 The pre-requisite requirements of a subject must have been fulfilled before a student registers for that subject. However, the subject offering Department has the discretion to waive the pre-requisite requirements of a subject, if deemed appropriate. If the pre-requisite subject concerned forms part of the requirements for award, the subject has to be passed in order to satisfy the graduation requirements for the programme concerned, despite the waiving of the pre-requisite.
- 12.3 Subject to the maximum study load of 21 credits per semester and the availability of study places, students are allowed to take additional subjects on top of the prescribed credit requirement for award before they become eligible for graduation. Students will be allowed to take additional subjects for the following semester for broadening purpose, after they fulfil the graduation requirements. However, they will still be subject to the maximum study load of 21 credits per semester and the availability of places in the subjects concerned. They will enrol as subject-based students only and be subject to the rules on 'Admission of Subject-based Students', except that graduates from UGC-funded programmes will not be restricted to taking only subjects from a self-financed programme.

## 13. STUDY LOAD

- 13.1 For students following the progression pattern specified for their programme, they have to take the number of credits and subjects, as specified in this Programme Booklet, for each semester. Students cannot drop those subjects assigned by the department unless prior approval has been given by the department.

- 13.2 The normal study load is 15 credits in a semester for full-time study. The maximum study load to be taken by a student in a semester is **21** credits, unless exceptional approval is given by the Head of the Department. For such cases, students are reminded that the study load approved should not be taken as grounds for academic appeal.
- 13.3 To help improve the academic performance of students on academic probation (the meaning of “academic probation” can be found in Section 21.2), these students will be required to take a reduced study load in the following semester (Summer Term excluded). The maximum number of credits to be taken in a semester by students on academic probation is **12**. If these students have strong reasons to study more credits, they will have to obtain the endorsement/approval of the respective authority:
- (i) study 13 to 15 credits in a semester: endorsement by the Programme Leader and approval by the Departmental Learning and Teaching Committee (DLTC);
  - (ii) study 16 to 18 credits in a semester: endorsement by the Programme Leader, the DLTC and the Head of Department, and approval by the Faculty Dean;
  - (iii) study more than 18 credits in a semester: endorsement by the Programme Leader, the DLTC and the Head of Department, and approval by QAC(AD).
- 13.4 Students are not allowed to take zero subject in any semester, including the mandatory summer term as required by some programmes, unless they have obtained prior approval from the Department; otherwise they will be classified as having unofficially withdrawn from the programme. Students who have been approved for zero subject enrolment (i.e. taking zero subject in a semester) are allowed to retain their student status and continue using campus facilities and library facilities. Any semester in which the students are allowed to take zero subject will nevertheless be counted towards the total period of registration.
- 13.5 Students who have obtained approval to pace their studies and students on programmes without any specified progression pattern who wish to take more than the normal load of 15 credits in a semester should seek advice from the Department concerned before the selection of subjects.

#### **14. SUBJECT EXEMPTION**

Students may be exempted from taking any specified subjects, including mandatory General University Requirements (GUR) subjects, if they have successfully completed similar subjects previously in another programme or have demonstrated the level of proficiency/ability to the satisfaction of the subject offering Department. Subject exemption is normally decided by the subject offering Department. However, for applications submitted by students who have

completed an approved student exchange programme, the subject exemption is to be decided by the programme offering Department in consultation with the subject offering Departments. In case of disagreement between the programme offering Department and the subject offering Department, the two Faculty Deans/School Board Chairmen concerned will make a final decision jointly on the application. If students are exempted from taking a specified subject, the credits associated with the exempted subject will not be counted towards the award requirements (except for exemptions granted at admission stage). It will therefore be necessary for the students to consult the programme offering Department and take another subject in order to satisfy the credit requirement for the award.

## 15. CREDIT TRANSFER

- 15.1 Students may be given credits for recognised previous studies including mandatory General University Requirements (GUR) subjects; and the credits will be counted towards meeting the requirements for award. Transferred credits may not normally be counted towards more than one award. The granting of credit transfer is a matter of academic judgment. In assessing the transferability of subjects previously taken, the syllabus of that subject should be carefully scrutinized to ascertain that it is comparable to the PolyU's curriculum. Whether the previous studies are from institutions on credit-based or non-credit-based system should not be a matter of concern, and the subject size need not be a perfect match. To ascertain the academic standing of the institution offering the previous studies, the Department might need to request the institutions concerned to provide more information.
- 15.2 Credit transfer may be done with or without the grade being carried over; the former should normally be used when the credits were gained from PolyU. Credit transfer with the grade being carried over may be granted for subjects taken from outside the University, if deemed appropriate, and with due consideration to the academic equivalence of the subjects concerned and the comparability of the grading systems adopted by the University and the other approved institutions. Subject credit transfer is normally decided by the subject offering Department. However, for applications submitted by students who have completed an approved student exchange programme, the decision will be made by the programme offering Department in consultation with the subject offering Departments. As the application for credit transfer may involve subjects offered by more than one Department, the programme offering Department should coordinate and check whether the maximum limit for credit transfer for a student has been exceeded, and whether the student has fulfilled the residential requirement of the University.
- 15.3 In case of disagreement between the programme offering Department and the subject offering Department, the two Faculty Deans/School Board Chairmen concerned will

make a final decision jointly on the application. The validity period of credits previously earned is 8 years after the year of attainment.

- 15.4 Normally, not more than 50% of the credit requirement for award may be transferable from approved institutions outside the University. For transfer of credits from programmes offered by PolyU, normally not more than 67% of the credit requirement for award can be transferred. In cases where both types of credits are being transferred (i.e. from programmes offered by PolyU and from approved institutions outside the University), not more than 50% of the credit requirement for award may be transferred. For students admitted to an Articulation Degree or Senior Year curriculum, which is already a reduced curriculum, they will not be given credit transfer for any required GUR subjects, and are required to complete at least 60 credits in order to be eligible for a Bachelor's award.
- 15.5 If the credits to be transferred are part of a PolyU programme which is accredited by a professional body, the Department concerned should ensure that the transferred credits will also meet the requirement of the relevant professional body.
- 15.6 If a student is waived from a particular stage of study on the basis of advanced qualifications held at the time of admission, the student concerned will be required to complete fewer credits for award. For these students, the 'deducted' credits at admission stage will be counted towards the maximum limit for credit transfer when students apply for further credit transfer after their admission. This also applies to students admitted to an Articulation Degree or Senior Year curriculum when they claim further credit transfer after admission.
- 15.7 Notwithstanding the upper limits stipulated in Section 15.4 above, (and unless professional bodies stipulate otherwise) students may be given more credit transfer than these upper limits (e.g. upon completion of an exchange programme as mentioned in Section 15.8 below), subject to their satisfying the residential requirement.
- 15.8 Credit transfer can be applicable to credits earned by students through studying at a non-local partner institution under an approved exchange programme. Students should, before they start the exchange programme, seek prior approval from the programme offering Department (who will consult the subject offering Departments as appropriate) on their study plan and credit transferability. As with all other credit transfer applications, the Departments concerned should scrutinize the syllabuses of the subjects which the students are going to take at the partner institution, and determine their credit transferability based on academic equivalence with the corresponding subjects on offer at the PolyU, and the comparability of the grading systems adopted by PolyU and the partner institution. The transferability of credits, and the suitability for allowing grades to

be carried over, must be determined and communicated to students before they start the exchange programme.

- 15.9 All credit transfers approved will take effect only in the semester for which they are approved. A student who applies for transfer of credits during the re-enrolment or the add/drop period of a particular semester will only be eligible for graduation at the end of that semester, even if the granting of credit transfer will immediately enable the student to satisfy the credit requirement for the award.
- 15.10 Regarding credit transfer for GUR subjects, the Programme Host Department is the approval authority at the time of admission to determine the number of GUR credits which an Advanced Standing student will be required to complete for the award concerned. Programme Host Departments will make reference to the mapping lists of GUR subjects, which are compiled by the Committee on General University Requirements (CoGUR), on the eligibility of the subjects that can be qualified as GUR subjects. Applications for credit transfer of GUR subjects after admission will be considered, on a case-by-case basis, by the Subject Offering Department or Office of Undergraduate Studies (OUS)/ Service-Learning and Leadership Office (SLLO), in consultation with the relevant Sub-committee(s) under CoGUR, as appropriate.
- 15.11 For credit transfer of retaken subjects, the grade attained in the last attempt should be taken in the case of credit transfer with grade being carried over. Students applying for credit transfer for a subject taken in other institutions are required to declare that the subject grade used for claiming credit transfer was attained in the last attempt of the subject in their previous studies. If a student fails in the last attempt of a retaken subject, no credit transfer should be granted, despite the fact that the student may have attained a pass grade for the subject in the earlier attempts.
- 15.12 Students will not be granted credit transfer for a subject which they have attempted and failed in their current study unless the subject was taken by the student as an exchange-out student in his current programme.

## **16. DEFERMENT OF STUDY**

- 16.1 Students may apply for deferment of study if they have a genuine need to do so such as illness or posting to work outside Hong Kong. Approval from the Department offering the programme is required. The deferment period will not be counted towards the total period of registration.
- 16.2 Application for deferment of study from students who have not yet completed the first year of a full-time programme will only be considered in exceptional circumstances.

- 16.3 Where the period of deferment of study begins during a stage for which fees have been paid, no refund of such fees will be made.
- 16.4 Students who have been approved for deferment are not entitled to enjoy any campus facilities during the deferment period.

## 17. PRINCIPLES OF ASSESSMENT

- 17.1 Assessment *of* learning and assessment *for* learning are both important for assuring the quality of student learning. Assessment *of* learning is to evaluate whether students have achieved the intended learning outcomes of the subjects that they have taken and have attained the overall learning outcomes of the academic programme at the end of their study at a standard appropriate to the award. Appropriate methods of assessment that align with the intended learning outcomes will be designed for this purpose. The assessment methods will also enable teachers to differentiate students' different levels of performance within subjects. Assessment *for* learning is to engage students in productive learning activities through purposefully designed assessment tasks.
- 17.2 Assessment will also serve as feedback to students. The assessment criteria and standards will be made explicit to students before the start of the assessment to facilitate student learning, and feedback provided will link to the criteria and standards. Timely feedback will be provided to students so that they are aware of their progress and attainment for the purpose of improvement.
- 17.3 The ultimate authority in the University for the confirmation of academic decisions is the Senate, but for practical reasons, the Senate has delegated to the Faculty/School Boards the authority to confirm the decisions of Boards of Examiners provided these are made within the framework of the General Assessment Regulations. Recommendations from Board of Examiners which fall outside these Regulations shall be ratified by the Academic Planning and Regulations Committee (APRC) and reported to the Senate.

## 18. ASSESSMENT METHODS

- 18.1 Students' performance in a subject can be assessed by continuous assessment and/or examinations, at the discretion of the individual subject offering Department. Where both continuous assessment and examinations are used, the weighting of each in the overall subject grade will be clearly stated in the programme booklet. The subject offering Department can decide whether students are required to pass both the continuous assessment and examination components, or either component only, in

order to obtain a subject pass, but this requirement (to pass both, or either components) will be specified in the programme booklet. Learning outcomes should be assessed by continuous assessment and/or examination appropriately, in line with the outcome-based approach.

- 18.2 Continuous assessment may include tests, assignments, projects, laboratory work, field exercises, presentations and other forms of classroom participation. Continuous Assessment Assignments which involve group work should nevertheless include some individual components therein. The contribution made by each student in continuous assessment involving a group effort shall be determined and assessed separately, and this can result in different grades being awarded to students in the same group.
- 18.3 Assessment methods and parameters of subjects shall be determined by the subject offering Department.
- 18.4 At the beginning of each semester, the subject teacher will inform students of the details of the methods of assessments to be used within the assessment framework as specified in the programme booklet.

## **19. SUBJECT RESULTS**

- 19.1 Subject Teachers, in respect of the subject they teach, have sole responsibilities for marking and grading students' coursework and examinations scripts. Timely feedback of continuous assessment will be given to students as soon as possible (e.g. not later than a month), and in any case, before the final examination/assessment. In this regard, Subject Teachers will be accountable to the Head of the subject offering Department, to ensure that all forms of assessment, including the students' coursework and examination scripts, are correctly marked and graded where appropriate. Subject Teachers will avoid administrative errors at all times, and submit the grades for finalisation by Subject Assessment Review Panel (SARP) according to the schedule of the Department. To ensure consistency and uniformity for a common subject taught by different Subject Teachers, meetings can be arranged amongst them before the examination papers are set or before the marking is done.
- 19.2 Subject grades will be reviewed and finalised by SARP before being formally released to students and submitted to the Board of Examiners. Each Department forms one or several SARPs to take care of the subjects it offers. The Board of Examiners will not attempt to change any grades.

- 19.3 SARP(s) shall be formed by the Head of the Department offering the subjects. It shall include the Head of the Department offering the subject as the Chairman, the relevant subject examiners and where appropriate, and the Programme Leader.

## **20. BOARD OF EXAMINERS (BoE)**

- 20.1 The authority for approving the overall results of students rests with the Board of Examiners (BoE). The BoE will meet at the end of each semester (except for Summer Term unless there are students who are eligible to graduate after the completion of Summer Term subjects) and is responsible to the Senate for making:
- (i) decisions on straight forward progression and deregistration cases;
  - (ii) decisions on the classification of awards to be granted to each student on completion of the programme; and
  - (iii) decisions on cases with extenuating circumstance.
- 20.2 These decisions are made by the BoE at the end of each semester in the light of the standard of student achievement appropriate to the award to which the programme is designed to lead, the aims of the programme, the students' performance on the programme in previous years, the General Assessment Regulations of the University, the specific programme regulations, and good practice established in the University and elsewhere.
- 20.3 The BoE will not attempt to change the grades for any student in any subject nor condone failures. The decisions of the BoE, except those on straight forward progression and deregistration cases, will be ratified by the Faculty Board. The Faculty Board may refer the decisions back to the BoE for further consideration and explanation.
- 20.4 Any decisions by the BoE outside the General Assessment Regulations of the University, supported by the Faculty Board, shall be referred to the APRC for ratification. All approved cases shall be reported to the Senate. Decisions by BoE outside the programme regulations but within the General Assessment Regulations of the University fall within the authority of the Faculty Board.
- 20.5 For straight forward progression and deregistration cases, students shall be formally notified of decisions affecting them after the BoE meeting. For graduating students and cases with extenuating circumstances, students shall only be notified of decisions affecting them after the Faculty Board meeting. For cases which require ratification of APRC, students shall be formally notified of the decisions after APRC's ratification. Any prior communication of results to these students shall be subject to formal ratification.

## 21. PROGRESSION / ACADEMIC PROBATION / DEREGISTRATION

- 21.1 The Board of Examiners shall, at the end of each semester (except for Summer Term unless there are students who are eligible to graduate after completion of Summer Term subjects or the Summer Term study is mandatory for the programme), determine whether each student is
- (i) eligible for progression towards an award; or
  - (ii) eligible for an award; or
  - (iii) required to be de-registered from the programme.

- 21.2 When a student has a Grade Point Average (GPA) (see Section 25.3 below) lower than 1.70, he/she will be put on academic probation in the following semester. If a student is able to pull his/her GPA up to 1.70 or above at the end of that following semester, the status of “academic probation” will be lifted. The status of “academic probation” will be reflected in the examination result notification but not in the transcript of studies.

- 21.3 A student will have ‘progressing’ status unless he/she falls within any one of the following categories, which shall be regarded as grounds for deregistration from the programme:
- (i) the student has reached the final year of the normal period of registration for that programme, as specified in the programme booklet, unless approval has been given for extension; or
  - (ii) the student has reached the maximum number of retakes allowed for a failed compulsory subject; or
  - (iii) the student’s GPA is lower than 1.70 for two consecutive semesters and his/her Semester GPA in the second semester is also lower than 1.70; or
  - (iv) the student’s GPA is lower than 1.70 for three consecutive semesters.

When a student falls within any of the categories as stipulated above, except for category (i) with approval for extension, the Board of Examiners shall de-register the student from the programme without exception.

- 21.4 A student may be de-registered from the programme enrolled before the time frame specified in Sections 21.3(iii) or 21.3(iv) above if his/her academic performance is poor to the extent that the Board of Examiners deems that his/her chance of attaining a GPA of 1.70 at the end of the programme is slim or impossible.
- 21.5 The progression of students to the following academic year will not be affected by the GPA obtained in the Summer Term, unless Summer Term study is mandatory for all students of the programme and constitutes a requirement for graduation, and is so specified in this programme booklet.

- 21.6 If the student is not satisfied with the deregistration decision of the Board of Examiners, he/she can lodge an appeal. All such appeal cases will be referred directly to Academic Appeals Committee (AAC) for **final** decision. Views of Faculties/Schools/Departments will be sought and made available to AAC for reference.

## 22. APPEAL AGAINST ASSESSMENT RESULTS

A student may appeal against a decision on their assessment results or the decision on deregistration upon the public announcement of the overall results. The procedures for appeals against examination results are detailed in the Student Handbook.

(<https://www.polyu.edu.hk/ar/students-in-taught-programmes/student-handbook/>).

## 23. RETAKING OF SUBJECTS

- 23.1 Students may only retake a subject which they have failed (i.e. Grade F or S or U). Retaking of subjects is with the condition that the maximum study load of 21 credits per semester is not exceeded.

- 23.2 The number of retakes of a subject should be restricted to two, i.e. a maximum of three attempts for each subject is allowed.

- 23.3 In cases where a student takes another subject to replace a failed elective subject, the fail grade will be taken into account in the calculation of the GPA, despite the passing of the replacement subject. Likewise, students who fail a Cluster Area Requirement (CAR) subject may need to take another subject from the same Cluster Area in order to fulfill this part of the GUR, since the original CAR subject may not be offered; in such cases, the fail grade for the first CAR subject will be taken into account in the calculation of the GPA, despite the passing of the second CAR subject. In the circumstances when students do not have a choice to retake a failed subject, such as when the failed subject has been phased out, a 'tie-subject' arrangement can be made with the approval of the Faculty Board. Under the arrangement, another appropriate subject can be taken as equivalent to the subject which is not offered. Upon passing the equivalent subject, the fail grade of the original subject will be replaced by the latest grade of the retake subject and the failure grade of the original subject will not be taken into account in the calculation of the GPA.

- 23.4 Students need to submit a request to the Faculty Board for the second retake of a failed subject.

23.5 Students who have failed a compulsory subject after two retakes and have been deregistered can submit an appeal to the Academic Appeals Committee (AAC) for a third chance of retaking the subject.

23.6 In relation to 23.5 above, in case AAC does not approve further retakes of a failed compulsory subject or the taking of an equivalent subject with special approval from the Faculty, the student concerned would be de-registered and the decision of the AAC shall be **final** within the University.

## 24. EXCEPTIONAL CIRCUMSTANCES

### *Absence from an assessment component*

24.1.1 If a student is unable to complete all the assessment components of a subject, due to illness or other circumstances which are beyond his/her control and considered by the subject offering Department as legitimate, the Department will determine whether the student will have to complete a late assessment and, if so, by what means. This late assessment shall take place at the earliest opportunity, and normally before the commencement of the following academic year (except that for Summer Term, which may take place within 3 weeks after the finalisation of Summer Term results). If the late assessment cannot be completed before the commencement of the following academic year, the Faculty Board Chairman shall decide on an appropriate time for completing the late assessment.

24.1.2 The student concerned is required to submit his/her application for late assessment in writing to the Head of Department offering the subject, within five working days from the date of the examination, together with any supporting documents. Approval of applications for late assessment and the means for such late assessments shall be given by the Head of Department offering the subject or the Subject Teacher concerned, in consultation with the Programme Leader.

### *Assessment to be completed*

24.2 For cases where students fail marginally in one of the components within a subject, the BoE can defer making a decision until the students concerned have completed the necessary remedial work to the satisfaction of the subject examiner(s). The remedial work must not take the form of re-examination.

### *Aegrotat award*

- 24.3 If a student is unable to complete the requirements of the programme in question for the award due to very serious illness, or other very special circumstances which are beyond his/her control, and considered by the Board of Examiners as legitimate, the Faculty/School Board will determine whether the student will be granted an aegrotat award. Aegrotat award will be granted under very exceptional circumstances.
- 24.4 A student who has been offered an aegrotat award shall have the right to opt to either accept such an award, or request to be assessed on another occasion to be stipulated by the Board of Examiners; the student's exercise of this option shall be irrevocable.
- 24.5 The acceptance of an aegrotat award by a student shall disqualify him/her from any subsequent assessment for the same award.
- 24.6 An aegrotat award shall normally not be classified, and the award parchment shall not state that it is an aegrotat award. However, the Board of Examiners may determine whether the award should be classified provided that they have adequate information on the students' academic performance.

*Other particular circumstances*

- 24.7 A student's particular circumstances may influence the procedures for assessment but not the standard of performance expected in assessment.

## 25. GRADING

25.1 Assessment grades shall be awarded on a criterion-referenced basis. A student's overall performance in a subject shall be graded as follows:

| <b>Subject grade</b> | <b>Short description</b> | <b>Elaboration on subject grading description</b>  |
|----------------------|--------------------------|--|
| A+<br>A<br>A-        | Excellent                | Demonstrates excellent achievement of intended subject learning outcomes by being able to skillfully use concepts and solve complex problems. Shows evidence of innovative and critical thinking in unfamiliar situations, and is able to express the synthesis or application of ideas in a logical and comprehensive manner.                             |
| B+<br>B<br>B-        | Good                     | Demonstrates good achievement of intended subject learning outcomes by being able to use appropriate concepts and solve problems. Shows the ability to analyse issues critically and make well-grounded judgements in familiar or standard situations, and is able to express the synthesis or application of ideas in a logical and comprehensive manner. |
| C+<br>C<br>C-        | Satisfactory             | Demonstrates satisfactory achievement of intended subject learning outcomes by being able to solve relatively simple problems. Shows some capacity for analysis and making judgements in a variety of familiar and standard situations, and is able to express the synthesis or application of ideas in a manner that is generally logical but fragmented. |
| D+<br>D              | Pass                     | Demonstrates marginal achievement of intended subject learning outcomes by being able to solve relatively simple problems. Can make basic comparisons, connections and judgments and express the ideas learnt in the subject, though there are frequent breakdowns in logic and clarity.   |
| F                    | Fail                     | Demonstrates inadequate achievement of intended subject learning outcomes through a lack of knowledge and/or understanding of the subject matter. Evidence of analysis is often irrelevant or incomplete.  |

'F' is a subject failure grade, whilst all others ('D' to 'A+') are subject passing grades. No credit will be earned if a subject is failed.

Indicative descriptors for modifier grades

|                       |  |
|-----------------------|--|
| Main Grade<br>(solid) | The student generally performed at this level, indicating mastery of the subject intended learning outcomes at this level.                                       |
| +                     | The student consistently performed at this level and exceeded the expectations of this level in some regards, but not enough to claim mastery at the next level. |
| -<br>(marginal)       | The student basically performed at this level, but the performance was inconsistent or fell slightly short in some regards.                                      |

Note: The above indicative descriptors for modifier grades are not applicable to the pass grades D and D+

25.2 A numeral grade point is assigned to each subject grade. The grade points assigned to subject grades attained by students from 2020/21 are as follows:

| Grade | Grade Point for grades attained from 2020/21 |
|-------|--|
| A+    | 4.3  |
| A     | 4.0  |
| A-    | 3.7  |
| B+    | 3.3  |
| B     | 3.0  |
| B-    | 2.7  |
| C+    | 2.3  |
| C     | 2.0  |
| C-    | 1.7  |
| D+    | 1.3  |
| D     | 1.0  |
| F     | 0.0  |

25.3 At the end of each semester, a Grade Point Average (GPA) will be computed based on the grade point of all the subjects as follows:

$$\text{GPA} = \frac{\sum_{n=1}^N \text{Subject Grade Point}_n \times \text{Subject Credit Value}_n}{\sum_{n=1}^N \text{Subject Credit Value}_n}$$

where  $N$  = number of subjects (inclusive of failed subjects) taken by the student up to and including the latest semester. For subjects which have been

retaken, only the grade point obtained in the final attempt will be included in the GPA calculation.

In addition, the following subjects will be excluded from the GPA calculation:

- (i) Exempted subjects
- (ii) Ungraded subjects
- (iii) Incomplete subjects
- (iv) Subjects for which credit transfer has been approved, but without any grade assigned (Subjects taken in PolyU or elsewhere and with grades assigned, and for which credit transfer has been approved, will be included in the GPA calculation.)
- (v) Subjects from which a student has been allowed to withdraw (i.e. those with the code 'W')

Subject which has been given an "S" code, i.e. absent from all assessment components, will be included in the GPA calculation and will be counted as "zero" grade point. GPA is thus the unweighted cumulative average calculated for a student, for all relevant subjects taken from the start of the programme to a particular point of time. GPA is an indicator of overall performance, and ranges from 0.00 to 4.30 from 2020/21.

## 25.4 Different types of GPA

25.4.1 GPA will be calculated for each Semester including the Summer Term. This Semester GPA will be used to determine students' eligibility to progress to the next Semester alongside with the 'cumulative GPA'. However, the Semester GPA calculated for the Summer Term will not be used for this purpose, unless the Summer Term study is mandatory for all students of the programme concerned and constitutes part of the graduation requirements.

25.4.2 The GPA calculated after the second Semester of the students' study is therefore a 'cumulative' GPA of all the subjects taken so far by students, and without applying any level weighting.

25.4.3 Along with the 'cumulative' GPA, a weighted GPA will also be calculated, to give an indication to the Board of Examiners on the award classification a student will likely get if he/she makes steady progress on his/her academic studies.

25.4.4 When a student has satisfied the requirements for award, an award GPA will be calculated to determine his/her award classification.

25.4.5 The relationship between the different types of GPA, and the methods for calculating each, is further explained in [Appendix 1](#).

## 26. GRADUATION REQUIREMENTS FOR BSC(HONS) IN INFORMATION SECURITY PROGRAMME

All students qualifying for a 2-year Full-time Articulation Degree must meet:

- (i) the University Graduation Requirements, as explained in [Section 26.1](#) below; and
- (ii) the specific graduation requirements of their chosen programme of study, as stated in [Section 26.2](#) below.

### 26.1 University Graduation Requirements

- (i) Satisfy the following requirements in general education (GUR):
  - (a) 3 credits of Service-Learning.
  - (b) 6 credits of Cluster Areas Requirement (CAR) from CAR (M) and a specially-designed CAR with English Language.
  - (c) Fulfilment of the English and Chinese reading and writing requirements (ER/EW & CR/CW) in CAR subjects.
  - (d) Non-credit bearing Essential Components of General Education
  - (e) Having met the equivalent standard of the Undergraduate Degree Language and Communication Requirements (LCR) as set out in [Section 4.2](#) <sup>Note 1</sup>.
- (ii) Earn a cumulative GPA of 1.70 or above at graduation.
- (iii) Obtain at least 2 WIE credits as set out in [Section 8.2](#).
- (iv) Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.

Further details about the University Graduation Requirements can be found in [Appendix 2](#).

Note 1: Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR - Chinese and CAR - Chinese Reading and Writing requirements. However, this group of students would still be required to take one Chinese LCR subject **recommended by CLC/EIE** to fulfil their Chinese LCR.

### 26.2 Specific Graduation Requirements for the **BSc(Hons) in Information Security Programme**

- (i) Complete successfully a minimum of 64 academic credits composed of the following:
    - (a) 9 credits of General University Requirements (GUR) as set out in Section 26.1 (i).
    - (b) 55 credits of Discipline-Specific Requirements (DSR), of which 43 credits from subjects categorized as COM (compulsory) and 12 credits from subjects categorized as ELE (elective) as stated in Table 4.1.
  - (ii) Obtain a total 2 credits in TRN (Training) as stated in Table 4.1.
  - (iii) Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.
- 26.3 Remedial subjects are designed for new students who are in need of additional preparations in a particular subject area, and only identified students of a programme are required to take these subjects. These subjects should therefore be counted outside the regular credit requirement for award.
- 26.4 In addition, students may be required to take subjects that are designed to enhance their skills in particular subject areas to underpin their further advanced study in the discipline. These underpinning subjects could be of different subject areas (e.g. Mathematics, science subjects), and the number of credits each student is required to take in a particular underpinning subject area may vary according to the different academic backgrounds of the students.
- 26.5 In the case that students have already taken certain subject(s) in their previous Associate Degree/Higher Diploma studies, exemption may be given from these subjects and students should take other electives (including free electives) instead to make up the minimum credits required. All students admitted to an Articulation Degree or Senior Year curriculum, irrespective of the entry qualifications they held when applying for admission to the programmes, are required to complete at least 60 credits to be eligible for award.
- 26.6 Level-0 subjects and training subjects (including clinical/field training) will not be counted to fulfil free elective requirement for graduation purpose.
- 26.7 A student is required to graduate as soon as he/she satisfies the graduation requirements as stipulated in Sections 26.1, 26.2 and 26.6 above. The student concerned is required to apply for graduation, in the semester in which he/she is able to

fulfil all his/her graduation requirements, and after the add/drop period for that semester has ended.

## 27. GUIDELINES FOR AWARD CLASSIFICATION

- 27.1 The guidelines for award classification of BSc(Hons) in Information Security award are stated in the following. In using these guidelines, the Board of Examiners shall exercise its judgement in coming to its conclusions as to the award for each student, and where appropriate, may use other relevant information.
- 27.2 This Programme uses Weighted GPA as a guide for helping to determine award classifications. A University-wide standard weighting is applied to all subjects of the same level, with a weighting of 2 for Level 1 and 2 subjects, a weighting of 3 for Level 3, 4 and 5 subjects.

Weighted GPA will be computed as follows:

$$\text{Weighted GPA} = \frac{\sum_{n=1}^N \text{Subject Grade Point}_n \times \text{Subject Credit Value}_n \times W_n}{\sum_{n=1}^N \text{Subject Credit Value}_n \times W_n}$$

where  $W_n = 2$  for all Level 1 and Level 2 subjects, and

$W_n = 3$  for all Level 3, Level 4 and Level 5 subjects.

$N$  = number of subjects counted towards the award as listed in Table 4.1 according to the Specified Progression Pattern (Section 5) (inclusive of failed subjects) taken by the student up to and including the latest semester. (For subjects which have been retaken, only the grade obtained in the final attempt will be included in the GPA calculation except those exclusions specified in Section 27.3.)

Same as GPA, Weighted GPA ranges from 0.00 to 4.30 from 2020/21.

- 27.3 Any subjects passed after the graduation requirement has been met or subjects taken on top of the prescribed credit requirements for award will not be taken into account in the grade point calculation for award classification (see sections 25.3 and 27.2 above). However, if a student attempts more elective subjects (or optional subjects) than those required for graduation in or before the semester in which he/she becomes eligible for award, the elective subjects (or optional subjects), except for subjects which are selected by students to fulfill the free electives requirement for graduation, with a higher

grade/contribution shall be included in the grade point calculation (i.e. the excessive subjects attempted with a lower grade/contribution, including failed subjects, will be excluded).

- 27.4 The following are guidelines for the Board for Examiners' reference in determining award classifications:

| <b>Honours Degrees</b>        | <b>Guidelines</b>  |
|-------------------------------|--|
| 1 <sup>st</sup>               | The student's performance/attainment is outstanding, and identifies him/her as exceptionally able in the field covered by the programme in question.             |
| 2 <sup>nd</sup> (Division I)  | The student has reached a standard of performance/attainment which is more than satisfactory but less than outstanding.  |
| 2 <sup>nd</sup> (Division II) | The student has reached a standard of performance/attainment judged to be satisfactory, and clearly higher than the 'essential minimum' required for graduation. |
| 3 <sup>rd</sup>               | The student has attained the 'essential minimum' required for graduation at a standard ranging from just adequate to just satisfactory.                          |

- 27.5 Under exceptional circumstances, a student who has completed an Honours degree programme, but has not attained Honours standard, may be awarded a Pass-without-Honours degree. A Pass-without-Honours degree award will be recommended, when the student has demonstrated a level of final attainment which is below the 'essential minimum' required for graduation with Honours from the programme in question, but has nonetheless covered the prescribed work of the programme in an adequate fashion while failing to show sufficient evidence of the expected intellectual calibre of Honours degree graduates. For example, if a student in an Honours degree programme has a Grade Point Average (GPA) of 1.70 or more, but his/her Weighted GPA is less than 1.70, he/she may be considered for a Pass-without-Honours classification. A Pass-without-Honours is an unclassified award, but the award parchment will not include this specification.

- 27.6 Students who have committed academic dishonesty or non-compliance with examination regulations will be subject to the penalty of lowering the award classification by one level. For undergraduate students who should be awarded a Third class Honours degree, they will be downgraded to a Pass-without-Honours. The minimum of downgraded overall result will be kept at a Pass. In rare circumstances where both the Student Discipline Committee and Board of Examiners of a Department consider that there are strong justifications showing the offence be less serious, the requirement for lowering the award classification can be waived.

27.7 The following are the award GPA ranges for determining award classifications:

| <b>Honours Classification</b> | <b>Award GPA</b> |
|-------------------------------|------------------|
| 1 <sup>st</sup>               | 3.60 – 4.30      |
| 2 <sup>nd</sup> (Division I)  | 3.00 – 3.59      |
| 2 <sup>nd</sup> (Division II) | 2.40 – 2.99      |
| 3 <sup>rd</sup>               | 1.70 – 2.39      |

27.8 Decisions by the Boards of Examiners on award classifications to be granted to each student on completion of the programme shall be ratified by the Faculty Board (of Examiners). For cases the decisions of which do not conform to the above indicative GPA range, they should be referred, by the Faculty Board (of Examiners), to the APRC for ratification.

## **28. RECORDING OF DISCIPLINARY ACTIONS IN STUDENTS' RECORDS**

28.1 With effect from Semester One of 2015/16, disciplinary actions against students' misconducts will be recorded in students' records.

28.2 Students who are found guilty of academic dishonesty or non-compliance with examination regulations will be subject to the penalty of having the subject result concerned disqualified, and be given a failure grade with a remark denoting 'Disqualification of result due to academic dishonesty/non-compliance with examination regulations'. The remark will be shown in the students' record and transcript of studies, until their leaving the University.

28.3 Students who have committed disciplinary offences (covering both academic and non-academic related matters) will be put on 'disciplinary probation'. The status of 'disciplinary probation' will be shown in the students' record, transcript of studies and testimonial during the probation period. The disciplinary probation is normally one year unless otherwise decided by the Student Discipline Committee.

28.4 The University reserves the right to withhold the issuance of any certificate of study to a student/graduand who has unsettled matters with the University, or is subject to disciplinary action.

**29. SYLLABI**

(Please see pages 44 to 121.)

**APPENDIX**

(Please see pages 123 to 127.)

### Subject Description Form

|  |  |
|--|--|
| <b>Subject Code</b>                            | CLC1104C (Cantonese) / CLC1104P (Putonghua) [2019-20 onward] /<br>CBS1104C (Cantonese) / CBS1104P (Putonghua) [2018-19 and before]<br><i>Remarks: Students taking the Cantonese version of CLC/CBS1104 (i.e. CLC/CBS1104C) will be offered a 39 hour non-credit bearing e-learning course in Putonghua (optional).</i>   |
| <b>Subject Title</b>                           | University Chinese (大學中文)  |
| <b>Credit Value</b>                            | 3  |
| <b>Level</b>                                   | 1  |
| <b>Pre-requisite / Co-requisite/ Exclusion</b> | Students with HKDSE Chinese subject result at level 3 or above or equivalent   |
| <b>Objectives</b>                              | This subject aims at enhancing the students' command of language knowledge to communicate effectively in both written and spoken Chinese, with particular reference to the stylistic variations of expression in different communicative settings. The ultimate goal of this subject is to train students to be effective communicators and life-long learners, and to equip them for the Chinese Discipline-Specific Language Requirement subject.  |
| <b>Intended Subject Learning Outcomes</b>      | <p><b>Upon completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Consolidate the ability to identify and correct the most common errors in written texts;</li> <li>2. Develop Chinese writing skills through the analysis and in-depth reading of selected literary masterpieces;</li> <li>3. Master the format, organization, language and style of expression of various genres of Chinese writing;</li> <li>4. Produce formal presentations in spoken Chinese effectively and appropriately.</li> </ol>  |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <ol style="list-style-type: none"> <li>1. Written communication<br/>Language, format and organization of each genre; coherence and thread of thinking in Chinese writing; style of expression of different genres; context dependent stylistic variation; development of logical and persuasive arguments.</li> <li>2. Spoken communication<br/>Choice of words; articulation and flow of speaking; manner of speaking and gesture; identification of main idea and key messages; evaluation of relevancy of information in a message; skills of summarizing; agreeing / disagreeing / answering to questions politely; use of visual aids; body movement.</li> <li>3. Reading strategies<br/>Intensive and critical reading; identification of authors' stances, arguments and purposes; extracting useful information from the texts; determination of the meanings of the important concept words in context; evaluation of the validity of the factual information and arguments of the texts; appreciation of different genres including literary masterpieces.</li> <li>4. Language development<br/>Grammatical skills; use of clear words; use of specific sentences; choice of diction.</li> </ol> |

| <b>Teaching/Learning Methodology</b>   | <p>The teaching/learning methodology is a combination of highly interactive seminars, self-formed study groups, seminar discussion, oral presentations and written assignments. E-learning materials for enhancing students' proficiency in both spoken and written Chinese are included in Chinese LCR teaching.</p> <p>Students are expected to follow teachers' guidelines and get access to the materials on the e-Learning platform for self-study on a voluntary basis.</p>   |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
|--|---|--|-----------------------------------|-------------|--|----------|-----------------------------|--|---|---------|------------------------------------|---|--------------------------|----------|--------------|----------|-----------------------------------|------------------|---------------------|-----|---|---|---|--|-------------------|-----|---|--|---|---|-------|-------|--|--|--|--|
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b> | <table border="1"> <thead> <tr> <th rowspan="2">Specific Assessment Methods/Tasks</th> <th rowspan="2">% Weighting</th> <th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Quizzes / Exercises</td> <td>20%</td> <td>√</td> <td></td> <td>√</td> <td></td> </tr> <tr> <td>Written Assignments</td> <td>55%</td> <td>√</td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>Oral presentation</td> <td>25%</td> <td>√</td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="4"></td> </tr> </tbody> </table> <p><b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b><br/> The quizzes and exercises are designed to assess students' basic knowledge of Chinese linguistics and how well they achieve ILOs (1) and (3). The writing assessments aim to obtain an objective measurement of students' basic competence in the use of written Chinese in accurate and appropriate grammatical structures (ref. ILOs (1), (2) and (3)). The oral assessment assesses students' ability to plan and present accurately, appropriately and effectively (ref. ILOs (1), (3) and (4)). Explanations and exercises are provided in classroom teaching.</p> |  | Specific Assessment Methods/Tasks | % Weighting | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |          |                             |  | 1   | 2       | 3                                  | 4 | Quizzes / Exercises      | 20%      | √            |          | √                                 |                  | Written Assignments | 55% | √ | √ | √ |  | Oral presentation | 25% | √ |  | √ | √ | Total | 100 % |  |  |  |  |
| Specific Assessment Methods/Tasks  | % Weighting   | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
|  |   | 1  | 2                                 | 3           | 4  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| Quizzes / Exercises  | 20%   | √  |                                   | √           |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| Written Assignments  | 55%   | √  | √                                 | √           |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| Oral presentation  | 25%   | √  |                                   | √           | √  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| Total  | 100 %   |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| <b>Student Study Effort Expected</b>   | <table border="1"> <tr> <td><b>Class contact:</b></td> <td></td> </tr> <tr> <td>• Seminar</td> <td>39 Hours</td> </tr> <tr> <td><b>Additional activity:</b></td> <td></td> </tr> <tr> <td>• e-Learning in Putonghua and written Chinese</td> <td>9 Hours</td> </tr> <tr> <td><b>Other student study effort:</b></td> <td></td> </tr> <tr> <td>• Outside Class Practice</td> <td>39 Hours</td> </tr> <tr> <td>• Self-study</td> <td>39 Hours</td> </tr> <tr> <td><b>Total student study effort</b></td> <td><b>126 Hours</b></td> </tr> </table>  |  | <b>Class contact:</b>             |             | • Seminar  | 39 Hours | <b>Additional activity:</b> |  | • e-Learning in Putonghua and written Chinese | 9 Hours | <b>Other student study effort:</b> |   | • Outside Class Practice | 39 Hours | • Self-study | 39 Hours | <b>Total student study effort</b> | <b>126 Hours</b> |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| <b>Class contact:</b>  |   |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| • Seminar  | 39 Hours  |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| <b>Additional activity:</b>  |   |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| • e-Learning in Putonghua and written Chinese                                  | 9 Hours   |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| <b>Other student study effort:</b>   |   |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| • Outside Class Practice   | 39 Hours  |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| • Self-study   | 39 Hours  |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| <b>Total student study effort</b>  | <b>126 Hours</b>  |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |
| <b>Reading List and References</b>   | <ol style="list-style-type: none"> <li>于成鯤、陳瑞端、秦扶一、金振邦主編：《當代應用文寫作規範叢書》，上海：復旦大學出版社，2011年。</li> <li>任伯江：《口語傳意權能：人際關係策略與潛力》，香港：香港中文大學出版社，2006年。</li> <li>吳禮權：《演講的技巧》，香港：商務印書館，2013年。</li> <li>李錦昌：《商業溝通與應用文大全》，香港：商務印書館，2012年。</li> <li>邵敬敏：《現代漢語通論》，上海：上海教育出版社，2007年。</li> <li>香港城市大學語文學部編著：《中文傳意—基礎篇》。香港：香港城市大學出版社，2001。</li> </ol>  |  |                                   |             |  |          |                             |  |   |         |                                    |   |                          |          |              |          |                                   |                  |                     |     |   |   |   |  |                   |     |   |  |   |   |       |       |  |  |  |  |

|                     |   |
|---------------------|---|
|                     | <p>7. 香港城市大學語文學部編著：《中文傳意—寫作篇》。香港：香港城市大學出版社，2001。</p> <p>8. 孫光萱：《中國現代散文名家名篇賞讀》，上海：上海教育出版社，2001年。</p> <p>9. 梁慧敏：《正識中文》，香港：三聯書店，2010年。</p> <p>10. 梁慧敏：《語文正解》，香港：三聯書店，2015年。</p> <p>11. 梁慧敏：《語文通病》，香港：三聯書店，2014年。</p> <p>12. 陳瑞端，《生活病語》，香港：中華書局，2000。</p> <p>13. 陳瑞端：《生活錯別字》，香港：中華書局，2000年。</p> <p>14. 賴蘭香：《傳媒中文寫作》(新修本)，香港：中華書局，2012年。</p> |
| <b>Last Updated</b> | May 2019  |
| <b>Prepared by</b>  | Chinese Language Centre   |

**Subject Description Form**

|  |   |
|--|---|
| <b>Subject Code</b>                            | ELC1011 (for 42470, 42477, 42480 and 42375)   |
| <b>Subject Title</b>                           | Practical English for University Studies  |
| <b>Credit Value</b>                            | 3   |
| <b>Level</b>                                   | 1   |
| <b>Pre-requisite / Co-requisite/ Exclusion</b> | Nil   |
| <b>Objectives</b>                              | This subject aims to develop and enhance students' general proficiency and communication skills in English. A strong focus will be given to enhancing communicative competence and confidence in text structure, grammar, vocabulary, pronunciation and fluency.  |
| <b>Intended Subject Learning Outcomes</b>      | <p><b>Upon successful completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. produce short written texts in a university context using appropriate structures, vocabulary and tone</li> <li>2. analyse and select information from a range of text types in order to present content and views in a university context</li> <li>3. apply multimodal communication strategies (e.g. spoken, written, visual and aural) to present information and views for an academic audience</li> </ol> <p>To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present their views logically and coherently.</p>  |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <ol style="list-style-type: none"> <li>1. Written communication<br/>Enhancing the use of accurate and appropriate grammatical structures and vocabulary for various communicative purposes; improving the ability to organise written texts logically; and improving cohesion and coherence in writing.</li> <li>2. Spoken communication<br/>Developing verbal and non-verbal interaction strategies appropriate to the context and level of formality.</li> <li>3. Reading and listening<br/>Understanding the content and structure of information delivered in written and spoken texts; developing effective reading and listening strategies.</li> <li>4. Language development<br/>Improving and extending relevant features of grammar, vocabulary, pronunciation and fluency.</li> <li>5. Multimodal communication<br/>Developing the application of multimodal communication strategies; using a range of media and modes to present information and opinions.</li> </ol> |
| <b>Teaching/Learning Methodology</b>           | <p>The study method is a combination of seminar, self-access work and online learning. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving drafting of texts, information search, mini-presentations and discussions. Students will make use of elearning resources and web-based work to improve their grammar and vocabulary, and other language skills.</p> <p>Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning.</p>  |

|  |   |                    |   |   |   |
|--|---|--------------------|---|---|---|
|  | Additional reference materials will be recommended as required. |                    |   |   |   |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b>   | <b>Specific assessment methods/tasks</b>                        | <b>% weighting</b> | <b>Intended subject learning outcomes to be assessed (Please tick as appropriate)</b> |   |   |
|  |   |                    | 1   | 2 | 3 |
|  | 1. Paragraph writing  | 20%                | ✓   | ✓ |   |
|  | 2. Essay writing  | 40%                | ✓   | ✓ |   |
|  | 3. Documentary presentation                                     | 40%                | ✓   | ✓ | ✓ |
|  | Total   | 100 %              |   |   |   |
| <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>The paragraph writing test, which assess students' grammar, vocabulary and paragraph organisation skills, necessitates achievement of LOs (1) and (2).</p> <p>The essay writing assessment evaluates students' ability to write a longer text using accurate and appropriate structures and vocabulary (ref. LOs (1) and (2)).</p> <p>The documentary presentation assesses students' ability to speak accurately, appropriately and confidently. Students will research a topic, organise information from a variety of sources, and deliver the information as a digital documentary and mini-presentation (ref. LOs (1), (2) and (3)).</p> <p>In addition to these assessments, students are required to complete further language training through web-based language work. The additional language training offered in online tasks is aligned with all the three LOs and corresponds to their learning in class.</p> |   |                    |   |   |   |
| <b>Student Study Effort Expected</b>   | <b>Class contact:</b>   |                    |   |   |   |
|  | • Seminar   |                    | 39 Hours  |   |   |
|  | <b>Other student study effort:</b>                              |                    |   |   |   |
|  | • Self-study/preparation  |                    | 78 Hours  |   |   |
|  | <b>Total student study effort</b>                               |                    | 117 Hours   |   |   |

|                                    |   |
|------------------------------------|---|
| <b>Reading List and References</b> | <p><b>Course material:</b><br/>Learning materials developed by the English Language Centre</p> <p><b>Recommended references:</b></p> <ol style="list-style-type: none"> <li>1. Boyle, J. &amp; Boyle, L. (1998). Common Spoken English Errors in Hong Kong. Hong Kong: Longman.</li> <li>2. Brannan, B. (2003). A writer's workshop: Crafting paragraphs, building essays (3<sup>rd</sup> ed.). Boston: McGraw-Hill.</li> <li>3. Hancock, M. (2003). English pronunciation in use. Cambridge: Cambridge University Press.</li> <li>4. Nettle, M. and Hopkins, D. (2003). Developing grammar in context: Intermediate. Cambridge: Cambridge University Press.</li> <li>5. Redman, S. (2003). English vocabulary in use: Pre-intermediate and intermediate. Cambridge: Cambridge University Press.</li> <li>6. Powell, M. (2011). Presenting in English. How to get successful presentations. USA. Heinle &amp; Heinle Publishers.</li> </ol> |
| <b>Last Updated</b>                | August 2021   |
| <b>Prepared by</b>                 | English Language Centre   |

**Subject Description Form**

|  |   |
|--|---|
| <b>Subject Code</b>                            | ELC1013   |
| <b>Subject Title</b>                           | English for University Studies<br>(This subject will be offered in two versions for students who will primarily be using (1) APA/Harvard referencing styles or (2) IEEE/Vancouver referencing styles in their university studies.)  |
| <b>Credit Value</b>                            | 3   |
| <b>Level</b>                                   | 1   |
| <b>Pre-requisite / Co-requisite/ Exclusion</b> | Students entering the University with Level 3-5** from the HKDSE will be required to take this course.  |
| <b>Objectives</b>                              | This subject aims to help students study effectively in the University's English medium learning environment, and to improve and develop their English language proficiency within a framework of university study contexts.  |
| <b>Intended Learning Outcomes</b>              | <p><b>Upon successful completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. refer to sources in written texts and oral presentations</li> <li>2. paraphrase and summarise materials from written and spoken sources</li> <li>3. plan, write and revise expository essays with references to sources</li> <li>4. deliver effective oral presentations</li> </ol> <p>To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present information logically and coherently.</p>  |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <ol style="list-style-type: none"> <li>1. Written communication<br/>Analysing and practising common writing functions; improving the ability of writing topic sentences and strategies for paragraph development; understanding common patterns of organisation in expository writing; taking notes from written and spoken sources; practising summarising and paraphrasing skills; improving coherence and cohesion in writing; developing revision and proofreading skills.</li> <li>2. Spoken communication<br/>Recognising the purposes of and differences between spoken and written communication in English in university study contexts; identifying and practising the verbal and non-verbal interaction strategies in oral presentations; developing and applying critical thinking skills to discussions of issues.</li> <li>3. Language development<br/>Improving and extending relevant features of grammar, vocabulary and pronunciation.</li> </ol> |
| <b>Teaching/Learning Methodology</b>           | <p>The study method is primarily seminar-based. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving drafting and evaluating texts, mini-presentations, discussions and simulations. The process approach to writing is adopted, and students make use of elearning resources to engage in academic discussions and to reflect on their learning.</p> <p>Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the</p>  |

|  |   |                    |   |          |          |          |
|--|---|--------------------|---|----------|----------|----------|
|  | Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.   |                    |   |          |          |          |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b> | <b>Specific assessment methods/tasks</b>  | <b>% weighting</b> | <b>Intended subject learning outcomes to be assessed (Please tick as appropriate)</b> |          |          |          |
|  |   |                    | <b>1</b>  | <b>2</b> | <b>3</b> | <b>4</b> |
|  | 1. Academic essay 1   | 25%                | ✓   | ✓        | ✓        |          |
|  | 2. Academic essay 2   | 35%                | ✓   | ✓        | ✓        |          |
|  | 3. Oral presentation  | 40%                | ✓   | ✓        |          | ✓        |
| <b>Total</b>   | <b>100 %</b>  |                    |   |          |          |          |
|  | <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Assessments 1 and 2 necessitate achievement of LOs (1), (2) and (3) in order to write an effective academic essay via the process of extending and improving the essay for assessment 1. In order for students to present an effective academic oral presentation, as demanded in assessment 3, they will need to read, note and synthesise from a variety of sources, and refer to those sources in their presentation (ref. LOs (1), (2) and (4)).</p> <p>In addition to these assessments, students are required to complete further language training, through web-based language work, reading tasks and online reflections. The additional language training offered in online tasks is aligned with all the four LOs. In some of the tasks, students to critically read and summarise information contained in a variety of sources, as required in LOs (a) and (b).</p> |                    |   |          |          |          |
| <b>Student Study Effort Expected</b>                                   | <b>Class contact:</b>   |                    |   |          |          |          |
|  | ▪ Seminars  |                    | 39 Hours  |          |          |          |
|  | <b>Other student study effort:</b>  |                    |   |          |          |          |
|  | ▪ Self study/preparation  |                    | 78 Hours  |          |          |          |
|  | <b>Total student study effort</b>   |                    | <b>117 Hours</b>  |          |          |          |
| <b>Reading List and References</b>                                     | <b><u>Course material</u></b>   |                    |   |          |          |          |
|  | Learning materials developed by the English Language Centre   |                    |   |          |          |          |
|  | <b><u>Recommended references</u></b>  |                    |   |          |          |          |
|  | <ol style="list-style-type: none"> <li>1. Bailey, S. (2014). <i>Academic writing: a handbook for international students</i>. Abingdon: Routledge.</li> <li>2. Comfort, J. (2001). <i>Effective presentations</i>. Oxford: Cornelsen &amp; Oxford University Press.</li> <li>3. Hung, T. T. N. (2005). <i>Understanding English grammar: A course book for Chinese learners of English</i>. Hong Kong: Hong Kong University Press.</li> <li>4. Tang, R. (2012). <i>Academic writing in a second or foreign language: Issues and challenges facing ESL/EFL academic writers in higher education contexts</i>. London: Continuum International Pub.</li> </ol>   |                    |   |          |          |          |

|                     |  |
|---------------------|--|
|                     | 5. Zwier, L. J. (2002). <i>Building academic vocabulary</i> . Ann Arbor, MI: University of Michigan Press. |
| <b>Last Updated</b> | July 2021  |
| <b>Prepared by</b>  | English Language Centre  |

### Subject Description Form

|  |  |
|--|--|
| <b>Subject Code</b>                          | ELC2014 (for 42470, 42477, 42480 and 42375)  |
| <b>Subject Title</b>                         | Advanced English for University Studies  |
| <b>Credit Value</b>                          | 3  |
| <b>Level</b>                                 | 2  |
| <b>Pre-requisite</b>                         | ELC1012 or ELC1013 English for University Studies (unless exempted)  |
| <b>Objectives</b>                            | This subject aims to help students study effectively in the University's English medium learning environment, and to improve and develop their English language proficiency within a framework of university study contexts.   |
| <b>Intended Subject Learning Outcomes</b>    | <p><b>Upon successful completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. research relevant academic texts for a topic and integrate the sources into a position argument essay appropriately and effectively;</li> <li>2. plan, research for, write and revise a position argument essay; and</li> <li>3. present and justify views effectively in a mini oral defence.</li> </ol> <p>To achieve the above outcomes, students are expected to use language and text structure appropriate to the context, select information critically, and present and support stance and opinion logically and persuasively.</p>  |
| <b>Subject Synopsis/ Indicative Syllabus</b> | <ol style="list-style-type: none"> <li>1. Written communication<br/>Developing logical and persuasive arguments; applying a variety of organisation patterns in discursive writing, including the writing of explanatory and evaluative texts; selecting information from academic texts critically; supporting stance; maintaining cohesion and coherence in discursive writing; achieving appropriate style and tone.</li> <li>2. Spoken communication<br/>Enhancing and practising the specific oral and aural skills required to participate effectively in an academic discussion and to present and justify views in an oral defence.</li> <li>3. Reading and listening<br/>Understanding the content and structure of information in oral and written texts; comprehending, inferring and evaluating messages and attitude.</li> <li>4. Language development<br/>Improving and extending relevant features of grammar, vocabulary and pronunciation.</li> </ol> |
| <b>Teaching/Learning Methodology</b>         | <p>The study method is primarily seminar-based. Following a blended delivery approach, activities include teacher input as well as in- and out-of-class individual and group work involving drafting and evaluating texts, mini-presentations, discussions and simulations. The process approach to writing is adopted, and students make use of elearning resources to engage in academic discussions and to reflect on their learning.</p> <p>Learning materials developed by the English Language Centre are used throughout the course. Students will be referred to learning resources on the Internet and in the ELC's Centre for Independent Language Learning. Additional reference materials will be recommended as required.</p>   |

|  |  |                    |   |          |          |
|--|--|--------------------|---|----------|----------|
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b>   | <b>Specific assessment methods/tasks</b>   | <b>% weighting</b> | <b>Intended subject learning outcomes to be assessed (Please tick as appropriate)</b> |          |          |
|  |  |                    | <b>1</b>  | <b>2</b> | <b>3</b> |
|  | 1. Position Argument Essay (draft)   | 20%                | ✓   | ✓        |          |
|  | 2. Academic Presentation & discussion  | 35%                | ✓   |          | ✓        |
|  | 3. Position Argument Essay (final)   | 45%                | ✓   | ✓        |          |
| Total  | 100 %  |                    |   |          |          |
| <p><b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b></p> <p>Assessments 1 and 3 assess students' abilities to produce a coherent academic text which requires research, and effective use and referencing of sources (ref. LOs (1) and (2)). Assessment 2 assesses their abilities to plan, present and justify their views in an oral defence (ref. LOs (1) and (3)).</p> <p>In addition to their assessments, students complete further language training by carrying out academic research and by completing a variety of independent-learning tasks focusing on grammar and academic skills such as paraphrasing and discussion strategies.</p> |  |                    |   |          |          |
| <b>Student Study Effort Expected</b>   | <b>Class contact:</b>  |                    |   |          |          |
|  | • Seminars   |                    | 39 Hours  |          |          |
|  | <b>Other student study effort:</b>   |                    |   |          |          |
|  | • Self study/preparation   |                    | 78 Hours  |          |          |
|  | <b>Total student study effort</b>  |                    | 117 Hours   |          |          |
| <b>Reading List and References</b>   | <p><b>Course material:</b><br/>Learning materials developed by the English Language Centre</p> <p><b>Recommended references:</b></p> <ol style="list-style-type: none"> <li>Davies, B. (2012). Reading research: A user friendly guide for health professionals (5<sup>th</sup> ed.). Toronto, ON: Elsevier Canada.</li> <li>Faigley, L. (2012). Backpack writing: Reflecting, arguing, informing, analyzing, evaluating (3<sup>rd</sup> ed.). Boston, MA: Pearson.</li> <li>Madden, C. and Rohlck, T. N. (1997). Discussion and interaction in the academic community. Ann Arbor, MI: University of Michigan Press.</li> <li>McWhorter, K. T. (2007). Academic reading (6<sup>th</sup> ed.). New York, NY: Pearson/Longman</li> <li>Oshima, A. &amp; Hogue, A. (2006). Writing academic English (4th ed.). White Plains, NY: Pearson/Longman.</li> <li>Reinhart, S. M. (2013). Giving academic presentations (2<sup>nd</sup> ed.). Ann Arbor, MI: University of Michigan Press.</li> <li>Rost, M. (2013). Active listening. Harlow, England: Pearson.</li> <li>Wood, N. V. (2012). Perspectives on argument (7<sup>th</sup> ed.). Boston, MA: Pearson.</li> </ol> |                    |   |          |          |
| <b>Last Updated</b>  | July 2021  |                    |   |          |          |
| <b>Prepared by</b>   | English Language Centre  |                    |   |          |          |

### Subject Description Form

|   |  |
|---|--|
| <b>Subject Code</b>                                   | AMA3100 (for 42480)  |
| <b>Subject Title</b>                                  | Number, Combinatorics and Statistics   |
| <b>Credit Value</b>                                   | 3  |
| <b>Level</b>  | 3  |
| <b>Pre-requisite/<br/>Co-requisite/<br/>Exclusion</b> | Nil  |
| <b>Objectives</b>                                     | <ol style="list-style-type: none"> <li>1. Introduce to students the necessary mathematical background for the understanding of modern information security measures</li> <li>2. Equip students with knowledge of basic number theory, combinatorics and statistical methods</li> <li>3. Introduce the applications of these theories in the area of information security</li> </ol>  |
| <b>Intended Subject Learning Outcomes</b>             | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand number theory as the background of modern cryptography</li> <li>2. Understand statistical methods and their applications to the area of information security</li> <li>3. Understand combinatorial mathematics</li> </ol> <p><u>Category B: Attributes for all-Roundedness</u></p> <ol style="list-style-type: none"> <li>4. Recognise the need for continuing development</li> </ol>   |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b>      | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Number Theory</u><br/>This part aims to cover elementary number theory. Topics include modular exponentiation, Euclidean algorithms, modular arithmetic, multiplicative inverses, system of linear congruences, discrete logarithms, and error correcting codes.</li> <li>2. <u>Combinatorics</u><br/>This part covers combinatorial probability, Knapsack problem, and pigeonhole principle, and binomial coefficients. Optional overview of advanced topics such as linear programming and game theory, network and graph theory.</li> <li>3. <u>Statistics</u><br/>This part covers methods of collecting and summarising data. Statistical inference methods concerning population means, proportions and variances are given. Common statistical tests and procedures, including correlation, regression analysis, Chi-square test will be covered.</li> <li>4. <u>RSA encryption</u><br/>Applications of the above mathematical concepts to the area of information security will be discussed (e.g. RSA and ElGamal encryption based on number theory, virus signature detection using statistical test).</li> </ol> |
| <b>Teaching/Learning Methodology</b>                  | <p>During the lectures, students will come across the common concepts and theories. Those concepts and theories would be explained with reference to sample applications.</p> <p>In the tutorials, students will be given scenarios related to the area of information security where these mathematical concepts are relevant.</p>  |

|  |   |                    |   |          |          |                  |
|--|---|--------------------|---|----------|----------|------------------|
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b> | <b>Specific Assessment Methods/Tasks</b>  | <b>% Weighting</b> | <b>Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</b> |          |          |                  |
|  |   |                    | <b>1</b>  | <b>2</b> | <b>3</b> | <b>4</b>         |
|  | 1. Continuous Assessment  | 50%                | ✓   | ✓        | ✓        | ✓                |
|  | 2. Examination  | 50%                | ✓   | ✓        | ✓        | ✓                |
|  | Total   | 100%               |   |          |          |                  |
|  | Types of assessments include assignments, test and examination.<br>Assignments are designed to reinforce the concepts and theories learned in the lecture and tutorial, by solving bigger problems. Test and examination are used to assess independent problem solving and critical thinking skills.   |                    |   |          |          |                  |
| <b>Student Study Effort Expected</b>   | <b>Class contact:</b>   |                    |   |          |          |                  |
|  | • Lecture   |                    |   |          |          | 26 Hours         |
|  | • Tutorial / Lab  |                    |   |          |          | 13 Hours         |
|  | <b>Other student study effort:</b>  |                    |   |          |          |                  |
|  | • Assignments, project, self-study, text and exam preparation   |                    |   |          |          | 66 Hours         |
|  | <b>Total student study effort:</b>  |                    |   |          |          | <b>105 Hours</b> |
| <b>Reading List and References</b>   | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. John Stillwell, <i>Elements of Number Theory.</i>, United States: Springer Undergraduate Texts in Mathematics, 2002.</li> <li>2. J. H. van Lint, R. M. Wilson, <i>A Course in Combinatorics</i>, Cambridge: Cambridge University Press, 2001.</li> <li>3. Douglas C. Montgomery, George C. Runger, Norma F. Hubele, <i>Engineering Statistics</i>. United States: Wiley, 2010.</li> <li>4. Johannes A. Buchmann, <i>Introduction to Cryptography</i>. United States: Springer Undergraduate Texts in Mathematics, 2004.</li> <li>5. Douglas Stinson, <i>Cryptography: Theory and Practice</i>. United States: CRC Press, 2006</li> <li>6. W. Cary Huffman, Vera Pless, <i>Fundamentals of Error Correcting Codes</i>. Cambridge: Cambridge University Press, 2003</li> <li>7. Hans Kellerer, Ulrich Pferschy, David Pisinger, <i>Knapsack Problems</i>. Berlin: Springer, 2004</li> </ol> |                    |   |          |          |                  |
| <b>Last Updated</b>  | July 2021   |                    |   |          |          |                  |
| <b>Prepared by</b>   | AMA Department  |                    |   |          |          |                  |

### Subject Description Form

|  |   |
|--|---|
| <b>Subject Code</b>                          | CLC3241P (2019-20 onward) / CBS3241P (2018-19 and before)   |
| <b>Subject Title</b>                         | Professional Communication in Chinese   |
| <b>Credit Value</b>                          | 2   |
| <b>Level</b>                                 | 3   |
| <b>Pre-requisite / Co-requisite</b>          | Chinese LCR subjects (in Semester 2 of Year 3 or Semester 1 of Year 4)  |
| <b>Objectives</b>                            | This subject aims to develop the language competence for professional communication in Chinese required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals and reports.  |
| <b>Intended Subject Learning Outcomes</b>    | <p><b>Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in Chinese, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1 Plan, organise and produce professionally acceptable project proposals and reports with appropriate text structures and language for different intended readers.</li> <li>2 Plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences.</li> <li>3 Adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences.</li> </ol>  |
| <b>Subject Synopsis/ Indicative Syllabus</b> | <ol style="list-style-type: none"> <li>1. Project proposals and reports in Chinese <ul style="list-style-type: none"> <li>• Planning and organising project proposals and reports</li> <li>• Explaining the background, rationale, objectives, scope and significance of a project</li> <li>• Referring to the literature to substantiate project proposals</li> <li>• Describing the methods of study</li> <li>• Describing and discussing project results, including anticipated results and results of pilot study</li> <li>• Presenting the budget, schedule and/or method of evaluation</li> <li>• Writing executive summaries./abstracts</li> </ul> </li> <li>2. Oral presentations of projects <ul style="list-style-type: none"> <li>• Selecting content for audience-focused presentations</li> <li>• Choosing language and style appropriate to the intended audience</li> <li>• Using appropriate transitions and maintaining coherence in team presentations</li> <li>• Using effective verbal and non-verbal interactive strategies</li> </ul> </li> </ol> |
| <b>Teaching/Learning Methodology</b>         | <p><u>Learning and teaching approach</u></p> <p>The subject is designed to develop the students' Chinese language skills, both oral and written, that students need to communicate effectively and professionally with a variety of stakeholders of engineering-related projects. It builds upon the language and communication skills covered in GUR language training subjects.</p> <p>The study approach is primarily seminar-based. Seminar activities include instructor input as well as individual and group work, involving drafting and evaluating texts, mini-presentations, discussions and simulations.</p> <p>The learning and teaching activities in the subject will focus on a course-long project which will engage students in proposing and reporting on an engineering-</p>   |

|   | <p>related project to different intended readers/audiences. During the course, students will be involved in:</p> <ul style="list-style-type: none"> <li>- planning and researching the project</li> <li>- writing project-related documents such as project proposals and reports</li> <li>- giving oral presentations to intended stakeholders of the project</li> </ul>  |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|---|--|-----------------------------------|-------------|--|--|--|---|---|---|--------------------------------|-----|---|--|---|--|-----|--|---|---|-------|------|--|--|--|--|--|--|
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b>  | <table border="1"> <thead> <tr> <th rowspan="2">Specific Assessment Methods/Tasks</th> <th rowspan="2">% Weighting</th> <th colspan="3">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>1. Project proposal in Chinese</td> <td>60%</td> <td style="text-align: center;">✓</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>2. Oral presentation of project proposal</td> <td>40%</td> <td></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Specific Assessment Methods/Tasks | % Weighting | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |  |  | 1 | 2 | 3 | 1. Project proposal in Chinese | 60% | ✓ |  | ✓ | 2. Oral presentation of project proposal | 40% |  | ✓ | ✓ | Total | 100% |  |  |  |  |  |  |
|   | Specific Assessment Methods/Tasks  |                                   |             | % Weighting  | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|   |  | 1                                 | 2           |  | 3  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|   | 1. Project proposal in Chinese   | 60%                               | ✓           |  | ✓  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|   | 2. Oral presentation of project proposal   | 40%                               |             | ✓  | ✓  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| Total   | 100%   |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| <p><b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b></p> <p>The assessments will arise from the course-long engineering-related project.</p> <ul style="list-style-type: none"> <li>• Students will be assessed on written documents and oral presentations targeted at different intended readers/audiences. This facilitates assessment of students' ability to select content and use language and style appropriate to the purposes and intended readers/audiences.</li> <li>• Students will collaborate in groups in planning, researching, discussing and giving oral presentations on the project. The written proposals will be individual work to ensure that students will be rigorously engaged in the application of language skills for the entire document.</li> </ul> |  |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| <b>Student Study Effort Expected</b>  | <b>Class contact:</b>  |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|   | <ul style="list-style-type: none"> <li>• Seminars</li> </ul>   | 26 Hours                          |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|   | <b>Other student study effort:</b>   |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
|   | <ul style="list-style-type: none"> <li>• Researching, planning, writing, and preparing the project</li> </ul>  | 44 Hours                          |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| <b>Total student study effort:</b>  |  | <b>70 Hours</b>                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| <b>Reading List and References</b>  | <ol style="list-style-type: none"> <li>1. 司有和 (1984) : 《科技寫作簡明教程》, 安徽教育出版社。</li> <li>2. 葉聖陶、呂叔湘、朱德熙、林燾 (1992) : 《文章講評》 語文出版社。</li> <li>3. 于成鯤主編 (2003) : 《現代應用文》, 復旦大學出版社。</li> <li>4. 岑紹基、謝錫金、祈永華 (2006) : 《應用文的語言· 語境· 語用》, 香港教育圖書公司。</li> <li>5. 邵敬敏主編 (2010) : 《現代漢語通論 (第二版)》, 上海教育出版社。</li> <li>6. 于成鯤、陳瑞端、秦扶一、金振邦主編 (2010) : 《中國現代應用文寫作規範叢書: 科教文與社交文書寫作規範》, 復旦大學出版社。</li> <li>7. 香港特別行政區政府教育局· 課程發展處中國語文教育組 (2012) : 《常用字字形表》, 政府物流服務署印。</li> </ol>  |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| <b>Last Updated</b>   | May 2019   |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |
| <b>Prepared by</b>  | Chinese Language Centre  |                                   |             |  |  |  |   |   |   |                                |     |   |  |   |  |     |  |   |   |       |      |  |  |  |  |  |  |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                             | COMP3334  |
| <b>Subject Title</b>                            | Computer Systems Security   |
| <b>Credit Value</b>                             | 3   |
| <b>Level</b>                                    | 3   |
| <b>Pre-requisite / Co-requisite / Exclusion</b> | <b>Pre-requisite:</b> Basic understanding of modern operating systems is preferred  |
| <b>Objectives</b>                               | <p>To equip students with a foundational understanding of the threats to computer systems. Students will be equipped to:</p> <ol style="list-style-type: none"> <li>1. understand the practical principles and models for protecting computer systems from various forms of attacks;</li> <li>2. understand the major security issues and problems in computer systems, and the countermeasures to mitigate the corresponding attacks; and</li> <li>3. acquire practical skills in using various tools and resources to analyse the security of computer systems, particularly the web systems.</li> </ol>  |
| <b>Intended Learning Outcomes</b>               | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. understand the major security threats to computer systems and software, and the countermeasures to mitigate the corresponding attacks;</li> <li>2. understand the major security threats to web systems and the countermeasures to mitigate the corresponding attacks;</li> <li>3. understand and apply basic cryptographic techniques to secure information of computer systems;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. combine various security mechanisms to address the security requirements of computer systems; and</li> <li>5. realise potential threats of new systems and the state-of-the-art technologies for protecting computer systems.</li> </ol> |
| <b>Subject Synopsis/ Indicative Syllabus</b>    | <b>Topic</b>  |
|   | <b>1. Overview</b><br>Security goals and policies, types of attacks, threat models.   |
|   | <b>2. Cryptography</b><br>Classical cryptography, modern symmetric cryptography, public-key cryptography, and steganography.  |
|   | <b>3. Authentication</b><br>Password systems, one-time passwords, strong password protocols, and password authentication protocols, key agreement protocols.  |
|   | <b>4. Software exploits and countermeasures</b><br>Buffer overflow, memory protection and corruption, principles of secure coding, code audit and review, malicious codes, rootkits, malwares, and browser security.  |
| <b>5. Web security</b>                          |   |

|   | <p>Input validation, SQL injection, cross-site scripting, cross-site request forgery, unvalidated redirects and forwards.</p> <p><b>6. Case study &amp; Advanced topics</b><br/>Blockchain, Merkle tree, blind signatures, ring signatures, and zero knowledge proof, etc.</p>   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
|---|--|-----------------------------------|-------------|---|--------|---|----------|--|---|---|---|---|---|------------------------------|------------|--|--|--|--|--|----------------|-----|---|---|---|--|---|--------------|-----|--|--|--|---|--|------------|-----|--|--|--|---|---|--------------------|------------|---|---|---|--|---|-------|------|--|--|--|--|--|
|   | <p><u>Workshops:</u><br/>A series of workshops will be given to let students acquire practical experience on the different topics.</p>   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| <p><b>Teaching/<br/>Learning<br/>Methodology</b></p>  | <p>The course will emphasise on both the principles and practices of computer system security. The principles will be covered mainly through the lectures and problem-solving activities in the tutorials, whereas the practice aspects will be taught through a series of workshops which are designed to reinforce what has been taught in the lectures and to help students acquire practical skills and group projects.</p>  |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| <p><b>Assessment<br/>Methods in<br/>Alignment with<br/>Intended<br/>Learning<br/>Outcomes</b></p> | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td><b>Continuous Assessment</b></td> <td><b>60%</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1. Assignments</td> <td>25%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>2. Workshops</td> <td>10%</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>3. Project</td> <td>25%</td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td><b>Examination</b></td> <td><b>40%</b></td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>The examination and assignments are designed to evaluate the students' understanding on the principles undergirding the web and software security. The workshops, on the other hand, are designed to evaluate the students' practical skills on solving computer system security problems.</p> | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed |        |   |          |  | 1 | 2 | 3 | 4 | 5 | <b>Continuous Assessment</b> | <b>60%</b> |  |  |  |  |  | 1. Assignments | 25% | ✓ | ✓ | ✓ |  | ✓ | 2. Workshops | 10% |  |  |  | ✓ |  | 3. Project | 25% |  |  |  | ✓ | ✓ | <b>Examination</b> | <b>40%</b> | ✓ | ✓ | ✓ |  | ✓ | Total | 100% |  |  |  |  |  |
| Specific assessment methods/tasks   | % weighting  |                                   |             | Intended subject learning outcomes to be assessed |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
|   |  | 1                                 | 2           | 3   | 4      | 5                                       |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| <b>Continuous Assessment</b>  | <b>60%</b>   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| 1. Assignments  | 25%  | ✓                                 | ✓           | ✓   |        | ✓                                       |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| 2. Workshops  | 10%  |                                   |             |   | ✓      |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| 3. Project  | 25%  |                                   |             |   | ✓      | ✓                                       |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| <b>Examination</b>  | <b>40%</b>   | ✓                                 | ✓           | ✓   |        | ✓                                       |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| Total   | 100%   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| <p><b>Student Study<br/>Effort Expected</b></p>   | <p><b>Class contact:</b></p> <table border="1"> <tr> <td>▪ Lectures</td> <td>39 Hours</td> </tr> <tr> <td>▪ Tutorials/Workshops</td> <td>0 Hour</td> </tr> </table> <p><b>Other student study effort:</b></p> <table border="1"> <tr> <td>▪ Self-study (average 6 hours per week)</td> <td>66 Hours</td> </tr> </table> <p><b>Total student study effort</b> 105 Hours</p>   | ▪ Lectures                        | 39 Hours    | ▪ Tutorials/Workshops                             | 0 Hour | ▪ Self-study (average 6 hours per week) | 66 Hours |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| ▪ Lectures  | 39 Hours   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| ▪ Tutorials/Workshops   | 0 Hour   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |
| ▪ Self-study (average 6 hours per week)   | 66 Hours   |                                   |             |   |        |   |          |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |   |  |   |              |     |  |  |  |   |  |            |     |  |  |  |   |   |                    |            |   |   |   |  |   |       |      |  |  |  |  |  |

|                                    |   |
|------------------------------------|---|
| <b>Reading List and References</b> | <p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>1. Bishop, Matt, <i>Introduction to Computer Security</i>, Addison Wesley, 2005.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. W. Stallings, <i>Cryptography and Network Security: Principles and Practice</i>, 7th ed., Pearson 2017.</li> <li>2. W. Du, <i>Computer &amp; Internet Security: A Hands-on Approach</i>, 2nd ed., Wenliang Du 2019.</li> <li>3. D. A. Tevault, <i>Mastering Linux Security and Hardening: Protect your Linux systems from intruders, malware attacks, and other cyber threats</i>, 2nd ed., Packt Publishing 2020.</li> <li>4. R. Anderson, <i>Security Engineering: A Guide to Building Dependable Distributed Systems</i>, 3rd ed., Wiley 2020.</li> <li>5. G. Hoglund and G. McGraw, <i>Exploiting Software</i>, Addison Wesley, 2004.</li> </ol> |
| <b>Last Updated</b>                | July 2022   |
| <b>Prepared by</b>                 | COMP  |

### Subject Description Form

|   |  |  |
|---|--|--|
| <b>Subject Code</b>                             | COMP3335   |  |
| <b>Subject Title</b>                            | Database Security  |  |
| <b>Credit Value</b>                             | 3  |  |
| <b>Level</b>                                    | 3  |  |
| <b>Pre-requisite / Co-requisite / Exclusion</b> | <b>Pre-requisite:</b> COMP2411 or equivalent introductory database subject   |  |
| <b>Objectives</b>                               | <p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. introduce to students about security threats with respect to database applications;</li> <li>2. equip students with knowledge of security measures and understanding on the concepts in protecting data; and</li> <li>3. equip students with skills to design and implement secure database applications with respect to the security requirements.</li> </ol>   |  |
| <b>Intended Learning Outcomes</b>               | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. identify security threats in database systems;</li> <li>2. understand the concepts and security mechanisms in the protection of data;</li> <li>3. design and implement secure database systems;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. develop skills in problem-solving; and</li> <li>5. solve complex problems in team and function effectively in a team environment to achieve a common goal.</li> </ol> |  |
| <b>Subject Synopsis/ Indicative Syllabus</b>    | <b>Topic</b>   |  |
|   | <b>1. Overview of Database Concepts</b><br>Common database technologies and database application architectures, including ER modelling and existing relational database management systems such as MySQL and Oracle; advanced database technologies, including object-oriented databases and distributed databases.  |  |
|   | <b>2. Introduction to Database Security</b><br>Threats to databases; commonly accepted security goals (integrity, availability and confidentiality); kinds of security control measures.   |  |
|   | <b>3. Access Control</b><br>Database authorisation, including discretionary security mechanisms and mandatory security mechanisms.   |  |
|   | <b>4. File System Security</b><br>FAT, NTFS, HFS, disk encryption.   |  |
|   | <b>5. Inference Control</b><br>Nature of statistical database and the inference control mechanism to prevent detailed confidential information.  |  |
|   | <b>6. Advanced Topics</b><br>Including security threats with respect to SQL injection attacks, virtual private databases and database auditing, searchable encryption, blockchain and decentralised storage.   |  |
| <b>Teaching/ Learning Methodology</b>           | <p>During the lectures, students will come across the common concepts and theories in database security issues. Those concepts and theories would be explained with reference to real database systems such as Oracle and MySQL.</p> <p>Hands-on exercises in tutorial/laboratory will be included to allow students to explore and analyse practical problems and topics. Group project to solve database security problems will help students to integrate and apply what they have learnt.</p>  |  |

|   |  |  |                    |  |  |          |          |           |          |
|---|--|--|--------------------|--|--|----------|----------|-----------|----------|
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b>  | <b>Specific assessment methods/tasks</b>   |  | <b>% weighting</b> |  | <b>Intended subject learning outcomes to be assessed</b> |          |          |           |          |
|   |  |  |                    |  | <b>1</b>   | <b>2</b> | <b>3</b> | <b>4</b>  | <b>5</b> |
|   | <b>Continuous Assessment</b>   |  | <b>55%</b>         |  | ✓  | ✓        | ✓        | ✓         | ✓        |
|   | <b>Examination</b>   |  | <b>45%</b>         |  | ✓  | ✓        | ✓        | ✓         |          |
|   | Total  |  | 100%               |  |  |          |          |           |          |
| <p>Types of assessments include assignments, project, test and examination. Assignments are designed to reinforce the concepts and mechanisms learned in the lecture and laboratory, by solving bigger problems. Project is used to develop students' analytic and problem-solving skills by developing a practical database security policy. Test and examination are used to assess independent problem solving and critical thinking skills.</p> |  |  |                    |  |  |          |          |           |          |
| <b>Student Study Effort Expected</b>  | <b>Class contact:</b>  |  |                    |  |  |          |          |           |          |
|   | ▪ Lecture  |  |                    |  |  |          |          | 39 Hours  |          |
|   | <b>Other student study effort:</b>   |  |                    |  |  |          |          |           |          |
|   | ▪ Assignments, Projects, Self-study, Test and Exam Preparation   |  |                    |  |  |          |          | 66 Hours  |          |
|   | <b>Total student study effort</b>  |  |                    |  |  |          |          | 105 Hours |          |
| <b>Reading List and References</b>  | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Vinicius M. Grippa and Sergey Kuzmichev, <i>Learning MySQL</i> (2nd Edition), O'Reilly Media, Inc., 2021</li> <li>2. Ettore Galluccio, Edoardo Caselli, Gabriele Lombari, <i>SQL Injection Strategies</i>, 2020</li> <li>3. Afyouni, Hassan A., <i>Database Security and Auditing: Protecting Data Integrity and Accessibility</i>, Course Technology, ISBN 0619215593, 2006.</li> <li>4. Basta, Alfred and Zgola, Melissa, <i>Database Security</i>, Cengage Learning, ISBN 1435453905, 2011.</li> </ol> |  |                    |  |  |          |          |           |          |
| <b>Last Updated</b>   | Jun 2022   |  |                    |  |  |          |          |           |          |
| <b>Prepared by</b>  | COMP   |  |                    |  |  |          |          |           |          |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                             | COMP3421  |
| <b>Subject Title</b>                            | Web Application Design and Development  |
| <b>Credit Value</b>                             | 3   |
| <b>Level</b>                                    | 3   |
| <b>Pre-requisite / Co-requisite / Exclusion</b> | <b>Pre-requisite:</b> COMP1011  |
| <b>Objectives</b>                               | <p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. highlight the impact of Web in facilitating a truly distributed, wide area and highly accessible computing environment;</li> <li>2. equip students with the ability to analyse, design and implement techniques required to develop for the Web and Internet based business applications; and</li> <li>3. review state-of-the-art technologies such as distributed client/server computing paradigm, middleware concepts and architecture, web-based client/server computing technologies, XML, wireless and intelligent Internet computing.</li> </ol>   |
| <b>Intended Learning Outcomes</b>               | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. differentiate different components of distributed client/server on Web and Internet computing;</li> <li>2. utilise the specialised concepts of Web services and related technologies in various Web development tasks;</li> <li>3. show in-depth understanding of client-side as well as server programming with related Web development tools, such as Ajax and GoogleApps;</li> <li>4. design, develop and implement innovative interactive Web applications;</li> <li>5. differentiate different components of XML and its related standards and technologies;</li> <li>6. understand latest and future Web technology, including wireless and intelligent Internet computing;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>7. communicate effectively in project / system presentation and technical documents / reports;</li> <li>8. demonstrate independent learning skills and apply new knowledge to solve non-routine technical problems;</li> <li>9. accept responsibility and accountability for determining and achieving personal and group outcomes while exhibiting leadership in a project team; and</li> <li>10. demonstrate critical thinking and creative mind in applying different computing technologies to interactive Web applications.</li> </ol> |

| <b>Subject Synopsis/<br/>Indicative Syllabus</b>  | <table border="1"> <tr> <th colspan="11">Topic</th> </tr> <tr> <td colspan="11"> <b>1. Introduction to Distributed Client/Server Web and Internet Computing</b><br/> Client/server evolution and its relation to Internet computing; overview of Internet services including file servers, database servers, transaction servers, web servers; concepts of two-tier versus three-tier architectures; network infrastructure and support for Web computing. </td> </tr> <tr> <td colspan="11"> <b>2. Web-Based Client/Server Computing</b><br/> Revolution of Web as the intergalactic client/server Internet computing platform; web model. Web protocols and hypertext technology; HTTP data representation and response; interactive Web-based client/server; Web programming such as JavaScript, ASP, Java Servlets; Servlet, PHP, JSP and others. </td> </tr> <tr> <td colspan="11"> <b>3. Extensible Markup Language (XML)</b><br/> XML introduction: XML data modelling such as DTD and XML Schema; XML related standards, DOM and SAX; XML data management: Querying XML data, XML data storage, and related XML tools and API, such as Ajax and GoogleAPI. </td> </tr> <tr> <td colspan="11"> <b>4. Latest and Future Web Computing</b><br/> Recent advancement of Web technologies, Web 2.0 and Web 3.0; Introduction to wireless Internet; wireless Internet applications; intelligent Internet computing using agent technology. </td> </tr> </table> | Topic                             |             |   |          |                                       |          |                                   |                  |   |    |  | <b>1. Introduction to Distributed Client/Server Web and Internet Computing</b><br>Client/server evolution and its relation to Internet computing; overview of Internet services including file servers, database servers, transaction servers, web servers; concepts of two-tier versus three-tier architectures; network infrastructure and support for Web computing. |   |   |   |   |   |   |   |   |   |    | <b>2. Web-Based Client/Server Computing</b><br>Revolution of Web as the intergalactic client/server Internet computing platform; web model. Web protocols and hypertext technology; HTTP data representation and response; interactive Web-based client/server; Web programming such as JavaScript, ASP, Java Servlets; Servlet, PHP, JSP and others. |     |  |  |  |  |  |  |  |  |  | <b>3. Extensible Markup Language (XML)</b><br>XML introduction: XML data modelling such as DTD and XML Schema; XML related standards, DOM and SAX; XML data management: Querying XML data, XML data storage, and related XML tools and API, such as Ajax and GoogleAPI. |                                  |   |   |   |   |   |   |   |   |   | <b>4. Latest and Future Web Computing</b><br>Recent advancement of Web technologies, Web 2.0 and Web 3.0; Introduction to wireless Internet; wireless Internet applications; intelligent Internet computing using agent technology. |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
|---|--|-----------------------------------|-------------|---|----------|---------------------------------------|----------|-----------------------------------|------------------|---|----|--|---|---|---|---|---|---|---|---|---|---|----|---|-----|--|--|--|--|--|--|--|--|--|---|----------------------------------|---|---|---|---|---|---|---|---|---|---|--------------------|-----|---|---|--|--|--|---|--|---|--|--------------|-------|--|--|--|--|--|--|--|--|--|
| Topic   |  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>1. Introduction to Distributed Client/Server Web and Internet Computing</b><br>Client/server evolution and its relation to Internet computing; overview of Internet services including file servers, database servers, transaction servers, web servers; concepts of two-tier versus three-tier architectures; network infrastructure and support for Web computing. |  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>2. Web-Based Client/Server Computing</b><br>Revolution of Web as the intergalactic client/server Internet computing platform; web model. Web protocols and hypertext technology; HTTP data representation and response; interactive Web-based client/server; Web programming such as JavaScript, ASP, Java Servlets; Servlet, PHP, JSP and others.                   |  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>3. Extensible Markup Language (XML)</b><br>XML introduction: XML data modelling such as DTD and XML Schema; XML related standards, DOM and SAX; XML data management: Querying XML data, XML data storage, and related XML tools and API, such as Ajax and GoogleAPI.   |  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>4. Latest and Future Web Computing</b><br>Recent advancement of Web technologies, Web 2.0 and Web 3.0; Introduction to wireless Internet; wireless Internet applications; intelligent Internet computing using agent technology.   |  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Teaching/<br/>Learning Methodology</b>   | <p>This subject emphasises the design and technical aspects of web application development. It is intended to equip the student with knowledge and practical experience on how to complete a web-based application.</p> <p>The lectures will be used to deliver course material that will be practised/reinforced during the labs and tutorials.</p>   |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b>  | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="10">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td><b>Continuous Assessment</b></td> <td rowspan="2">55%</td> <td></td> </tr> <tr> <td>1. Assignments, Tests &amp; Projects</td> <td>✓</td> </tr> <tr> <td><b>Examination</b></td> <td>45%</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td><b>Total</b></td> <td>100 %</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed |          |                                       |          |                                   |                  |   |    |  |   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | <b>Continuous Assessment</b>  | 55% |  |  |  |  |  |  |  |  |  |   | 1. Assignments, Tests & Projects | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓   | <b>Examination</b> | 45% | ✓ | ✓ |  |  |  | ✓ |  | ✓ |  | <b>Total</b> | 100 % |  |  |  |  |  |  |  |  |  |
| Specific assessment methods/tasks   | % weighting  |                                   |             | Intended subject learning outcomes to be assessed |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
|   |  | 1                                 | 2           | 3   | 4        | 5                                     | 6        | 7                                 | 8                | 9 | 10 |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Continuous Assessment</b>  | 55%  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| 1. Assignments, Tests & Projects  |  | ✓                                 | ✓           | ✓   | ✓        | ✓                                     | ✓        | ✓                                 | ✓                | ✓ | ✓  |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Examination</b>  | 45%  | ✓                                 | ✓           |   |          |                                       | ✓        |                                   | ✓                |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Total</b>  | 100 %  |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Student Study Effort Expected</b>  | <p><b>Class contact:</b></p> <table border="1"> <tr> <td>▪ Lectures</td> <td>26 Hours</td> </tr> <tr> <td>▪ Tutorials/Lab</td> <td>13 Hours</td> </tr> </table> <p><b>Other student study effort:</b></p> <table border="1"> <tr> <td>▪ Assignments, Tests, Projects, Exams</td> <td>80 Hours</td> </tr> <tr> <td><b>Total student study effort</b></td> <td><b>119 Hours</b></td> </tr> </table>  | ▪ Lectures                        | 26 Hours    | ▪ Tutorials/Lab                                   | 13 Hours | ▪ Assignments, Tests, Projects, Exams | 80 Hours | <b>Total student study effort</b> | <b>119 Hours</b> |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| ▪ Lectures  | 26 Hours   |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| ▪ Tutorials/Lab   | 13 Hours   |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| ▪ Assignments, Tests, Projects, Exams   | 80 Hours   |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Total student study effort</b>   | <b>119 Hours</b>   |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |
| <b>Reading List and References</b>  | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Duckett, Jon, <i>Web Design with HTML, CSS, JavaScript and jQuery Set</i>, Wiley, 2014.</li> </ol>   |                                   |             |   |          |                                       |          |                                   |                  |   |    |  |   |   |   |   |   |   |   |   |   |   |    |   |     |  |  |  |  |  |  |  |  |  |   |                                  |   |   |   |   |   |   |   |   |   |   |                    |     |   |   |  |  |  |   |  |   |  |              |       |  |  |  |  |  |  |  |  |  |

|                     |   |
|---------------------|---|
|                     | <ol style="list-style-type: none"> <li>2. Myers, Mark, <i>A Smarter Way to Learn JavaScript: The new approach that uses technology to cut your effort in half</i>, Kindle Edition, 2013.</li> <li>3. Deitel, Paul J., <i>Internet &amp; World Wide Web: How to Program</i>, 4<sup>th</sup> Edition, Deitel &amp; Associates Inc., Prentice Hall, 2008.</li> <li>4. Godbole, Achyut S. and Kahate, Atul, <i>Web Technologies: TCP/IP Architecture, and Java Programming</i>, McGraw-Hill, 2009.</li> <li>5. Welling, Luke and Thomson, Laura, <i>PHP and MySQL Web Development</i>, Addison-Wesley, 2008.</li> <li>6. Steelman, Andrea and Murach, Joel, <i>Murach's Java Servlets and JSP</i>, Mike Murach &amp; Associates, 2010.</li> </ol> |
| <b>Last Updated</b> | Jun 2022  |
| <b>Prepared by</b>  | COMP  |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                             | COMP3512  |
| <b>Subject Title</b>                            | Legal Aspects, Professionalism and Ethics of Computing  |
| <b>Credit Value</b>                             | 3   |
| <b>Level</b>                                    | 3   |
| <b>Pre-requisite / Co-requisite / Exclusion</b> |   |
| <b>Objectives</b>                               | <p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. be fully aware of the basic set of legal, ethical and security responsibilities;</li> <li>2. introduce relevant professional bodies and be able to apply codes of conduct and ethical standards as a computing/IT practitioner; and</li> <li>3. be in a position to deal with ethical dilemmas and legal challenges that they can expect to face when they start work.</li> </ol>   |
| <b>Intended Learning Outcomes</b>               | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. demonstrate a basic understanding of professional issues, including contemporary legislation, and ethical considerations, from the viewpoint of computing/IT professionals;</li> <li>2. apply the conceptual tools provided in the course to develop analytical skills for determining what to do in ethical and legal decision-making;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>3. communicate effectively both verbally and in writing as a professional in computing/IT;</li> <li>4. develop the basic skills to work independently to solve routine problems; and</li> <li>5. think and reason critically, especially on different issues related to computing/IT professional in society.</li> </ol>  |
| <b>Subject Synopsis/ Indicative Syllabus</b>    | <p><b>Topic</b></p> <ol style="list-style-type: none"> <li><b>1. Introduction</b><br/>A brief account of the development of computing/IT industry; exploration of computing technologies whose impact is likely to grow in the near future.</li> <li><b>2. Computer Ethics and Profession</b><br/>Generic skills; typical scenarios of profession; characteristics of a profession; the system of professions; the computing profession; social issues.</li> <li><b>3. Professional Bodies and Codes of Ethics</b><br/>Role and functions of professional bodies; professional bodies for computing/IT practitioners; Impact of computing/IT professional bodies.</li> <li><b>4. Methods and Tools for Ethical Analysis</b><br/>Traditional/philosophical ethics; policy vacuum; social context; competing factors in decision making; practical approach/ analysis; sample cases.</li> <li><b>5. Computer Crimes and Laws</b><br/>Computer criminals; computer fraud; computer sabotage; computer forensics.</li> <li><b>6. Privacy</b><br/>Personal privacy; computer and privacy; relevant privacy acts.</li> <li><b>7. Software Ownership and Intellectual Property</b><br/>Ethical/legal issues of software; intellectual property; property rights; legal protection; philosophical basis; consequentialist argument.</li> <li><b>8. Security</b><br/>Fundamental concepts about security, Security at e-commerce, Security and legislation.</li> </ol> |

|  |   |                    |  |          |          |          |          |
|--|---|--------------------|--|----------|----------|----------|----------|
|  | <b>9. Entrepreneurship</b><br>Emerging technologies; entrepreneurship in computing profession; professional capabilities extended through virtual firms.  |                    |  |          |          |          |          |
| <b>Teaching/ Learning Methodology</b>                                  | This subject emphasises both ethical and legal aspects of computing/IT professional. It is intended to provide students with knowledge and practical experience on ethical, technological and legal issues related to computing. Lectures would cover the conceptual aspects. Guest lectures with external speakers provide students with knowledge from another perspective. Laboratory and tutorial sessions focus on the exercises to gain understanding both of what being a professional in computing involves and how they can most effectively deal with the challenges they will encounter.   |                    |  |          |          |          |          |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b> | <b>Specific assessment methods/tasks</b>  | <b>% weighting</b> | <b>Intended subject learning outcomes to be assessed</b> |          |          |          |          |
|  |   |                    | <b>1</b>   | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
|  | <b>Continuous Assessment</b>  | <b>100%</b>        |  |          |          |          |          |
|  | Assignment  |                    | ✓  | ✓        | ✓        | ✓        | ✓        |
|  | Tests   |                    | ✓  | ✓        |          | ✓        | ✓        |
|  | Projects  |                    | ✓  | ✓        | ✓        | ✓        | ✓        |
|  | Presentations   |                    | ✓  | ✓        | ✓        |          | ✓        |
|  | <b>Examination</b>  | <b>0%</b>          |  |          |          |          |          |
| Total  | 100%  |                    |  |          |          |          |          |
| <b>Student Study Effort Expected</b>                                   | <b>Class contact:</b>   |                    |  |          |          |          |          |
|  | ▪ Lectures  | 39 Hours           |  |          |          |          |          |
|  | ▪ Tutorials/Lab   | 0 Hours            |  |          |          |          |          |
|  | <b>Other student study effort:</b>  |                    |  |          |          |          |          |
|  | ▪ Assignments, Quizzes, Projects, and Tests   | 66 Hours           |  |          |          |          |          |
|  | <b>Total student study effort</b>   | <b>105 Hours</b>   |  |          |          |          |          |
| <b>Reading List and References</b>                                     | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>Herman T. Tavani, <i>Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing</i>, 3<sup>rd</sup> Edition, Wiley, Hoboken, N.J., 2011.</li> <li>Deborah G. Johnson and Keith W. Miller, <i>Computer Ethics: Analyzing Information Technology</i>, 4<sup>th</sup> Edition, Prentice Hall, Upper Saddle River, N.J, 2009.</li> <li>Tobias Kollmann, Andreas Kuckertz, Christoph Stöckmann (2010) <i>E-Entrepreneurship and ICT Ventures: Strategy, Organization and Technology</i>, Hershey, PA: Business Science Reference. 2010.</li> <li>Thomas N. Duening, Robert D. Hisrich, Michael A. Lechter, <i>Technology Entrepreneurship: Creating, Capturing, and Protecting Value</i>, Academic Press, Burlington, MA, 2010.</li> <li>D. G. Johnson, <i>Computer Ethics</i>, 4<sup>th</sup> Edition, Prentice Hall, 2009.</li> <li>M. J. Quinn, <i>Ethics for the Information Age</i>, Addison Wesley, 2013.</li> </ol> |                    |  |          |          |          |          |
| <b>Last Updated</b>  | Jun 2022  |                    |  |          |          |          |          |
| <b>Prepared by</b>   | COMP  |                    |  |          |          |          |          |

### Subject Description Form

|  |   |
|--|---|
| <b>Subject Code</b>                            | EIE3117   |
| <b>Subject Title</b>                           | Integrated Project  |
| <b>Credit Value</b>                            | 3   |
| <b>Level</b>                                   | 3   |
| <b>Pre-requisite / Co-requisite/ Exclusion</b> | Nil   |
| <b>Objectives</b>                              | At a mid-stage of the programme, this subject plays the role of applying knowledge acquired in other subjects in an integrated manner. While the emphasis will be placed on the technical challenges that may encompass system integration, software development and troubleshooting, students will also be given opportunities to face various non-technical difficulties behind the development of information security systems.  |
| <b>Intended Subject Learning Outcomes</b>      | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Design effective and reliable software programs to achieve the objectives of a project</li> <li>2. Critically evaluate the different alternatives and strategies when implementing a project</li> <li>3. Locate and resolve problems in an information security system and the related software</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Search, self-learn and try untaught solutions</li> <li>5. Effectively use the limited resource and exercise discipline and time-planning to meet deadlines</li> <li>6. Present ideas and findings effectively</li> </ol>   |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <p><b>Syllabus:</b></p> <p>The project(s) shall be of software development in nature with defined milestones (or <b>Subtasks</b>). The scope to be covered will include information security system design. The project will not be close-ended in nature and will provide ample headroom for the more enthusiastic students to excel. Each <b>Subtask</b> will be given a certain period of time to complete. Progress will be measured by functional <b>Demonstrations</b>, and one or two written <b>Progress Reports</b>. Upon the completion of the project, each student will give a demonstration/presentation of the completed system and submit a <b>Final Report</b>. Students are required to individually keep an electronic <b>Logbook</b> on the work performed during the entire period. The logbooks are to be evaluated by the supervisor /assessor. At the end of the project, the logbooks will be collected and graded.</p> <p><b>Lectures:</b></p> <p>Lectures are to be conducted at the beginning of the semester. During these lectures, the instructor shall give clear explanation on the functional and technical requirements, with a schedule for submitting deliverables. Concepts specific to the project(s), which are not yet learnt by the students, are to be covered in these lectures. Concepts behind critical use of tools and equipment will also be strengthened. Copies of supplementary/reference material will be distributed, or, links to on-line material will be provided for self-paced learning.</p> <p><b>Guided Laboratory Experiments:</b></p> |

The project will normally require the students to learn to use specific tools and/or equipment. Laboratory demonstrations and exercises will be arranged in the early weeks. Below are some examples:

1. Use of project-specific development tools, software and hardware.
2. Implementation of the basic framework of the project.
3. Software techniques to optimize the performance of the system.

**Self-Paced Work:**

Multiple sessions of laboratory will be scheduled to cater for self-paced work in the laboratory, particularly during the second half of the semester. To ensure the students are working in a correct direction, defined milestones are given in the course of their work. Students are required to demonstrate their works at each milestone to show their progress.

|                                      |                                     |  |   |
|--------------------------------------|-------------------------------------|--|---|
| <b>Teaching/Learning Methodology</b> | <b>Teaching and Learning Method</b> | <b>Intended Subject Learning Outcome</b> | <b>Remarks</b>  |
|                                      | Lectures                            | 1, 2, 3                                  | Principles and key concepts of the information security platform used in the project are explained to students. Uses of tools are demonstrated.<br><br>The goals are specified. Various problems to be encountered are explained. |
|                                      | Supervised Laboratory Sessions      | 1, 2, 3                                  | Students need to learn to use the provided software modules and expand them to accommodate new functionalities.   |
|                                      | Extended self-paced laboratory work | 1, 2, 3, 4, 5, 6                         | Students will work to construct an information security system. They need to learn to use the provided software modules and expand them to accommodate new functionalities.   |

|  |  |                    |   |          |          |          |          |          |
|--|--|--------------------|---|----------|----------|----------|----------|----------|
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b> | <b>Specific Assessment Methods/Tasks</b> | <b>% Weighting</b> | <b>Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</b> |          |          |          |          |          |
|  |  |                    | <b>1</b>  | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> |
|  | 1. Continuous Assessment                 | 100%               |   |          |          |          |          |          |
|  | • Lab reports                            |                    | ✓   | ✓        | ✓        |          |          |          |
|  | • Log book and reports                   |                    | ✓   | ✓        | ✓        | ✓        | ✓        | ✓        |
|  | • Progress and final demonstrations      |                    | ✓   | ✓        | ✓        | ✓        | ✓        | ✓        |
| Total  | 100%                                     |                    |   |          |          |          |          |          |

Assessment on individual student's ability and contribution will be conducted, according to the attributes detailed below.

INSIGHT as evidenced by how well the concepts are understood  
 CREATIVITY as evidenced by ingenuity and imagination  
 WORKMANSHIP as evidenced by how well ideas are implemented and how problems are resolved  
 DRIVE as evidenced by initiative, diligence and tenacity  
 COMMUNICATION as evidenced by an ability to express ideas clearly and succinctly  
 MANAGEMENT as evidenced by how time, manpower and other resources are effectively used

At the completion of each subtask, the student will be asked to give a demonstration to the assessor. Based on the presentation and response to questions addressed to the members, the assessor will rate the contribution, achievement, and performance of each member. Other assessment items include lab reports, logbook, progress report, final demonstration, report and presentation.

**Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:**

| Specific Assessment Methods/Tasks | Remark   |
|-----------------------------------|--|
| Lab reports                       | To measure the students' understanding of the theories and concepts as well as some practical issues in their subject materials  |
| Progress and final demonstrations | Students need to think critically and creatively in order to come up with good alternate solution for an existing problem.<br><br>Oral examination on the approach taken will be conducted for each student to evaluate his contribution, technical knowledge and communication skills.  |
| Log book and reports              | Each student is required to produce one or two progress reports and a final report. Accuracy and the presentation of the reports will be assessed. Each student needs to explain in the reports the solutions they plan to use or have been used in the project. The reason behind of choosing such solutions should also be exemplified. The students also need to explain how the limited resources are used in the project. Logbooks are assessed to evaluate contributions and the quality of records on the progress. |

|                                      |  |                  |
|--------------------------------------|--|------------------|
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>  |                  |
|                                      | • Lecture  | 12 Hours         |
|                                      | • Laboratory   | 12 Hours         |
|                                      | • Mini-project / Meetings / Presentation   | 15 Hours         |
|                                      | <b>Other student study effort:</b>   |                  |
|                                      | • Revision   | 12 Hours         |
|                                      | • Additional laboratory work   | 12 Hours         |
|                                      | • Mini-project work / presentation / report writing                                  | 42 Hours         |
|                                      | <b>Total student study effort:</b>   | <b>105 Hours</b> |
| <b>Reading List and References</b>   | <b>Reference Books:</b><br>To be specified by the subject lecturer for each project. |                  |
| <b>Last Updated</b>                  | July 2020  |                  |
| <b>Prepared by</b>                   | Dr. Haibo Hu   |                  |

### Subject Description Form

|  |  |
|--|--|
| <b>Subject Code</b>                              | EIE3120  |
| <b>Subject Title</b>                             | Network Technologies and Security  |
| <b>Credit Value</b>                              | 3  |
| <b>Level</b>                                     | 3  |
| <b>Pre-requisite</b>                             | The students are expected to possess basic knowledge about network protocols (Ethernet and TCP/IP) and cryptography (public-key and private-key encryption, hash function, digital signature).   |
| <b>Co-requisite/<br/>Exclusion</b>               | Nil  |
| <b>Objectives</b>                                | This subject teaches students the features and technologies about public and private telecommunication and data networks for the provision of security services of confidentiality, integrity, availability, and authentication.   |
| <b>Intended Subject Learning Outcomes</b>        | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Describe common security issues arising from the use of telecommunication and data networks for the transmission of information</li> <li>2. Describe methods for dealing with security issues as described in (1)</li> <li>3. Identify and solve network security problems by applying knowledge learnt and by using appropriate tools and techniques</li> <li>4. Communicate effectively and understand the importance of life-learning as well as continual professional development</li> </ol>   |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b> | <p><b>Syllabus:</b></p> <p><b>Fundamentals:</b></p> <ol style="list-style-type: none"> <li>1. Basic network technologies and components: Internet, Ethernet, VPN, hub, switch, router, network layer protocols (IP, ICMP, DHCP, NAT), transport layer protocols (TCP, UDP)</li> <li>2. The network security model, services, mechanisms, and threats: authentication, key exchange, access control, data confidentiality, data integrity, availability, eavesdropping, DOS (denial-of-service), application layer security</li> </ol> <p><b>Applications:</b></p> <ol style="list-style-type: none"> <li>3. Authentication and Key Distribution for protected communication: Kerberos, X.509, Public Key Infrastructure, Certification Authority</li> <li>4. Firewalls: packet filtering, application-level gateway, encrypted tunnels</li> <li>5. Internet Protocol Security: ESP and IKE</li> <li>6. Transport layer security: Secure Sockets Layer (SSL) and Transport Layer Security (TLS), SSH</li> </ol> |

|   |   |   |   |  |          |                  |          |
|---|---|---|---|--|----------|------------------|----------|
| <b>Teaching/Learning Methodology</b>  | <b>Assessment Method</b>  | <b>Intended Subject Learning Outcomes</b> | <b>Descriptions/Remarks</b>   |  |          |                  |          |
|   | Lectures  | 1, 2, 4                                   | Lectures will be used as the main instruction mechanism, to be supplemented with interactive discussion, multimedia (video, edX, website information), and presentation materials.  |  |          |                  |          |
|   | Tutorials/Practical Works   | 1, 2, 3, 4                                | The tutorials require students to apply learned knowledge in different scenarios.   |  |          |                  |          |
|   | Laboratory  | 2,3                                       | Students are required to identify and solve network security problems by applying knowledge learnt and by using appropriate tools and techniques.   |  |          |                  |          |
|   | Case Study Project  | 1, 2, 3, 4                                | Students are required to set up the company network and describe the common security issues arising from SME and data networks. They need to identify and solve the network security problems by applying knowledge learnt and using appropriate tools and techniques in the demonstration. |  |          |                  |          |
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b>            | <b>Specific Assessment Methods/Tasks</b>  |   | <b>% Weighting</b>  | <b>Intended Subject Learning Outcomes to be Assessed</b> |          |                  |          |
|   |   |   |   | <b>1</b>   | <b>2</b> | <b>3</b>         | <b>4</b> |
|   | 1. Continuous Assessment  |   | 50%   |  |          |                  |          |
|   | • Project   |   | 20%   | √  | √        | √                | √        |
|   | • Laboratory  |   | 12%   |  | √        | √                |          |
|   | • Assignments   |   | 8%  | √  | √        | √                | √        |
|   | • Test  |   | 10%   | √  | √        |                  | √        |
|   | 2. Examination  |   | 50%   | √  | √        | √                | √        |
|   | Total   |   | 100%  |  |          |                  |          |
| <b>The continuous assessment consists of laboratory reports, project report and test.</b> |   |   |   |  |          |                  |          |
| <b>Student Study Effort Expected</b>  | <b>Class contact (time-tabled):</b>   |   |   |  |          |                  |          |
|   | • Lecture   |   |   |  |          | 21 Hours         |          |
|   | • Tutorial/Laboratory/Practice Classes  |   |   |  |          | 18 Hours         |          |
|   | <b>Other student study effort:</b>  |   |   |  |          |                  |          |
|   | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination |   |   |  |          | 30 Hours         |          |
|   | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing     |   |   |  |          | 36 Hours         |          |
|   | <b>Total student study effort:</b>  |   |   |  |          | <b>105 Hours</b> |          |

|                                    |  |
|------------------------------------|--|
| <b>Reading List and References</b> | <p><b>Reference Books:</b></p> <p>A set of comprehensive lecture notes will be provided to students for the study of this subject, together with tutorial worksheets and laboratory hand-outs. Students may refer to the following suggested reading lists for a more in-depth and extensive discussion of topics covered and end-of-chapter problem sets (when applicable):</p> <ol style="list-style-type: none"> <li>1. Stewart, J., &amp; Kinsey, D., <i>Network security, firewalls, and VPNs (Third ed., Jones &amp; Bartlett Learning information systems security &amp; assurance series)</i>. Burlington, MA: Jones and Bartlett Learning, ISBN: 9781284183696, c2021.</li> <li>2. Fiedelholz, <i>The Cyber Security Network Guide (Vol. 274, Studies in Systems, Decision and Control)</i>. Cham: Springer International Publishing AG, (online access from PolyU Library), ISBN: 3030615901, ISBN: 9783030615901, c2020.</li> <li>3. Stallings, W., <i>Cryptography and network security: Principles and Practice (Seventh ed.)</i>. Hoboken, New Jersey: Pearson, c2017. ISBN: 0134444280.</li> <li>4. Stallings, William, Upper Saddle River, <i>Network security essentials: applications and standards</i>, 5<sup>th</sup> ed., N.J.: Pearson Education, c2014.</li> <li>5. Jacobs, Stuart, Books24x7. ; Wiley (DDA)_d., Hoboken, N.J. : John Wiley &amp; Sons; Piscataway, <i>Security management of next generation telecommunications networks and services</i>, NJ: IEEE Press, c2014.</li> </ol> <p><b>Classics reading materials:</b></p> <ol style="list-style-type: none"> <li>6. <i>ITU-T Recommendation X.800 Data Communication Networks: Open System Interconnection (OSI); Security, Structure and Applications</i>, ITU-T CCITT, Geneva, 1991 (PDF version available from <a href="http://www.itu.int/rec/T-REC-X.800-199103-I/e">http://www.itu.int/rec/T-REC-X.800-199103-I/e</a>)</li> <li>7. "Communication theory of secrecy systems" in <i>Claude Elwood Shannon: collected papers</i>, Shannon, Claude Elwood, 1916-2001, New York: Institute of Electrical and Electronics Engineers, c1993., PolyU Lib. Acc. No.: TK5101 .S448 1993, (p.84-143)</li> </ol> |
| <b>Last Updated</b>                | July 2023  |
| <b>Prepared by</b>                 | Prof. Hu Haibo and Dr Lawrence Cheung  |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                                   | EIE3333   |
| <b>Subject Title</b>                                  | Data and Computer Communications  |
| <b>Credit Value</b>                                   | 3   |
| <b>Level</b>  | 3   |
| <b>Pre-requisite/<br/>Co-requisite/<br/>Exclusion</b> | Nil   |
| <b>Objectives</b>                                     | <ol style="list-style-type: none"> <li>1. To provide solid foundation to students about the architectures and operations of communication networks.</li> <li>2. To enable students to master the knowledge about computer networking in the context of real-life applications.</li> <li>3. To prepare students to learn and to critically evaluate new knowledge and emerging technology in communication networks.</li> </ol>  |
| <b>Intended Subject Learning Outcomes</b>             | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand the services, functions, and inter-relationship of different layers in communication network models</li> <li>2. Describe how components in different layers inter-operate and analyze their performance.</li> <li>3. Understand and apply the principles and practices of communication networks.</li> <li>4. Learn new techniques and to align new technologies to existing network infrastructure.</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>5. Present ideas and findings effectively.</li> <li>6. Learn independently.</li> </ol>  |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b>      | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Computer Networks, Services, and Layered Architectures</u><br/>Evolution of networking and switching technology. Protocol and services. Layered network architectures: OSI 7-layer model, TCP/IP architecture.</li> <li>2. <u>Digital Transmission and Protocols in Data Link Layer</u><br/>Line coding techniques, error detection and correction. Automatic Repeat Request (ARQ) protocol and reliable data transfer service. Sliding-window flow control. Framing and point-to-point protocol, flow control and error controls. High level data link control (HDLC) protocol and point-to-point protocol (PPP).</li> <li>3. <u>Local Area Networks (LANs) and Wireless LANs</u><br/>Media Access Control (MAC) protocols: the IEEE802.3 Ethernet and IEEE802.11 wireless LAN standards. Interconnection of LANs: bridge, switch, and virtual LAN.</li> <li>4. <u>Network Layer Protocols</u><br/>Network layer operations, connection oriented and connectionless services. Internet protocol (IP): IP datagram format, IP addressing, subnetting, IP routing and router operations. Internet control message protocol (ICMP), dynamic host configuration protocol (DHCP), network address translation (NAT).</li> <li>5. <u>Transport Layer Protocols</u></li> </ol> |

|  | <p>Transmission control protocol (TCP) and user datagram protocol (UDP)</p> <p><b>Possible Laboratory Experiments:</b></p> <ol style="list-style-type: none"> <li>1. Cisco router configuration and programming.</li> <li>2. Static and Dynamic routing.</li> <li>3. Network monitoring and analysis</li> <li>4. Address resolution, ARP, IP, and TCP.</li> </ol>  |  |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
|--|--|--|---|---|---|---|---|-----------------------------------|-----------------------------------|--|--|--|--|--|--|----------|------------|---|---|---|---|--------------------------|-----|-----------|---------------|--|--|--|--|-----------------|-----|---------------------|---------|---|---|---|--|--------------------|-----|---|---|---|---|---|--|---------------|----|---|---|---|---|---|--|----------------|-----|--|--|---|--|---|---|----------------|-----|---|---|---|---|---|--|-------|------|--|--|--|--|--|--|
| <p><b>Teaching/ Learning Methodology</b></p>                                 | <table border="1"> <thead> <tr> <th>Teaching and Learning Method</th> <th>Intended Subject Learning Outcome</th> <th colspan="6">Remarks</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>1, 2, 3, 4</td> <td colspan="6">Fundamental principles and key concepts of the subject are delivered to students.</td> </tr> <tr> <td>Tutorials</td> <td>1, 2, 3, 4, 5</td> <td colspan="6">Supplementary to lectures. Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br/>Problems and application examples are given and discussed.</td> </tr> <tr> <td>Laboratory sessions</td> <td>3, 5, 6</td> <td colspan="6">Students will conduct practical exercises to reinforce concepts and techniques learned.</td> </tr> </tbody> </table>   |  |   |   |   |   |   | Teaching and Learning Method      | Intended Subject Learning Outcome | Remarks  |  |  |  |  |  | Lectures | 1, 2, 3, 4 | Fundamental principles and key concepts of the subject are delivered to students. |   |   |   |                          |     | Tutorials | 1, 2, 3, 4, 5 | Supplementary to lectures. Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br>Problems and application examples are given and discussed. |  |  |  |                 |     | Laboratory sessions | 3, 5, 6 | Students will conduct practical exercises to reinforce concepts and techniques learned. |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| Teaching and Learning Method   | Intended Subject Learning Outcome  | Remarks  |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| Lectures   | 1, 2, 3, 4   | Fundamental principles and key concepts of the subject are delivered to students.  |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| Tutorials  | 1, 2, 3, 4, 5  | Supplementary to lectures. Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br>Problems and application examples are given and discussed. |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| Laboratory sessions  | 3, 5, 6  | Students will conduct practical exercises to reinforce concepts and techniques learned.  |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| <p><b>Alignment of Assessment and Intended Subject Learning Outcomes</b></p> | <table border="1"> <thead> <tr> <th rowspan="2">Specific Assessment Methods/ Task</th> <th rowspan="2">% Weighting</th> <th colspan="6">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td>50%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>• Mid-Term Test</td> <td>15%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>• End-of-Term Test</td> <td>15%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>• Assignments</td> <td>8%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>• Laboratories</td> <td>12%</td> <td></td> <td></td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Examination</td> <td>50%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> |  |   |   |   |   |   | Specific Assessment Methods/ Task | % Weighting                       | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |  |  |  |  |  | 1        | 2          | 3   | 4 | 5 | 6 | 1. Continuous Assessment | 50% |           |               |  |  |  |  | • Mid-Term Test | 15% | ✓                   | ✓       | ✓   | ✓ | ✓ |  | • End-of-Term Test | 15% | ✓ | ✓ | ✓ | ✓ | ✓ |  | • Assignments | 8% | ✓ | ✓ | ✓ | ✓ | ✓ |  | • Laboratories | 12% |  |  | ✓ |  | ✓ | ✓ | 2. Examination | 50% | ✓ | ✓ | ✓ | ✓ | ✓ |  | Total | 100% |  |  |  |  |  |  |
| Specific Assessment Methods/ Task  | % Weighting  | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)   |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
|  |  | 1  | 2 | 3 | 4 | 5 | 6 |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| 1. Continuous Assessment   | 50%  |  |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| • Mid-Term Test  | 15%  | ✓  | ✓ | ✓ | ✓ | ✓ |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| • End-of-Term Test   | 15%  | ✓  | ✓ | ✓ | ✓ | ✓ |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| • Assignments  | 8%   | ✓  | ✓ | ✓ | ✓ | ✓ |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| • Laboratories   | 12%  |  |   | ✓ |   | ✓ | ✓ |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| 2. Examination   | 50%  | ✓  | ✓ | ✓ | ✓ | ✓ |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |
| Total  | 100%   |  |   |   |   |   |   |                                   |                                   |  |  |  |  |  |  |          |            |   |   |   |   |                          |     |           |               |  |  |  |  |                 |     |                     |         |   |   |   |  |                    |     |   |   |   |   |   |  |               |    |   |   |   |   |   |  |                |     |  |  |   |  |   |   |                |     |   |   |   |   |   |  |       |      |  |  |  |  |  |  |

|                                      | <p><b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b></p> <table border="1"> <thead> <tr> <th>Specific Assessment Methods/ Tasks</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>Assignments, Tests and examination</td> <td> <p>These can measure the students' understanding of the theories and the concepts of the subject. End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;</p> <p>Assignments of reading report type to assess students' ability in acquiring new knowledge related to communication networks;</p> <p>Students need to think critically and creatively in order to come with an alternate solution for an existing problem.</p> </td> </tr> <tr> <td>Laboratory sessions</td> <td> <p>Each group of students is required to complete work-sheets, to indicate their understanding and correct completion of the laboratories.</p> <p>Accuracy and the presentation of the work-sheets will be assessed;</p> </td> </tr> </tbody> </table> |                  | Specific Assessment Methods/ Tasks | Remark | Assignments, Tests and examination | <p>These can measure the students' understanding of the theories and the concepts of the subject. End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;</p> <p>Assignments of reading report type to assess students' ability in acquiring new knowledge related to communication networks;</p> <p>Students need to think critically and creatively in order to come with an alternate solution for an existing problem.</p> | Laboratory sessions | <p>Each group of students is required to complete work-sheets, to indicate their understanding and correct completion of the laboratories.</p> <p>Accuracy and the presentation of the work-sheets will be assessed;</p> |
|--------------------------------------|--|------------------|------------------------------------|--------|------------------------------------|---|---------------------|--|
| Specific Assessment Methods/ Tasks   | Remark   |                  |                                    |        |                                    |   |                     |  |
| Assignments, Tests and examination   | <p>These can measure the students' understanding of the theories and the concepts of the subject. End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;</p> <p>Assignments of reading report type to assess students' ability in acquiring new knowledge related to communication networks;</p> <p>Students need to think critically and creatively in order to come with an alternate solution for an existing problem.</p>  |                  |                                    |        |                                    |   |                     |  |
| Laboratory sessions                  | <p>Each group of students is required to complete work-sheets, to indicate their understanding and correct completion of the laboratories.</p> <p>Accuracy and the presentation of the work-sheets will be assessed;</p>   |                  |                                    |        |                                    |   |                     |  |
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>  |                  |                                    |        |                                    |   |                     |  |
|                                      | • Lecture  | 24 Hours         |                                    |        |                                    |   |                     |  |
|                                      | • Tutorial/Laboratory/Practice Classes   | 15 hours         |                                    |        |                                    |   |                     |  |
|                                      | <b>Other student study effort:</b>   |                  |                                    |        |                                    |   |                     |  |
|                                      | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination  | 36 Hours         |                                    |        |                                    |   |                     |  |
|                                      | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing  | 30 Hours         |                                    |        |                                    |   |                     |  |
|                                      | <b>Total student study effort:</b>   | <b>105 Hours</b> |                                    |        |                                    |   |                     |  |
| <b>Reading List and References</b>   | <p><b>Textbook :</b></p> <p>1. Behrouz A. Forouzan, <i>Data Communications &amp; Networking</i>, 5<sup>th</sup> ed., McGraw-Hill, 2012.</p> <p><b>Reference Books:</b></p> <p>1. Behrouz A. Forouzan, <i>Computer Networks: A Top-Down Approach</i>, McGraw-Hill, 2012.</p> <p>2. William Stallings, <i>Data and Computer Communications</i>, 9<sup>th</sup> ed., Pearson/Prentice-Hall, 2012.</p> <p>3. Douglas Comer, <i>Computer Networks and Internets</i>, 5<sup>th</sup> ed., Pearson/Prentice-Hall, 2009.</p>   |                  |                                    |        |                                    |   |                     |  |
| <b>Last Updated</b>                  | July 2020  |                  |                                    |        |                                    |   |                     |  |
| <b>Prepared by</b>                   | Dr K.T. Lo   |                  |                                    |        |                                    |   |                     |  |

### Subject Description Form

|  |  |
|--|--|
| <b>Subject Code</b>                              | EIE3343  |
| <b>Subject Title</b>                             | Computer Systems Principles  |
| <b>Credit Value</b>                              | 3  |
| <b>Level</b>                                     | 3  |
| <b>Pre-requisite</b>                             | EIE2105 Digital and Computer Systems   |
| <b>Co-requisite/<br/>Exclusion</b>               | Nil  |
| <b>Objectives</b>                                | This subject provides students with a broad treatment of the fundamentals of computer operating systems and the related system programming techniques.   |
| <b>Intended Subject Learning Outcomes</b>        | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand the basic structure of a computer operating system.</li> <li>2. Comprehend the basic concepts of file system and management, process control, scheduling and communication, as well as memory management.</li> <li>3. Develop software programs to implement the abovementioned system functions.</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Understand the creative process when designing solutions to a problem.</li> </ol>  |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b> | <p><b>Syllabus:</b></p> <ul style="list-style-type: none"> <li>• <u>Operating System Overview</u><br/>OS objectives and functions<br/>Modern operating systems<br/>Microsoft windows overview<br/>UNIX and LINUX</li> <li>• <u>File System and Management</u><br/>File organization and access<br/>File directories<br/>File sharing<br/>Secondary storage management<br/>System programming for file, directory and I/O access</li> <li>• <u>Process Description and Control</u><br/>Definition of process<br/>Process description<br/>Process control<br/>Process communication<br/>System programming for process control and communication</li> <li>• <u>Threads and Scheduling</u><br/>Processes and threads<br/>Thread management and scheduling<br/>Thread synchronization<br/>System programming for thread management</li> <li>• <u>Memory Management</u><br/>Memory management requirement<br/>Memory partitioning<br/>Paging</li> </ul> |

|   | <p>Segmentation<br/>Dynamic Link Library (DLL)<br/>System programming for memory management</p> <ul style="list-style-type: none"> <li>• <u>Processor Scheduling</u><br/>Types of processor scheduling<br/>Scheduling algorithms<br/>Multiprocessor scheduling<br/>Case study</li> </ul>  |   |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
|---|---|---|---|---|-----------------------------------|-----------------------------------|--|--|--|--|----------|---------|---|---|--------------------------|-----|-----------|---------|---|--|-----------------------|-----|---------------------|------------|--|---|---------|-----|-------------|---------|---|--|-----------------|-----|---|---|---|--|----------------|-----|---|---|---|--|-------|------|--|--|--|--|
| <p><b>Teaching/ Learning Methodology</b></p>  | <table border="1"> <thead> <tr> <th>Teaching and Learning Method</th> <th>Intended Subject Learning Outcome</th> <th colspan="4">Remarks</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>1, 2, 3</td> <td colspan="4">Fundamental principles and key concepts of the subject are delivered to students.</td> </tr> <tr> <td>Tutorials</td> <td>1, 2, 3</td> <td colspan="4">Supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed.</td> </tr> <tr> <td>Laboratory sessions</td> <td>1, 2, 3, 4</td> <td colspan="4">Students will make use of software tools to develop system programs in order to resolve different system problems.</td> </tr> <tr> <td>Assignments</td> <td>1, 2, 3</td> <td colspan="4">Through working assignment and end-of-chapter problems in text books, students will develop a firm understanding and comprehension of the knowledge taught.</td> </tr> </tbody> </table>   |   |   |   | Teaching and Learning Method      | Intended Subject Learning Outcome | Remarks  |  |  |  | Lectures | 1, 2, 3 | Fundamental principles and key concepts of the subject are delivered to students. |   |                          |     | Tutorials | 1, 2, 3 | Supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed. |  |                       |     | Laboratory sessions | 1, 2, 3, 4 | Students will make use of software tools to develop system programs in order to resolve different system problems. |   |         |     | Assignments | 1, 2, 3 | Through working assignment and end-of-chapter problems in text books, students will develop a firm understanding and comprehension of the knowledge taught. |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| Teaching and Learning Method  | Intended Subject Learning Outcome   | Remarks   |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| Lectures  | 1, 2, 3   | Fundamental principles and key concepts of the subject are delivered to students.   |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| Tutorials   | 1, 2, 3   | Supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed. |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| Laboratory sessions   | 1, 2, 3, 4  | Students will make use of software tools to develop system programs in order to resolve different system problems.  |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| Assignments   | 1, 2, 3   | Through working assignment and end-of-chapter problems in text books, students will develop a firm understanding and comprehension of the knowledge taught.   |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| <p><b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b></p> | <table border="1"> <thead> <tr> <th rowspan="2">Specific Assessment Methods/ Task</th> <th rowspan="2">% Weighting</th> <th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td>50%</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>• Laboratory sessions</td> <td>10%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>• Tests</td> <td>25%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>• Assignment(s)</td> <td>15%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>2. Examination</td> <td>50%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> |   |   |   | Specific Assessment Methods/ Task | % Weighting                       | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |  |  |  | 1        | 2       | 3   | 4 | 1. Continuous Assessment | 50% |           |         |   |  | • Laboratory sessions | 10% | ✓                   | ✓          | ✓  | ✓ | • Tests | 25% | ✓           | ✓       | ✓   |  | • Assignment(s) | 15% | ✓ | ✓ | ✓ |  | 2. Examination | 50% | ✓ | ✓ | ✓ |  | Total | 100% |  |  |  |  |
| Specific Assessment Methods/ Task   | % Weighting   | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)  |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
|   |   | 1   | 2 | 3 | 4                                 |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| 1. Continuous Assessment  | 50%   |   |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| • Laboratory sessions   | 10%   | ✓   | ✓ | ✓ | ✓                                 |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| • Tests   | 25%   | ✓   | ✓ | ✓ |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| • Assignment(s)   | 15%   | ✓   | ✓ | ✓ |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| 2. Examination  | 50%   | ✓   | ✓ | ✓ |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |
| Total   | 100%  |   |   |   |                                   |                                   |  |  |  |  |          |         |   |   |                          |     |           |         |   |  |                       |     |                     |            |  |   |         |     |             |         |   |  |                 |     |   |   |   |  |                |     |   |   |   |  |       |      |  |  |  |  |

|                                      | <p><b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b></p> <table border="1"> <thead> <tr> <th>Specific Assessment Methods/Tasks</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>Assignments, tests and examination</td> <td>End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;</td> </tr> <tr> <td>Laboratory sessions</td> <td>Each student is required to answer several questions related to each lab session in the lab sheet and hand in his/her answers. Students need to think critically and creatively in order to come with an alternate solution for an existing problem.</td> </tr> </tbody> </table> |                  | Specific Assessment Methods/Tasks | Remark | Assignments, tests and examination | End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; | Laboratory sessions | Each student is required to answer several questions related to each lab session in the lab sheet and hand in his/her answers. Students need to think critically and creatively in order to come with an alternate solution for an existing problem. |
|--------------------------------------|--|------------------|-----------------------------------|--------|------------------------------------|--|---------------------|--|
| Specific Assessment Methods/Tasks    | Remark   |                  |                                   |        |                                    |  |                     |  |
| Assignments, tests and examination   | End-of-chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;   |                  |                                   |        |                                    |  |                     |  |
| Laboratory sessions                  | Each student is required to answer several questions related to each lab session in the lab sheet and hand in his/her answers. Students need to think critically and creatively in order to come with an alternate solution for an existing problem.   |                  |                                   |        |                                    |  |                     |  |
| <b>Student Study Effort Required</b> | <b>Class contact (time-tabled):</b>  |                  |                                   |        |                                    |  |                     |  |
|                                      | • Lecture  | 24 Hours         |                                   |        |                                    |  |                     |  |
|                                      | • Tutorial/Laboratory/Practice Classes   | 15 Hours         |                                   |        |                                    |  |                     |  |
|                                      | <b>Other student study effort:</b>   |                  |                                   |        |                                    |  |                     |  |
|                                      | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination  | 36 Hours         |                                   |        |                                    |  |                     |  |
|                                      | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or report writing   | 30 Hours         |                                   |        |                                    |  |                     |  |
|                                      | <b>Total student study effort:</b>   | <b>105 Hours</b> |                                   |        |                                    |  |                     |  |
| <b>Reading List and References</b>   | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. J. Hart, <i>Windows System Programming</i>, 4<sup>th</sup> ed., Addison-Wesley, 2010.</li> <li>2. W. Stallings, <i>Operating Systems: Internals and Design Principles</i>, 7<sup>th</sup> ed., Prentice-Hall, 2011.</li> <li>3. H.M. Deital, P.J. Deital, and D.R. Choffnes, <i>Operating Systems</i>, 3<sup>rd</sup> ed., Prentice-Hall, 2004.</li> </ol>  |                  |                                   |        |                                    |  |                     |  |
| <b>Last Updated</b>                  | June 2023  |                  |                                   |        |                                    |  |                     |  |
| <b>Prepared by</b>                   | Dr Lawrence Cheung   |                  |                                   |        |                                    |  |                     |  |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                           | ELC3531 (for 42470, 42477, 42375 and 42480)   |
| <b>Subject Title</b>                          | Professional Communication in English for Engineering Students  |
| <b>Credit Value</b>                           | 2   |
| <b>Level</b>                                  | 3   |
| <b>Pre-requisite / Co-requisite</b>           | English LCR subjects  |
| <b>Objectives</b>                             | This subject aims to develop the language competence for professional communication in English required by students to communicate effectively with various parties and stakeholders in regard to engineering-related project proposals.  |
| <b>Intended Subject Learning Outcomes</b>     | <p><b>Upon completion of the subject, and in relation to effective communication with a variety of intended readers/audiences in English, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. plan, organise and produce professionally acceptable project proposals with appropriate text structures and language for different intended readers</li> <li>2. plan, organise and deliver effective project-related oral presentations with appropriate interactive strategies and language for different intended audiences</li> <li>3. adjust the style of expression and interactive strategies in writing and speaking in accordance with different intended readers/audiences</li> </ol>  |
| <b>Subject Synopsis / Indicative Syllabus</b> | <ol style="list-style-type: none"> <li>1. Project proposal in English <ul style="list-style-type: none"> <li>• Planning and organising a project proposal</li> <li>• Explaining the background, rationale, objectives, scope and significance of a project</li> <li>• Referring to the current situation or existing literature to substantiate a project proposal</li> <li>• Describing the methods of study</li> <li>• Describing and discussing anticipated project results and (if applicable) results of a pilot study</li> <li>• Presenting the budget, schedule and (if applicable) method of evaluation</li> <li>• Writing an executive summary</li> </ul> </li> <li>2. Oral presentation of project proposal in English <ul style="list-style-type: none"> <li>• Selecting content for an audience-focused presentation</li> <li>• Choosing language and style appropriate to the intended audience</li> <li>• Using appropriate transitions and maintaining coherence in a team presentation</li> <li>• Using effective verbal and non-verbal interactive strategies</li> </ul> </li> </ol> |
| <b>Teaching/Learning Methodology</b>          | <p>The subject is designed to develop the English language skills, both oral and written, that students need to use to communicate effectively and professionally with a variety of stakeholders of engineering-related projects. It builds upon the language and communication skills covered in GUR language training subjects.</p> <p>The study approach is primarily seminar-based. Seminar activities include instructor input as well as individual and group work, involving drafting and evaluating texts, mini-presentations, discussions and simulations.</p> <p>The learning and teaching activities in the subject will focus on a course-long project which will engage students in proposing and reporting on an</p>  |

|   | <p>engineering-related project to different intended readers/audiences. During the course, students will be involved in:</p> <ul style="list-style-type: none"> <li>• planning and researching the project</li> <li>• writing project-related documents such as project proposals</li> <li>• giving oral presentations to intended stakeholders of the project</li> </ul>  |  |   |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
|---|--|--|---|-----------------------------------|---------------------------|--|---|----------------------------|--------|---|--------------------|--------------------------------|-----|---|--|---|---|-----|--|---|---|-------|------|--|--|--|
| <p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p>   | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="3">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>1. Project proposal in English</td> <td>40%</td> <td style="text-align: center;">✓</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>2. Oral presentation of project proposal in English</td> <td>60%</td> <td></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>  |  |   | Specific assessment methods/tasks | % weighting               | Intended subject learning outcomes to be assessed (Please tick as appropriate) |   |                            | 1      | 2   | 3                  | 1. Project proposal in English | 40% | ✓ |  | ✓ | 2. Oral presentation of project proposal in English | 60% |  | ✓ | ✓ | Total | 100% |  |  |  |
| Specific assessment methods/tasks   | % weighting  | Intended subject learning outcomes to be assessed (Please tick as appropriate) |   |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
|   |  | 1  | 2   | 3                                 |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| 1. Project proposal in English  | 40%  | ✓  |   | ✓                                 |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| 2. Oral presentation of project proposal in English   | 60%  |  | ✓   | ✓                                 |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| Total   | 100%   |  |   |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
|   | <p><b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b></p> <p>The assessments will arise from a course-long engineering-related project. Students will collaborate in groups in planning, researching, discussing and giving oral presentations on the project. They will be assessed on written documents and oral presentations targeted at different intended readers/audiences. This facilitates assessment of students' ability to select content and use language and style appropriate to the purposes and intended readers/audiences.</p> <table border="1"> <thead> <tr> <th>Assessment type</th> <th>Intended readers/audience</th> <th>Timing</th> </tr> </thead> <tbody> <tr> <td>           1. Project proposal in English<br/><br/>           Each team writes a proposal of 2000-2500 words; and each member writes a report of 200-250 words explaining his/her contribution to the project         </td> <td>Mainly engineering experts</td> <td>Week 8</td> </tr> <tr> <td>           2. Oral presentation of project proposal in English<br/><br/>           Each team delivers a speech (30 minutes for a team of four), simulating a presentation of the final proposal         </td> <td>Mainly non-experts</td> <td>Weeks 12-13</td> </tr> </tbody> </table> |  |   | Assessment type                   | Intended readers/audience | Timing   | 1. Project proposal in English<br><br>Each team writes a proposal of 2000-2500 words; and each member writes a report of 200-250 words explaining his/her contribution to the project | Mainly engineering experts | Week 8 | 2. Oral presentation of project proposal in English<br><br>Each team delivers a speech (30 minutes for a team of four), simulating a presentation of the final proposal | Mainly non-experts | Weeks 12-13                    |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| Assessment type   | Intended readers/audience  | Timing   |   |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| 1. Project proposal in English<br><br>Each team writes a proposal of 2000-2500 words; and each member writes a report of 200-250 words explaining his/her contribution to the project | Mainly engineering experts   | Week 8   |   |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| 2. Oral presentation of project proposal in English<br><br>Each team delivers a speech (30 minutes for a team of four), simulating a presentation of the final proposal               | Mainly non-experts   | Weeks 12-13  |   |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |
| <p><b>Student Study Effort Expected</b></p>   | <p><b>Class contact:</b></p> <ul style="list-style-type: none"> <li>• Seminars</li> </ul> <p><b>Other student study effort:</b></p> <ul style="list-style-type: none"> <li>• Researching, planning and writing the project</li> <li>• Rehearsing the presentation</li> </ul> <p><b>Total student study effort:</b></p>   |  | <p>26 hours</p> <p>52 hours</p> <p>78 hours</p> |                                   |                           |  |   |                            |        |   |                    |                                |     |   |  |   |   |     |  |   |   |       |      |  |  |  |

|                                    |   |
|------------------------------------|---|
| <b>Reading List and References</b> | <p><b>Course material:</b><br/>Learning materials developed by the English Language Centre</p> <p><b>Recommended references:</b></p> <ol style="list-style-type: none"> <li>1. D. F. Beer, Ed., <i>Writing and Speaking in the Technology Professions: A practical guide</i>, 2nd ed. Hoboken, NJ: Wiley, 2003.</li> <li>2. R. Johnson-Sheehan, <i>Writing Proposals</i>, 2nd ed. New York: Pearson/Longman, 2008.</li> <li>3. S. Kuiper and D. Clippinger, <i>Contemporary Business Reports</i>, 5th ed. Mason, OH: South-Western, 2013.</li> <li>4. M. H. Markel, <i>Practical Strategies for Technical Communication</i>, 2nd ed. New York: Bedford/St. Martin's, 2016.</li> <li>5. D. C. Reep, <i>Technical Writing: Principles, strategies, and readings</i>, 8th ed. Boston: Pearson/Longman, 2011.</li> <li>6. E. D. Zanders and L. Macleod, <i>Presentation Skills for Scientists: A practical guide</i>, 2nd ed. Cambridge: Cambridge University Press, 2018.</li> </ol> |
| <b>Last Updated</b>                | July 2021   |
| <b>Prepared by</b>                 | English Language Centre   |

**Subject Description Form**

|  |  |              |   |  |  |   |  |
|--|--|--------------|---|--|--|---|--|
| <b>Subject Code</b>  | COMP4127   |              |   |  |  |   |  |
| <b>Subject Title</b>   | Information Systems Audit and Control  |              |   |  |  |   |  |
| <b>Credit Value</b>  | 3  |              |   |  |  |   |  |
| <b>Level</b>   | 4  |              |   |  |  |   |  |
| <b>Pre-requisite / Co-requisite / Exclusion</b>  |  |              |   |  |  |   |  |
| <b>Objectives</b>  | <p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. recap of different information systems in operation and their management;</li> <li>2. extend the potential graduates' horizon into the realm of audit and control aspects of information management;</li> <li>3. evaluate the effectiveness of information systems; and</li> <li>4. integrate the elements of risk assessment and cybersecurity in project management.</li> </ol>  |              |   |  |  |   |  |
| <b>Intended Learning Outcomes</b>  | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. apply the concept of audit in managing information systems and project management;</li> <li>2. identify various types of controls and develop new control measures;</li> <li>3. conduct audit exercises, collect and evaluate audit evidence.</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. improve presentation and communication skills through various exercises;</li> <li>5. develop the ability to conduct group works and solve related problems; and</li> <li>6. think and reason in a critical manner, especially on different issues related to audit and control.</li> </ol>  |              |   |  |  |   |  |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <table border="1"> <tr> <td><b>Topic</b></td> </tr> <tr> <td><b>1. Information Systems Audit and Control</b><br/>Nature of IS audit; concepts of auditing; types of audit; concepts of internal controls.</td> </tr> <tr> <td><b>2. Management Controls</b><br/>Top management control frameworks: CobiT, COSO; ISO27001; systems development management controls; programming management controls.</td> </tr> <tr> <td><b>3. Applications Controls</b><br/>Boundary controls; input/output controls; data validation edit and controls, processing controls; business process controls; testing application systems.</td> </tr> <tr> <td><b>4. Evidence Collection and Evaluation</b><br/>Nature of evidence; evidence collection; computer-assisted audit techniques; analysis and review.</td> </tr> <tr> <td><b>5. Protection of Information Assets</b><br/>Information security management; risk management concepts and methodologies; the process and components of information assets and risk management.</td> </tr> </table> | <b>Topic</b> | <b>1. Information Systems Audit and Control</b><br>Nature of IS audit; concepts of auditing; types of audit; concepts of internal controls. | <b>2. Management Controls</b><br>Top management control frameworks: CobiT, COSO; ISO27001; systems development management controls; programming management controls. | <b>3. Applications Controls</b><br>Boundary controls; input/output controls; data validation edit and controls, processing controls; business process controls; testing application systems. | <b>4. Evidence Collection and Evaluation</b><br>Nature of evidence; evidence collection; computer-assisted audit techniques; analysis and review. | <b>5. Protection of Information Assets</b><br>Information security management; risk management concepts and methodologies; the process and components of information assets and risk management. |
| <b>Topic</b>   |  |              |   |  |  |   |  |
| <b>1. Information Systems Audit and Control</b><br>Nature of IS audit; concepts of auditing; types of audit; concepts of internal controls.  |  |              |   |  |  |   |  |
| <b>2. Management Controls</b><br>Top management control frameworks: CobiT, COSO; ISO27001; systems development management controls; programming management controls.                             |  |              |   |  |  |   |  |
| <b>3. Applications Controls</b><br>Boundary controls; input/output controls; data validation edit and controls, processing controls; business process controls; testing application systems.     |  |              |   |  |  |   |  |
| <b>4. Evidence Collection and Evaluation</b><br>Nature of evidence; evidence collection; computer-assisted audit techniques; analysis and review.  |  |              |   |  |  |   |  |
| <b>5. Protection of Information Assets</b><br>Information security management; risk management concepts and methodologies; the process and components of information assets and risk management. |  |              |   |  |  |   |  |

|  | <p><b>6. The Application of IS Audit and Control</b><br/>The application of IS audit and control in financial systems and industry; Basel; case studies.</p> <p><b>7. Business Continuity and Disaster Recovery</b><br/>Concepts; the planning process and components; case studies.</p>  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
|--|---|-----------------------------------|-------------|---|--------|--|----------|-----------------------------------|-----------|---|---|---|---|---|---|------------------------------|-----|--|--|--|--|--|--|----------------------------------|---|---|---|---|---|---|--------------------|-----|---|---|---|---|---|---|-------|------|--|--|--|--|--|--|
| <b>Teaching/ Learning Methodology</b>                                  | This subject emphasises both theoretical and practical aspects of information systems audit and control. It is intended to provide students with knowledge and practical experience on conducting information systems audit projects. Guest seminars from the audit industry will be included. Various auditing tools, data analytics, simulations and exercises on information system audit will be provided in laboratory and tutorial sessions.  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b> | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td><b>Continuous Assessment</b></td> <td rowspan="2">55%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1. Assignments, Tests &amp; Projects</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td><b>Examination</b></td> <td>45%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed |        |  |          |                                   |           | 1 | 2 | 3 | 4 | 5 | 6 | <b>Continuous Assessment</b> | 55% |  |  |  |  |  |  | 1. Assignments, Tests & Projects | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | <b>Examination</b> | 45% | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Total | 100% |  |  |  |  |  |  |
| Specific assessment methods/tasks                                      | % weighting   |                                   |             | Intended subject learning outcomes to be assessed |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
|  |   | 1                                 | 2           | 3   | 4      | 5                                      | 6        |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Continuous Assessment</b>   | 55%   |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| 1. Assignments, Tests & Projects                                       |   | ✓                                 | ✓           | ✓   | ✓      | ✓                                      | ✓        |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Examination</b>   | 45%   | ✓                                 | ✓           | ✓   | ✓      | ✓                                      | ✓        |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| Total  | 100%  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Student Study Effort Expected</b>                                   | <p><b>Class contact:</b></p> <table border="1"> <tbody> <tr> <td>▪ Lecture</td> <td>39 Hours</td> </tr> <tr> <td>▪ Tutorial/Lab</td> <td>0 Hour</td> </tr> </tbody> </table> <p><b>Other student study effort:</b></p> <table border="1"> <tbody> <tr> <td>▪ Assignments, Quizzes, Projects, Exam</td> <td>80 Hours</td> </tr> <tr> <td><b>Total student study effort</b></td> <td>119 Hours</td> </tr> </tbody> </table>   | ▪ Lecture                         | 39 Hours    | ▪ Tutorial/Lab                                    | 0 Hour | ▪ Assignments, Quizzes, Projects, Exam | 80 Hours | <b>Total student study effort</b> | 119 Hours |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| ▪ Lecture  | 39 Hours  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| ▪ Tutorial/Lab   | 0 Hour  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| ▪ Assignments, Quizzes, Projects, Exam                                 | 80 Hours  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Total student study effort</b>                                      | 119 Hours   |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Reading List and References</b>                                     | <p><b>References:</b></p> <ol style="list-style-type: none"> <li>CISA Review Manual, ISACA publications.</li> <li>CRISC Review Manual, ISACA Publications.</li> <li>CISSP CBK, ISC2 publication</li> <li>Calder, Alan and Watkins, Steve, <i>IT Governance – An international guide to data security and ISO27001/ISO27002</i>.</li> <li>Whitman, Michael E. and Mattord, Herbert J., <i>Management of Information Security</i>, Cengage.</li> <li>ISACA Journal</li> <li>The Computer Journal, British Computer Society</li> <li>Harvard Business Review</li> </ol>  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Last Updated</b>  | Jun 2022  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |
| <b>Prepared by</b>   | COMP  |                                   |             |   |        |  |          |                                   |           |   |   |   |   |   |   |                              |     |  |  |  |  |  |  |                                  |   |   |   |   |   |   |                    |     |   |   |   |   |   |   |       |      |  |  |  |  |  |  |

**Subject Description Form**

| <b>Subject Code</b>  | COMP4142   |              |  |  |  |
|--|--|--------------|--|--|--|
| <b>Subject Title</b>   | E-Payment and Cryptocurrency   |              |  |  |  |
| <b>Credit Value</b>  | 3  |              |  |  |  |
| <b>Level</b>   | 4  |              |  |  |  |
| <b>Pre-requisite / Co-requisite / Exclusion</b>  | <b>Pre-requisite:</b> COMP3334   |              |  |  |  |
| <b>Objectives</b>  | <p>To understand the technologies and applications for e-payment and cryptocurrency.</p> <p>Specifically, the students should:</p> <ol style="list-style-type: none"> <li>1. understand fundamental security technologies for supporting e-payment and cryptocurrency;</li> <li>2. evaluate different types of payment methods; and</li> <li>3. understand the design and application of e-payment and cryptocurrency systems.</li> </ol>  |              |  |  |  |
| <b>Intended Learning Outcomes</b>  | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. acquire a fundamental understanding of cryptocurrency and e-payment – the basic principles as well as the technical and business aspects;</li> <li>2. evaluate cryptocurrency and e-payment systems, applications and protocols;</li> <li>3. design and implement cryptocurrency and e-payment systems/applications;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. follow trends of e-payment and crypto-currency; and</li> <li>5. acquire critical thinking and analytical skills, and improve technical writing as well as presentation skills.</li> </ol>                |              |  |  |  |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <table border="1"> <thead> <tr> <th><b>Topic</b></th> </tr> </thead> <tbody> <tr> <td> <b>1. Introduction</b><br/>                     Payment fundamentals; Different types of payment; Regulatory issues.                 </td> </tr> <tr> <td> <b>2. Security Fundamentals</b><br/>                     Review of security mechanisms (encryptions, digital signatures, hash functions, authentication protocols, digital certificate, Internet security).<br/><br/>                     Elliptic curve cryptography (ECDLP, ECDSA); recent hash functions (SHA-256, RIPEMD-160)                 </td> </tr> <tr> <td> <b>3. Internet Payment Systems</b><br/>                     SET and 3D credit card payment protocols; Electronic check; E-cash; Internet payment services.                 </td> </tr> </tbody> </table> | <b>Topic</b> | <b>1. Introduction</b><br>Payment fundamentals; Different types of payment; Regulatory issues. | <b>2. Security Fundamentals</b><br>Review of security mechanisms (encryptions, digital signatures, hash functions, authentication protocols, digital certificate, Internet security).<br><br>Elliptic curve cryptography (ECDLP, ECDSA); recent hash functions (SHA-256, RIPEMD-160) | <b>3. Internet Payment Systems</b><br>SET and 3D credit card payment protocols; Electronic check; E-cash; Internet payment services. |
| <b>Topic</b>   |  |              |  |  |  |
| <b>1. Introduction</b><br>Payment fundamentals; Different types of payment; Regulatory issues.   |  |              |  |  |  |
| <b>2. Security Fundamentals</b><br>Review of security mechanisms (encryptions, digital signatures, hash functions, authentication protocols, digital certificate, Internet security).<br><br>Elliptic curve cryptography (ECDLP, ECDSA); recent hash functions (SHA-256, RIPEMD-160) |  |              |  |  |  |
| <b>3. Internet Payment Systems</b><br>SET and 3D credit card payment protocols; Electronic check; E-cash; Internet payment services.   |  |              |  |  |  |

|   | <p><b>4. Mobile Payment Systems</b></p> <p>Smart card payment; Apple Wallet; Google Wallet; Other mobile payment systems.</p> <p><b>5. Cryptocurrency</b></p> <p>Block chain; Bitcoin (and its variants, e.g. Litecoin); Other crypto-currency systems (e.g. Ethereum, Monero, ZCash).</p> <p><b>6. Related Topics</b></p> <p>Legal issues; Advanced/emerging technologies; Case studies.</p> <p><u>Laboratory Experiments:</u></p> <p>Laboratory exercises on blockchain, cryptocurrency and e-payment.</p> <p><u>Case Studies:</u></p> <p>Case studies on blockchain, Bitcoin, Internet/mobile payment systems.</p>   |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
|---|---|--|-------------|---|----------|---|-----------|--|---|---|---|---|---|------------------------------|------------|--|--|--|--|--|----------------|---|---|--|---|--|------------|---|---|---|---|---|------------------|---|---|--|--|--|--------------------|------------|---|---|--|---|--|--------------|--------------|--|--|--|--|--|
| <p><b>Teaching/ Learning Methodology</b></p>                                  | <p>Teaching is mainly conducted through lectures. Learning is supplemented by exercises in labs/tutorials. Students are assessed through assignments, a project, a mid-term test and an examination.</p>  |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| <p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p> | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td><b>Continuous Assessment</b></td> <td rowspan="4"><b>55%</b></td> <td colspan="5"></td> </tr> <tr> <td>1. Assignments</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>2. Project</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>3. Mid-Term Test</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td><b>Examination</b></td> <td><b>45%</b></td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td><b>Total</b></td> <td><b>100 %</b></td> <td colspan="5"></td> </tr> </tbody> </table> <p>Continuous assessments consist of assignments, a project and a mid-term test, which are designed to facilitate students to achieve the intended learning outcomes. The project is used to assess all learning outcomes. It is designed to enhance students' ability to a deeper understanding of a problem of a larger-scope and solving it systematically. Examination will provide a summative evaluation of the overall ability and understanding of the subject (i.e., e-payment and cryptocurrency).</p> | Specific assessment methods/tasks                        | % weighting | Intended subject learning outcomes to be assessed |          |   |           |  | 1 | 2 | 3 | 4 | 5 | <b>Continuous Assessment</b> | <b>55%</b> |  |  |  |  |  | 1. Assignments | ✓ | ✓ |  | ✓ |  | 2. Project | ✓ | ✓ | ✓ | ✓ | ✓ | 3. Mid-Term Test | ✓ | ✓ |  |  |  | <b>Examination</b> | <b>45%</b> | ✓ | ✓ |  | ✓ |  | <b>Total</b> | <b>100 %</b> |  |  |  |  |  |
| Specific assessment methods/tasks   | % weighting   |  |             | Intended subject learning outcomes to be assessed |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
|   |   | 1  | 2           | 3   | 4        | 5 |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| <b>Continuous Assessment</b>  | <b>55%</b>  |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| 1. Assignments  |   | ✓  | ✓           |   | ✓        |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| 2. Project  |   | ✓  | ✓           | ✓   | ✓        | ✓ |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| 3. Mid-Term Test  |   | ✓  | ✓           |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| <b>Examination</b>  | <b>45%</b>  | ✓  | ✓           |   | ✓        |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| <b>Total</b>  | <b>100 %</b>  |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| <p><b>Student Study Effort Expected</b></p>                                   | <p><b>Class contact:</b></p> <table border="1"> <tr> <td>▪ Class activities (lecture, tutorial, laboratory, etc.)</td> <td>39 Hours</td> </tr> </table> <p><b>Other student study effort:</b></p> <table border="1"> <tr> <td>▪ Self-study and other related work</td> <td>66 Hours</td> </tr> </table> <p><b>Total student study effort</b></p> <table border="1"> <tr> <td></td> <td>105 Hours</td> </tr> </table>   | ▪ Class activities (lecture, tutorial, laboratory, etc.) | 39 Hours    | ▪ Self-study and other related work               | 66 Hours |   | 105 Hours |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| ▪ Class activities (lecture, tutorial, laboratory, etc.)                      | 39 Hours  |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
| ▪ Self-study and other related work   | 66 Hours  |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |
|   | 105 Hours   |  |             |   |          |   |           |  |   |   |   |   |   |                              |            |  |  |  |  |  |                |   |   |  |   |  |            |   |   |   |   |   |                  |   |   |  |  |  |                    |            |   |   |  |   |  |              |              |  |  |  |  |  |

|                                    |  |
|------------------------------------|--|
| <b>Reading List and References</b> | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Narayanan, A., Bonneau, J., Felten, E., Miller, A. and Goldfeder, S., <i>Bitcoin and Cryptocurrency Technologies</i>, Princeton University Press, 2016.</li> <li>2. Liébana-Cabanillas, Francisco, <i>Electronic Payment Systems for Competitive Advantage in E-Commerce</i>, IGI Global, 2014.</li> <li>3. Nakajima, Masashi, <i>Payment System Technologies and Functions: Innovations and Developments</i>, IGI Global, 2011.</li> <li>4. Tapscott, Alex and Tapscott, Don, <i>Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World</i>, Portfolio, 2016.</li> <li>5. Vigna, Paul and Casey, Michael J., <i>The Age of Cryptocurrency: How Bitcoin and the Blockchain Are Challenging the Global Economic Order</i>, Picador, 2016.</li> <li>6. Antonopoulos, Andreas M., <i>Mastering Bitcoin: Unlocking Digital Cryptocurrencies</i>, O'Reilly, 2014.</li> <li>7. Stallings, W., <i>Cryptography and Network Security: Principles and Practice</i>, 7<sup>th</sup> Edition, Prentice Hall, 2017.</li> <li>8. Mostafa Hashem Sherif, <i>Protocols for Secure Electronic Commerce</i>, ISBN 9781138586055, CRC Press, 2018.</li> </ol> |
| <b>Last Updated</b>                | Jun 2022   |
| <b>Prepared by</b>                 | COMP   |

**Subject Description Form**

| <b>Subject Code</b>  | COMP4334  |              |  |  |   |  |  |
|--|---|--------------|--|--|---|--|--|
| <b>Subject Title</b>   | Principles and Practice of Internet Security  |              |  |  |   |  |  |
| <b>Credit Value</b>  | 3   |              |  |  |   |  |  |
| <b>Level</b>   | 4   |              |  |  |   |  |  |
| <b>Pre-requisite / Co-requisite / Exclusion</b>  | <b>Pre-requisite:</b> COMP3334  |              |  |  |   |  |  |
| <b>Objectives</b>  | To equip students with a foundational understanding of the threats to the Internet infrastructure. Students will be equipped to: <ol style="list-style-type: none"> <li>1. understand the practical principles, models, cryptographic methods for protecting Internet from various forms of attacks;</li> <li>2. understand the major security issues and problems in the TCP/IP protocol suite and the lower layers, and the countermeasures to mitigate the corresponding attacks; and</li> <li>3. acquire practical skills in using various tools and resources to analyse the security of Internet protocols.</li> </ol>  |              |  |  |   |  |  |
| <b>Intended Learning Outcomes</b>  | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. acquire a foundational understanding of the cryptographic primitives, security functions and Internet threats;</li> <li>2. understand the major security issues and problems in the TCP/IP protocol suite and the lower layers, and the countermeasures to mitigate the corresponding attacks;</li> <li>3. acquire practical skills, such as setting up a secure private network using firewalls, secure tunnels, and end-to-end secure applications, implementing and/or integrating security functions, and assessment of system security;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. acquire critical and independent analytical skills in the process of analysing the security problems in the Internet; and</li> <li>5. synthesise various security problems into a small set of fundamental security issues and propose feasible security mechanisms and solutions.</li> </ol> |              |  |  |   |  |  |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <table border="1"> <thead> <tr> <th><b>Topic</b></th> </tr> </thead> <tbody> <tr> <td>1. <b>Overview</b><br/>Types of attacks; threat models; the role of cryptography in network security.</td> </tr> <tr> <td>2. <b>Cryptographic Functions and Services</b><br/>Symmetric encryption, block cipher; hash functions; message authentication codes; public-key encryption, digital signatures, and authentication protocols.</td> </tr> <tr> <td>3. <b>IP and Link-Layer Security</b><br/>IP security and Internet key exchange protocols; routing security; wireless network security.</td> </tr> <tr> <td>4. <b>End-to-End Security</b><br/>TCP security; Secure Socket Layer; examples of secure application protocols; e.g., Secure Shell, Kerberos, and Pretty Good Privacy.</td> </tr> <tr> <td>5. <b>Other Topics</b><br/>DNS security, denial-of-service attacks, botnet, firewalls and intrusion detection/prevention systems.</td> </tr> </tbody> </table>   | <b>Topic</b> | 1. <b>Overview</b><br>Types of attacks; threat models; the role of cryptography in network security. | 2. <b>Cryptographic Functions and Services</b><br>Symmetric encryption, block cipher; hash functions; message authentication codes; public-key encryption, digital signatures, and authentication protocols. | 3. <b>IP and Link-Layer Security</b><br>IP security and Internet key exchange protocols; routing security; wireless network security. | 4. <b>End-to-End Security</b><br>TCP security; Secure Socket Layer; examples of secure application protocols; e.g., Secure Shell, Kerberos, and Pretty Good Privacy. | 5. <b>Other Topics</b><br>DNS security, denial-of-service attacks, botnet, firewalls and intrusion detection/prevention systems. |
| <b>Topic</b>   |   |              |  |  |   |  |  |
| 1. <b>Overview</b><br>Types of attacks; threat models; the role of cryptography in network security.   |   |              |  |  |   |  |  |
| 2. <b>Cryptographic Functions and Services</b><br>Symmetric encryption, block cipher; hash functions; message authentication codes; public-key encryption, digital signatures, and authentication protocols. |   |              |  |  |   |  |  |
| 3. <b>IP and Link-Layer Security</b><br>IP security and Internet key exchange protocols; routing security; wireless network security.  |   |              |  |  |   |  |  |
| 4. <b>End-to-End Security</b><br>TCP security; Secure Socket Layer; examples of secure application protocols; e.g., Secure Shell, Kerberos, and Pretty Good Privacy.   |   |              |  |  |   |  |  |
| 5. <b>Other Topics</b><br>DNS security, denial-of-service attacks, botnet, firewalls and intrusion detection/prevention systems.   |   |              |  |  |   |  |  |

|  | Workshops:<br>A series of workshops on Web security will be given to let students acquire practical experience.   |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
|--|---|-----------------------------------|-------------|---|--------|--|----------|-----------------------------------|------------------|---|---|---|---|------------------------------|------------|--|--|--|--|--|----------------|-----|---|---|--|---|---|--------------|-----|--|--|---|--|--|------------|-----|--|--|---|---|---|--------------------|------------|---|---|--|---|---|-------|------|--|--|--|--|--|
| <b>Teaching/<br/>Learning<br/>Methodology</b>  | The course will emphasise on both the principles and practices of network and system security. The principles will be covered mainly through the lectures and problem-solving activities in the tutorials, whereas the practice aspects will be taught through a series of workshops on Web security which are designed to reinforce what has been taught in the lectures and to help students acquire practical skills and group projects.   |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Assessment<br/>Methods in<br/>Alignment with<br/>Intended<br/>Learning<br/>Outcomes</b> | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="5">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> </tr> </thead> <tbody> <tr> <td><b>Continuous Assessment</b></td> <td><b>60%</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1. Assignments</td> <td>25%</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Workshops</td> <td>10%</td> <td></td> <td></td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>3. Project</td> <td>25%</td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td><b>Examination</b></td> <td><b>40%</b></td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>The examination and assignments are designed to evaluate the students' understanding on the principles undergirding the network and system security. The workshops on Web security and group projects, on the other hand, are designed to evaluate the students' practical skills on solving Internet security problems.</p> | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed |        |  |          |                                   | 1                | 2 | 3 | 4 | 5 | <b>Continuous Assessment</b> | <b>60%</b> |  |  |  |  |  | 1. Assignments | 25% | ✓ | ✓ |  | ✓ | ✓ | 2. Workshops | 10% |  |  | ✓ |  |  | 3. Project | 25% |  |  | ✓ | ✓ | ✓ | <b>Examination</b> | <b>40%</b> | ✓ | ✓ |  | ✓ | ✓ | Total | 100% |  |  |  |  |  |
| Specific assessment methods/tasks  | % weighting   |                                   |             | Intended subject learning outcomes to be assessed |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
|  |   | 1                                 | 2           | 3   | 4      | 5                                      |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Continuous Assessment</b>   | <b>60%</b>  |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| 1. Assignments   | 25%   | ✓                                 | ✓           |   | ✓      | ✓                                      |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| 2. Workshops   | 10%   |                                   |             | ✓   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| 3. Project   | 25%   |                                   |             | ✓   | ✓      | ✓                                      |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Examination</b>   | <b>40%</b>  | ✓                                 | ✓           |   | ✓      | ✓                                      |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| Total  | 100%  |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Student Study<br/>Effort Expected</b>   | <p><b>Class contact:</b></p> <table border="1"> <tbody> <tr> <td>▪ Lectures</td> <td>39 Hours</td> </tr> <tr> <td>▪ Tutorials/Workshops</td> <td>0 Hour</td> </tr> </tbody> </table> <p><b>Other student study effort:</b></p> <table border="1"> <tbody> <tr> <td>▪ Self-study (around 7 hours per week)</td> <td>94 Hours</td> </tr> <tr> <td><b>Total student study effort</b></td> <td><b>133 Hours</b></td> </tr> </tbody> </table>  | ▪ Lectures                        | 39 Hours    | ▪ Tutorials/Workshops                             | 0 Hour | ▪ Self-study (around 7 hours per week) | 94 Hours | <b>Total student study effort</b> | <b>133 Hours</b> |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| ▪ Lectures   | 39 Hours  |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| ▪ Tutorials/Workshops  | 0 Hour  |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| ▪ Self-study (around 7 hours per week)   | 94 Hours  |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Total student study effort</b>  | <b>133 Hours</b>  |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |
| <b>Reading List and<br/>References</b>   | <p><b>Textbooks:</b></p> <ol style="list-style-type: none"> <li>Stallings, William, <i>Cryptography and Network Security: Principles and Practice</i>, 6<sup>th</sup> Edition, Pearson, 2013.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>Anderson, Ross J., <i>Security Engineering</i>, 2<sup>nd</sup> Edition, Wiley, 2008.</li> <li>Kaufman, Charlie, Perlman, Radia and Speciner, Mike, <i>Network Security: Private Communication in a Public World</i>, 2<sup>nd</sup> Edition, Prentice Hall PTR 2003.</li> <li>Zwicky, Elizabeth D., Cooper, Simon and Chapman, D. Brent, <i>Building Internet Firewalls</i>, 2<sup>nd</sup> Edition, O'Reilly &amp; Associates, 2000.</li> <li>Cheswick, William and Bellovin, Steven M., <i>Firewalls and Internet Security</i>, 2<sup>nd</sup> Edition, Addison Wesley, 2003.</li> </ol>   |                                   |             |   |        |  |          |                                   |                  |   |   |   |   |                              |            |  |  |  |  |  |                |     |   |   |  |   |   |              |     |  |  |   |  |  |            |     |  |  |   |   |   |                    |            |   |   |  |   |   |       |      |  |  |  |  |  |

|                     |  |
|---------------------|--|
|                     | <ol style="list-style-type: none"> <li>5. Schneier, Bruce, <i>Applied Cryptography</i>, 2<sup>nd</sup> Edition, Wiley, 1996.</li> <li>6. Schneier, Bruce, <i>Secrets and Lies</i>, Wiley, 2000.</li> <li>7. Young, Adam and Yung, Moti, <i>Malicious Cryptography</i>, Wiley, 2004.</li> <li>8. Stinson, Douglas R., <i>Cryptography: Theory and Practice</i>, 3<sup>rd</sup> Edition, Chapman and Hall/CRC, 2006.</li> <li>9. Forouzan, Behrouz A., <i>Cryptography and Network Security</i>, McGraw-Hill, 2008.</li> <li>10. Boyd, Colin and Mathuria, Anish, <i>Protocols for Authentication and Key Establishment</i>, Springer, 2003.</li> <li>11. Katz, Jonathan, and Yehuda Lindell. <i>Introduction to modern cryptography</i>. CRC press, 2nd Edition, 2020.</li> </ol> |
| <b>Last Updated</b> | Jun 2022   |
| <b>Prepared by</b>  | COMP   |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                             | COMP4433  |
| <b>Subject Title</b>                            | Data Mining and Data Warehousing  |
| <b>Credit Value</b>                             | 3   |
| <b>Level</b>                                    | 3   |
| <b>Pre-requisite / Co-requisite / Exclusion</b> | <b>Pre-requisite:</b> COMP2411 or equivalent introductory database subject  |
| <b>Objectives</b>                               | <p>This subject aims at equipping students with the latest knowledge and skills to:</p> <ol style="list-style-type: none"> <li>1. create a clean, consistent repository of data within a data warehouse for large corporations;</li> <li>2. utilise various techniques developed for data mining to discover interesting patterns in large databases;</li> <li>3. use existing commercial or public-domain tools to perform data mining tasks to solve real problems in business and commerce; and</li> <li>4. expose students to new techniques and ideas that can be used to improve the effectiveness of current data mining tools.</li> </ol>   |
| <b>Intended Learning Outcomes</b>               | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. identify and analyse why there is a need for data warehouse in addition to traditional operational database systems, motivated by real examples;</li> <li>2. conduct in-depth analysis of the key components in typical and advanced data warehouse architectures;</li> <li>3. design a data warehouse and understand the process required to construct one;</li> <li>4. identify and analyse why there is a need for data mining and in what ways it is different from traditional statistical techniques, motivated by real examples;</li> <li>5. learn and master the algorithms made available by popular commercial data mining software;</li> <li>6. solve real data mining problems by using the right tools to find interesting patterns;</li> <li>7. obtain deep understanding of a typical knowledge discovery process;</li> <li>8. obtain hands-on experience with some popular data mining software;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>9. apply data mining and data warehousing tools;</li> <li>10. learn independently and search for relevant information to write reports to recommend appropriate data warehousing and data mining tools; and</li> <li>11. generate innovative solutions individually or in groups and develop group work skills directly and indirectly.</li> </ol> |

|  |   |
|--|---|
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <b>Topic</b>  |
|  | <b>1. Introduction to Data Warehousing and Data Mining</b><br>Introduction to data warehousing and data mining; possible application areas in business and finance; definitions and terminologies; types of data mining problems.   |
|  | <b>2. Data Warehousing</b><br>Data warehouse and data warehousing; data warehouse and the industry; definitions; operational databases vs. data warehouses.   |
|  | <b>3. Data Warehouse Architecture and Design</b><br>Data warehouse architecture and design; two-tier and three-tier architecture; star schema and snowflake schema; data characteristics; static and dynamic data; meta-data; data marts.   |
|  | <b>4. Data Replication and Online Analytical Processing</b><br>Data replication, data capturing and indexing, data transformation and cleansing; replicated data and derived data; Online Analytical Processing (OLAP); multidimensional databases; data cube.  |
|  | <b>5. Data Mining and Knowledge Discovery</b><br>Data mining and knowledge discovery, the data mining lifecycle; pre-processing; data transformation; types of problems and applications.   |
|  | <b>6. Association Rules</b><br>Mining of association rules; the Apriori algorithm; binary, quantitative and generalised association rules; interestingness measures.  |
|  | <b>7. Classification</b><br>Classification; decision tree based algorithms; Bayesian approach; statistical approaches, nearest neighbour approach; neural network based approach; genetic algorithms based technique; evaluation of classification model.   |
|  | <b>8. Clustering</b><br>Clustering; k-means algorithm; hierarchical algorithm; condorset; neural network and genetic algorithms based approach; evaluation of effectiveness.  |
|  | <b>9. Sequential Data Mining</b><br>Sequential data mining; time dependent data and temporal data; time series analysis; sub-sequence matching; classification and clustering of temporal data; prediction.   |
| <b>10. Other Techniques</b><br>Computation intelligence techniques; fuzzy logic, genetic algorithms and neural networks for data mining. |   |
| Laboratory Experiment:   |   |
| <b>Topic</b>   |   |
| 1. Discover Association rules and sequential patterns using data mining tools  |   |
| 2. Discover Classification rules using data mining tools   |   |
| 3. Discover Clusters using data mining tools   |   |
| Case Study:  |   |
| 1. Application of data mining techniques to solve real business problems.  |   |
| 2. Attributes leading to success and failure of data warehousing projects tutorials when appropriate.                                    |   |
| <b>Teaching/ Learning Methodology</b>  | <p>This subject consists mainly of class lectures and laboratory sessions. For the class lectures, various cases will be presented to help student understand why there is a need for data warehouse to be built and why data mining is important for modern day business intelligence. Students will be given time to participate in discussions when the cases are presented.</p> <p>All assignments and projects will also be given in the form of different cases collected so as to allow students to learn more about how data warehouse and data mining can be and have been used in real business environment. For the projects and assignments, students are expected to learn independently and think critically with minimise guidance. They are expected to practice their writing skills through project</p> |

|  | <p>documentations and report writing. As students will work in teams on the project, they are expected to also learn to work with each other collaboratively.</p> <p>During laboratory sessions, students will be introduced to popular software products that can support the building of data warehouses and the mining of them. Students are expected to solve real data mining problems by using the right tools to find interesting patterns.</p>  |   |   |   |   |   |   |   |   |                  |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|---|------------------|----|----|-----------------------------------|-------------|---|--|--|--|--|--|--|--|--|--|-----------------------|---|---|---|---|---|---|---|---|---|----------|----|------------------------------|------------|--|--|--|--|--|--|--|--|---------|--|------------------------------------|---------------|---|--|---|---|--|--|--|--|---|---|--------------------------------|------------|--|--|--|---|---|---|---|---|----------|---|-------------------------|--------------------|------------|---|---|---|---|---|---|---|----------|---|-----------------------------------|--|--------------|--------------|--|--|--|--|--|--|------------------|--|--|--|--|
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b> | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="11">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> </tr> </thead> <tbody> <tr> <td><b>Continuous Assessment</b></td> <td rowspan="3"><b>55%</b></td> <td colspan="11"></td> </tr> <tr> <td>1. Assignment</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>2. Project</td> <td></td> <td></td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td><b>Examination</b></td> <td><b>45%</b></td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td><b>Total</b></td> <td><b>100 %</b></td> <td colspan="11"></td> </tr> </tbody> </table> <p>The assessment consists of written assignments, a group project and an examination. For the assignments and projects, they are designed to ensure that students are able to achieve the learning outcomes intended for this subject. They are expected to tackle a number of cases drawn from different application areas in business and commerce so that they can understand why there is a need for data warehouse in addition to traditional operational database systems and why data mining is important for modern-day business intelligence. In addition, students will learn through the questions and cases, when a particular data warehouse architecture or when a particular data mining algorithm is useful and should be used. Questions in the assignments are expected to help students learning the details of the data mining algorithm and the use of popular data mining software. They are also expected to use such popular tool as Oracle Warehouse Builder to construct data warehouses. For the projects, students are expected to work in groups of three to four to tackle a real case involving the design of a data warehouse or the use of data mining to mine very large data bases. They are expected to learn how real-world problems in business and commerce should be tackled using real-world tools as Oracle's Warehouse Builder or IBM's Clementine data mining system. They are expected to learn independently and search for relevant information to write reports to recommend appropriate data warehousing and data mining tools. Students are expected to practice their writing skills with project document and report writing. They will learn to develop critical thinking and team work skills.</p> |   |   |   |   |   |   |   |   |                  |    |    | Specific assessment methods/tasks | % weighting | Intended subject learning outcomes to be assessed |  |  |  |  |  |  |  |  |  |                       | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10       | 11 | <b>Continuous Assessment</b> | <b>55%</b> |  |  |  |  |  |  |  |  |         |  |                                    | 1. Assignment | ✓ |  | ✓ | ✓ |  |  |  |  | ✓ | ✓ |                                | 2. Project |  |  |  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓        | ✓ | ✓                       | <b>Examination</b> | <b>45%</b> | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓        | ✓ |                                   |  | <b>Total</b> | <b>100 %</b> |  |  |  |  |  |  |                  |  |  |  |  |
| Specific assessment methods/tasks                                      | % weighting   | Intended subject learning outcomes to be assessed |   |   |   |   |   |   |   |                  |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
|  |   | 1   | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9                | 10 | 11 |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| <b>Continuous Assessment</b>   | <b>55%</b>  |   |   |   |   |   |   |   |   |                  |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| 1. Assignment  |   | ✓   |   | ✓ | ✓ |   |   |   |   | ✓                | ✓  |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| 2. Project   |   |   |   |   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓                | ✓  | ✓  |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| <b>Examination</b>   | <b>45%</b>  | ✓   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓                |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| <b>Total</b>   | <b>100 %</b>  |   |   |   |   |   |   |   |   |                  |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| <b>Student Study Effort Expected</b>                                   | <table border="1"> <tr> <td colspan="12"><b>Class contact:</b></td> </tr> <tr> <td colspan="10">▪ Lectures/Laboratory</td> <td colspan="2">39 Hours</td> </tr> <tr> <td colspan="10">▪ Tutorials</td> <td colspan="2">0 Hours</td> </tr> <tr> <td colspan="12"><b>Other student study effort:</b></td> </tr> <tr> <td colspan="10">▪ Assignments and Case Studies</td> <td colspan="2">45 Hours</td> </tr> <tr> <td colspan="10">▪ Projects and Research</td> <td colspan="2">25 Hours</td> </tr> <tr> <td colspan="10"><b>Total student study effort</b></td> <td colspan="2"><b>109 Hours</b></td> </tr> </table>  |   |   |   |   |   |   |   |   |                  |    |    | <b>Class contact:</b>             |             |   |  |  |  |  |  |  |  |  |  | ▪ Lectures/Laboratory |   |   |   |   |   |   |   |   |   | 39 Hours |    | ▪ Tutorials                  |            |  |  |  |  |  |  |  |  | 0 Hours |  | <b>Other student study effort:</b> |               |   |  |   |   |  |  |  |  |   |   | ▪ Assignments and Case Studies |            |  |  |  |   |   |   |   |   | 45 Hours |   | ▪ Projects and Research |                    |            |   |   |   |   |   |   |   | 25 Hours |   | <b>Total student study effort</b> |  |              |              |  |  |  |  |  |  | <b>109 Hours</b> |  |  |  |  |
| <b>Class contact:</b>  |   |   |   |   |   |   |   |   |   |                  |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| ▪ Lectures/Laboratory  |   |   |   |   |   |   |   |   |   | 39 Hours         |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| ▪ Tutorials  |   |   |   |   |   |   |   |   |   | 0 Hours          |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| <b>Other student study effort:</b>                                     |   |   |   |   |   |   |   |   |   |                  |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| ▪ Assignments and Case Studies   |   |   |   |   |   |   |   |   |   | 45 Hours         |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| ▪ Projects and Research  |   |   |   |   |   |   |   |   |   | 25 Hours         |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |
| <b>Total student study effort</b>                                      |   |   |   |   |   |   |   |   |   | <b>109 Hours</b> |    |    |                                   |             |   |  |  |  |  |  |  |  |  |  |                       |   |   |   |   |   |   |   |   |   |          |    |                              |            |  |  |  |  |  |  |  |  |         |  |                                    |               |   |  |   |   |  |  |  |  |   |   |                                |            |  |  |  |   |   |   |   |   |          |   |                         |                    |            |   |   |   |   |   |   |   |          |   |                                   |  |              |              |  |  |  |  |  |  |                  |  |  |  |  |

|                                    |   |
|------------------------------------|---|
| <b>Reading List and References</b> | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Han, Jiawei and Kamber, Micheline, <i>Data Mining: Concepts and Techniques</i>, 3<sup>rd</sup> Edition, Morgan Kaufmann, 2012.</li> <li>2. Golfarelli, Matteo and Rizzi, Stefano, <i>Data Warehouse Design: Modern Principles and Methodologies</i>, McGraw-Hill, 2009.</li> <li>3. Inmon, W.H., Strauss, Derek and Neushloss, Genia, <i>DW 2.0: The Architecture for the Next Generation of Data Warehousing</i>, Morgan Kaufmann, 2008.</li> <li>4. Rokach, Lior and Maimon, Oded Z., <i>Data Mining with Decision Trees: Theory and Applications</i>, World Scientific, 2008.</li> <li>5. Witten, Ian H., Frank, Eibe and Hall, Mark A., <i>Data Mining: Practical Machine Learning Tools and Techniques</i>, 3<sup>rd</sup> Edition, Morgan Kaufmann, 2011.</li> <li>6. Westphal, Christopher, <i>Data Mining for Intelligence, Fraud &amp; Criminal Detection: Advanced Analytics &amp; Information Sharing Technologies</i>, CRC Press, 2008.</li> <li>7. Cox, Earl, <i>Fuzzy Modeling and Genetic Algorithms for Data Mining and Exploration</i>, Morgan Kaufmann, 2005.</li> <li>8. Liu, Bing, <i>Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data</i>, Springer, Berlin Heidelberg, 2009.</li> <li>9. Tsipstis, Konstantinos K. and Chorianopoulos, Antonios, <i>Data Mining Techniques in CRM: Inside Customer Segmentation</i>, Wiley, 2010.</li> <li>10. Shapiro, A.F. and Jain, L.C., <i>Intelligent and Other Computational Techniques in Insurance: Theory and Applications</i>, World Scientific, 2003.</li> </ol> |
| <b>Last Updated</b>                | July 2022   |
| <b>Prepared by</b>                 | COMP  |

### Subject Description Form

|   |  |
|---|--|
| <b>Subject Code</b>                             | COMP4442   |
| <b>Subject Title</b>                            | Service and Cloud Computing  |
| <b>Credit Value</b>                             | 3  |
| <b>Level</b>                                    | 4  |
| <b>Pre-requisite / Co-requisite / Exclusion</b> | <b>Pre-requisite:</b> COMP2421 Computer Organization & COMP2432 Operating Systems, or equivalent subjects  |
| <b>Objectives</b>                               | <p>This is a fundamental course that provides students with the foundations of service and cloud computing, focusing on software development and applications. It covers the principles and concepts, the technical underpinnings and supporting technologies, and the best practices and applications. The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. provide students with a broad view of the theoretical and technological aspects that has led to the evolution of service and cloud computing;</li> <li>2. teach students how service and cloud computing supports different forms of functionality that are essential to the modern IT industry, and the requirements of working with cloud computing environments and develop cloud-based services and applications;</li> <li>3. equip students with the underlying technologies of service and cloud computing including service-oriented architecture, cloud architecture and service models, virtualisation, and cloud management; and</li> <li>4. equip students with the knowledge and skills for the planning, design and programming of cloud systems and software services for real-world applications.</li> </ol> |
| <b>Intended Learning Outcomes</b>               | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. demonstrate in-depth understanding and appreciation of the technological impact of service and cloud computing for future enterprises, and the technologies underpinning it;</li> <li>2. apply systematic and principled practices to designing, implementing and deploying service and cloud-oriented computing;</li> <li>3. review and assess the risks, opportunities, costs and steps towards migrating existing systems to service and cloud computing;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. develop systematic and incremental approach to resolving practical enterprise computing problems and challenges;</li> <li>5. demonstrate teamwork spirit and work effectively as a team member; and</li> <li>6. write technical reports and present solutions.</li> </ol>  |

| <b>Subject Synopsis/ Indicative Syllabus</b>   | <p><b>Topics:</b></p> <table border="1"> <tr> <td> <b>1. Overview</b><br/>           The evolution of computing paradigms; Motivations and benefits of service and cloud computing; Definitions and principles of service and cloud computing; Applications of cloud computing.         </td> </tr> <tr> <td> <b>2. Cloud Architecture and Service Models</b><br/>           Cloud architecture and major components; Physical infrastructure; Service models; Service provisioning;         </td> </tr> <tr> <td> <b>3. Service and Cloud Computing Technology Foundation</b><br/>           Key technologies behind service and cloud computing; Resource sharing, scalability, multi-tenancy, and heterogeneity; Virtualisation and Containerisation; Cloud computing and service-orientation; Web Services, SOA, Web 2.0; Services co-ordination and composition, MSA, Devops, Agile; SDN.         </td> </tr> <tr> <td> <b>4. Cloud Service Providers and Platforms</b><br/>           Services and functions provided by cloud service providers; Representative providers and platforms (Amazon, Microsoft, IBM, Google, Alibaba, etc); AWS (EC2, S3, CloudFront, composite services, etc);         </td> </tr> <tr> <td> <b>5. Cloud-based Application Development</b><br/>           Concepts and principles: common cloud use cases; types of cloud services; support for cloud application development; principles of building cloud-based applications.<br/>           Methods and techniques: general procedure of cloud application development; paradigms of cloud applications (Web, Mobile, Content delivery, Event-driven, IoT, Big Data, Machine learning); Case study with AWS.         </td> </tr> <tr> <td> <b>6. Cloud Management</b><br/>           Functionalities and requirements of cloud management; Core functions of cloud management; Platforms and tools for cloud management; Cloud security and data privacy.         </td> </tr> </table> | <b>1. Overview</b><br>The evolution of computing paradigms; Motivations and benefits of service and cloud computing; Definitions and principles of service and cloud computing; Applications of cloud computing. | <b>2. Cloud Architecture and Service Models</b><br>Cloud architecture and major components; Physical infrastructure; Service models; Service provisioning; | <b>3. Service and Cloud Computing Technology Foundation</b><br>Key technologies behind service and cloud computing; Resource sharing, scalability, multi-tenancy, and heterogeneity; Virtualisation and Containerisation; Cloud computing and service-orientation; Web Services, SOA, Web 2.0; Services co-ordination and composition, MSA, Devops, Agile; SDN. | <b>4. Cloud Service Providers and Platforms</b><br>Services and functions provided by cloud service providers; Representative providers and platforms (Amazon, Microsoft, IBM, Google, Alibaba, etc); AWS (EC2, S3, CloudFront, composite services, etc); | <b>5. Cloud-based Application Development</b><br>Concepts and principles: common cloud use cases; types of cloud services; support for cloud application development; principles of building cloud-based applications.<br>Methods and techniques: general procedure of cloud application development; paradigms of cloud applications (Web, Mobile, Content delivery, Event-driven, IoT, Big Data, Machine learning); Case study with AWS. | <b>6. Cloud Management</b><br>Functionalities and requirements of cloud management; Core functions of cloud management; Platforms and tools for cloud management; Cloud security and data privacy. |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
|--|--|--|--|---|---|--|--|--|--|---|---|---|---|---|---|---------------------------|-----|---|---|---|---|---|---|----------------------|-----|---|---|---|---|--|--|-------|------|--|--|--|--|--|--|
| <b>1. Overview</b><br>The evolution of computing paradigms; Motivations and benefits of service and cloud computing; Definitions and principles of service and cloud computing; Applications of cloud computing.   |  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>2. Cloud Architecture and Service Models</b><br>Cloud architecture and major components; Physical infrastructure; Service models; Service provisioning;   |  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>3. Service and Cloud Computing Technology Foundation</b><br>Key technologies behind service and cloud computing; Resource sharing, scalability, multi-tenancy, and heterogeneity; Virtualisation and Containerisation; Cloud computing and service-orientation; Web Services, SOA, Web 2.0; Services co-ordination and composition, MSA, Devops, Agile; SDN.  |  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>4. Cloud Service Providers and Platforms</b><br>Services and functions provided by cloud service providers; Representative providers and platforms (Amazon, Microsoft, IBM, Google, Alibaba, etc); AWS (EC2, S3, CloudFront, composite services, etc);  |  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>5. Cloud-based Application Development</b><br>Concepts and principles: common cloud use cases; types of cloud services; support for cloud application development; principles of building cloud-based applications.<br>Methods and techniques: general procedure of cloud application development; paradigms of cloud applications (Web, Mobile, Content delivery, Event-driven, IoT, Big Data, Machine learning); Case study with AWS. |  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>6. Cloud Management</b><br>Functionalities and requirements of cloud management; Core functions of cloud management; Platforms and tools for cloud management; Cloud security and data privacy.   |  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>Teaching/ Learning Methodology</b>  | <p>The course is comprised of lectures, tutorials and laboratory exercises. During lectures, students are taught the important concepts and principles that drive the development of service computing, and how it connects to cloud. In the lecture, students are encouraged to actively participate in mini-discussions and questions that are designed to reinforce their understanding of concepts taught.</p> <p>During tutorials, students will be presented with real and practical scenarios of enterprise case studies. In particular, they will be given the unique opportunities to study, analyse and propose solutions that leverage service and cloud computing concepts. Small group discussions will be encouraged and students will need to present their results and solutions in the form of reports and presentations.</p> <p>To reinforce practical aspects of their training, simple lab exercises will be conducted to expose students to the state-of-the-art tools and development environment that uses service and cloud computing as the underlying architecture to provide enterprise solutions.</p>  |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b>   | <table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessments</td> <td>55%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Final Examination</td> <td>45%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Students taking the subject will be assessed by performance in two parts: continuous assessments and examination. Continuous assessment may include in-class discussions / quizzes, assignments, and tests.</p>  | Specific assessment methods/tasks  | % weighting  | Intended subject learning outcomes to be assessed   |   |  |  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 1. Continuous Assessments | 55% | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 2. Final Examination | 45% | ✓ | ✓ | ✓ | ✓ |  |  | Total | 100% |  |  |  |  |  |  |
| Specific assessment methods/tasks  | % weighting  |  |  | Intended subject learning outcomes to be assessed   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
|  |  | 1  | 2  | 3   | 4   | 5  | 6  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| 1. Continuous Assessments  | 55%  | ✓  | ✓  | ✓   | ✓   | ✓  | ✓  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| 2. Final Examination   | 45%  | ✓  | ✓  | ✓   | ✓   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |
| Total  | 100%   |  |  |   |   |  |  |  |  |   |   |   |   |   |   |                           |     |   |   |   |   |   |   |                      |     |   |   |   |   |  |  |       |      |  |  |  |  |  |  |

|                                      |  |           |
|--------------------------------------|--|-----------|
|                                      | <p>The in-class discussions and quizzes engage students to actively participate in learning during lectures and tutorials. Students are to collaboratively work together to apply what they have learned in the class to solve practical problems. Assignment may include group projects that are designed to help students to work together in a small group to solve practical case studies and examples by applying concepts that are taught in the class. The results are to be presented in the form of reports and presentations. Tests and assignments are designed to help students reinforced their understanding of concepts and principles that are taught in the class. They are conducted to assess independent problem solving and critical thinking skills.</p> |           |
| <b>Student Study Effort Expected</b> | <b>Class contact:</b>  |           |
|                                      | ▪ Lectures, Tutorials / Labs   | 39 Hours  |
|                                      | <b>Other student study effort:</b>   |           |
|                                      | ▪ Assignments, Projects, Reading and Exam  | 66 Hours  |
|                                      | <b>Total student study effort</b>  | 105 Hours |
| <b>Reading List and References</b>   | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Chellammal Surianarayanan and Pethuru Raj Chelliah, <i>Essentials of Cloud Computing</i>, Springer, 2019.</li> <li>2. Arshdeep Bahga and Vijay Madisetti, <i>Cloud Computing Solutions Architect: A Hands-On Approach</i>, Arshdeep Bahga &amp; Vijay Madisetti, 2019.</li> <li>3. Articles from web, technical journals, and conference proceedings will be handed out or posted on L@PU Blackboard when needed.</li> </ol>  |           |
| <b>Last Updated</b>                  | Jun 2022   |           |
| <b>Prepared by</b>                   | COMP   |           |

### Subject Description Form

| <b>Subject Code</b>  | COMP4512  |       |  |   |  |  |   |
|--|---|-------|--|---|--|--|---|
| <b>Subject Title</b>   | Intellectual Property Protection and Management   |       |  |   |  |  |   |
| <b>Credit Value</b>  | 3   |       |  |   |  |  |   |
| <b>Level</b>   | 4   |       |  |   |  |  |   |
| <b>Pre-requisite / Co-requisite / Exclusion</b>  | -   |       |  |   |  |  |   |
| <b>Objectives</b>  | <p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. introduce to students the management and protection of intellectual property in this knowledge-based society from the legal, technical and business perspectives, with emphasis on the technical perspective;</li> <li>2. equip students with knowledge of the value of innovation and value of protection; and</li> <li>3. introduce to students various techniques for digital rights management.</li> </ol>  |       |  |   |  |  |   |
| <b>Intended Learning Outcomes</b>  | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. understand the value of intellectual property and their protection;</li> <li>2. understand various measures in the protection of digital content;</li> <li>3. use current technologies and tools for the practice of software protection;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. recognise the need for continuing development; and</li> <li>5. have an understanding of professional, ethical and legal issues and responsibilities in the use of digital content.</li> </ol>  |       |  |   |  |  |   |
| <b>Subject Synopsis/ Indicative Syllabus</b>   | <table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Topic</th> </tr> </thead> <tbody> <tr> <td> <b>1. Overview of Intellectual Property Protection and Management</b><br/>           IP management perspective: legal, business and technical; IP acquisition: purchase, JV, strategic alliances, licenses, patent pooling; the value of IP in business strategy; the law (Copyright Acts) and economics governing intellectual property protection (secrecy and patent), the use of I.P. in the digital content industry.         </td> </tr> <tr> <td> <b>2. Intellectual Property Protection</b><br/>           Copyright, related rights; trademarks and patents; problem of IP theft and their solutions.         </td> </tr> <tr> <td> <b>3. Digital Right Management</b><br/>           Digital rights management in different scenarios including computer software, documents, e-books, films, music and television. Also include different generations of DRM software and their limitations.         </td> </tr> <tr> <td> <b>4. Common DRM Techniques</b><br/>           Restrictive Licensing Agreements; Software Obfuscation and Encryption; trusted hardware/ trusted computing; reverse engineering; digital watermarking; steganography; traitor-tracing techniques in encryption.         </td> </tr> <tr> <td> <b>5. Optional Topics</b><br/>           Opposition to DRM; Alternatives to DRM; DRM system in practice (Adobe Adept DRM, Apple FairPlay, Ubisoft Uplay, etc.).         </td> </tr> </tbody> </table> | Topic | <b>1. Overview of Intellectual Property Protection and Management</b><br>IP management perspective: legal, business and technical; IP acquisition: purchase, JV, strategic alliances, licenses, patent pooling; the value of IP in business strategy; the law (Copyright Acts) and economics governing intellectual property protection (secrecy and patent), the use of I.P. in the digital content industry. | <b>2. Intellectual Property Protection</b><br>Copyright, related rights; trademarks and patents; problem of IP theft and their solutions. | <b>3. Digital Right Management</b><br>Digital rights management in different scenarios including computer software, documents, e-books, films, music and television. Also include different generations of DRM software and their limitations. | <b>4. Common DRM Techniques</b><br>Restrictive Licensing Agreements; Software Obfuscation and Encryption; trusted hardware/ trusted computing; reverse engineering; digital watermarking; steganography; traitor-tracing techniques in encryption. | <b>5. Optional Topics</b><br>Opposition to DRM; Alternatives to DRM; DRM system in practice (Adobe Adept DRM, Apple FairPlay, Ubisoft Uplay, etc.). |
| Topic  |   |       |  |   |  |  |   |
| <b>1. Overview of Intellectual Property Protection and Management</b><br>IP management perspective: legal, business and technical; IP acquisition: purchase, JV, strategic alliances, licenses, patent pooling; the value of IP in business strategy; the law (Copyright Acts) and economics governing intellectual property protection (secrecy and patent), the use of I.P. in the digital content industry. |   |       |  |   |  |  |   |
| <b>2. Intellectual Property Protection</b><br>Copyright, related rights; trademarks and patents; problem of IP theft and their solutions.  |   |       |  |   |  |  |   |
| <b>3. Digital Right Management</b><br>Digital rights management in different scenarios including computer software, documents, e-books, films, music and television. Also include different generations of DRM software and their limitations.   |   |       |  |   |  |  |   |
| <b>4. Common DRM Techniques</b><br>Restrictive Licensing Agreements; Software Obfuscation and Encryption; trusted hardware/ trusted computing; reverse engineering; digital watermarking; steganography; traitor-tracing techniques in encryption.   |   |       |  |   |  |  |   |
| <b>5. Optional Topics</b><br>Opposition to DRM; Alternatives to DRM; DRM system in practice (Adobe Adept DRM, Apple FairPlay, Ubisoft Uplay, etc.).  |   |       |  |   |  |  |   |
| <b>Teaching/ Learning Methodology</b>  | <p>During the lectures, students will come across the common concepts and theories. Those concepts and theories would be further explained with reference to case studies in the tutorials.</p>   |       |  |   |  |  |   |

|   |  |  |                    |  |  |          |           |          |          |
|---|--|--|--------------------|--|--|----------|-----------|----------|----------|
| <b>Assessment Methods in Alignment with Intended Learning Outcomes</b>  | <b>Specific assessment methods/tasks</b>   |  | <b>% weighting</b> |  | <b>Intended subject learning outcomes to be assessed</b> |          |           |          |          |
|   |  |  |                    |  | <b>1</b>   | <b>2</b> | <b>3</b>  | <b>4</b> | <b>5</b> |
|   | <b>Continuous Assessment</b>   |  | <b>55%</b>         |  | ✓  | ✓        | ✓         | ✓        | ✓        |
|   | <b>Examination</b>   |  | <b>45%</b>         |  | ✓  | ✓        | ✓         | ✓        | ✓        |
|   | <b>Total</b>   |  | <b>100%</b>        |  |  |          |           |          |          |
| <p>Types of assessments included assignments, project, test and examination. Assignments are designed to reinforce the concepts and theories learned in the lecture, by solving bigger problems. Project is used to develop students' analytic and problem-solving skills by developing a study report. Test and examination are used to assess independent problem solving and critical thinking skills.</p> |  |  |                    |  |  |          |           |          |          |
| <b>Student Study Effort Expected</b>  | <b>Class contact:</b>  |  |                    |  |  |          |           |          |          |
|   | ▪ Lecture  |  |                    |  |  |          |           | 39 Hours |          |
|   | <b>Other student study effort:</b>   |  |                    |  |  |          |           |          |          |
|   | ▪ Assignments, Project, Self-study, Test and Exam Preparation  |  |                    |  |  |          |           | 66 Hours |          |
| <b>Total student study effort</b>   |  |  |                    |  |  |          | 105 Hours |          |          |
| <b>Reading List and References</b>  | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Bouchoux, Deborah E., <i>Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets</i>, 5<sup>th</sup> Edition, Cengage, 2017.</li> <li>2. European Union Intellectual Property Office.<br/><a href="https://euipo.europa.eu/knowledge/course/view.php?id=1738">https://euipo.europa.eu/knowledge/course/view.php?id=1738</a></li> <li>3. Halt Jr., G.B., Donch Jr., J.C., Stiles, A.R. and Fesnak, R., <i>Intellectual Property in Consumer Electronics, Software and Technology Startups</i>, Springer, 2014.</li> <li>4. WIPO - World Intellectual Property Organization<br/><a href="http://www.wipo.int">http://www.wipo.int</a></li> </ol> |  |                    |  |  |          |           |          |          |
| <b>Last Updated</b>   | Jun 2022   |  |                    |  |  |          |           |          |          |
| <b>Prepared by</b>  | COMP   |  |                    |  |  |          |           |          |          |

### Subject Description Form

|   |   |   |                                 |                     |  |                          |                                   |
|---|---|---|---------------------------------|---------------------|--|--------------------------|-----------------------------------|
| <b>Subject Code</b>   | COMP4913  |   |                                 |                     |  |                          |                                   |
| <b>Subject Title</b>  | Capstone Project  |   |                                 |                     |  |                          |                                   |
| <b>Credit Value</b>   | 6   |   |                                 |                     |  |                          |                                   |
| <b>Level</b>  | 4   |   |                                 |                     |  |                          |                                   |
| <b>Pre-requisite / Co-requisite / Exclusion</b>                   | <b>Exclusion:</b> Any other equivalent capstone project   |   |                                 |                     |  |                          |                                   |
| <b>Objectives</b>   | <p>The objectives of this subject are to:</p> <ol style="list-style-type: none"> <li>1. provide a student the opportunities to apply and integrate his/her knowledge acquired throughout the undergraduate study;</li> <li>2. develop the capabilities of a student in analysing and solving complex and possibly real-life problems; and</li> <li>3. train students with skills on systematic development and documentation of a significant piece of work.</li> </ol>   |   |                                 |                     |  |                          |                                   |
| <b>Intended Learning Outcomes</b>                                 | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. conduct literature survey to locate for materials and sources relevant to the selected problem area;</li> <li>2. understand the materials obtained and connect the materials with the problem to be solved;</li> <li>3. define and specify the problem precisely;</li> <li>4. assimilate and apply the knowledge learnt in generating good solutions to the problem;</li> <li>5. think critically the formulation of alternative models and solutions to the problem, in the analysis of approaches to the solution and their implementation;</li> <li>6. evaluate the final outcome in an objective manner;</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>7. improve presentation and communicate skills via oral presentation;</li> <li>8. enhance technical report writing skills with proper organisation of materials;</li> <li>9. develop the ability to learn independently and to find/integrate information from different sources required in solving real-life problems;</li> <li>10. manage the project efficiently and effectively through the supervision of supervisor(s); and</li> <li>11. work collaboratively with related parties (e.g. vendors, sponsor company, technical support staff, team-partners, research students, etc.).</li> </ol> |   |                                 |                     |  |                          |                                   |
| <b>Subject Synopsis/ Indicative Syllabus</b>                      | <table border="1" style="width: 100%;"> <tr> <td>1. In-depth Study of a Topic Typically Proposed by the Supervisor</td> </tr> <tr> <td>2. Project Meeting and Planning</td> </tr> <tr> <td>3. Proposal Writing</td> </tr> <tr> <td>4. Regular Progress Checking and Reporting</td> </tr> <tr> <td>5. Project Documentation</td> </tr> <tr> <td>6. Presentation and Demonstration</td> </tr> </table> <p>Capstone Projects are normally proposed by academic staff of the department or in conjunction with external organisations or other departments in the university. However, students may propose a topic along an area of their interest contingent upon the condition that they could find an interested academic staff to supervise the project. Each student will be assigned a supervisor who is in charge of the entire project.</p>  | 1. In-depth Study of a Topic Typically Proposed by the Supervisor | 2. Project Meeting and Planning | 3. Proposal Writing | 4. Regular Progress Checking and Reporting | 5. Project Documentation | 6. Presentation and Demonstration |
| 1. In-depth Study of a Topic Typically Proposed by the Supervisor |   |   |                                 |                     |  |                          |                                   |
| 2. Project Meeting and Planning                                   |   |   |                                 |                     |  |                          |                                   |
| 3. Proposal Writing   |   |   |                                 |                     |  |                          |                                   |
| 4. Regular Progress Checking and Reporting                        |   |   |                                 |                     |  |                          |                                   |
| 5. Project Documentation  |   |   |                                 |                     |  |                          |                                   |
| 6. Presentation and Demonstration                                 |   |   |                                 |                     |  |                          |                                   |

| <b>Teaching/<br/>Learning<br/>Methodology</b>  | The capstone project spans across the academic year for two consecutive semesters. The teaching/learning activities include regular project meetings with the supervisor and/or other involved parties, guided study of project materials, independent project development work and other project management tasks.   |  |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
|--|---|--|---|---|---|---|---|---|---|---|----|----|---|---|----------------|--|-----------|--|-----------|--|--|--|--|--|--|--|---|---|---|---|---|---|---|---|---|----|----|--------------------------|------|---|---|---|---|---|---|---|---|---|---|---|---|-------|-------|--|--|--|--|--|--|--|--|--|--|--|
| <b>Assessment<br/>Methods in<br/>Alignment with<br/>Intended<br/>Learning<br/>Outcomes</b>   | <table border="1"> <thead> <tr> <th rowspan="2">Specific<br/>assessment<br/>methods/tasks</th> <th rowspan="2">%<br/>weighting</th> <th colspan="11">Intended subject learning outcomes to be<br/>assessed</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> <th>11</th> </tr> </thead> <tbody> <tr> <td>Continuous<br/>Assessment</td> <td>100%</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="11"></td> </tr> </tbody> </table> <p><u>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</u></p> <p>The capstone project will be assessed by the supervisor and other assessors. Attributes to be assessed include, but not limited to, Problem Identification, Problem Solving, Communication and Presentation, Project Management, and Self-Discipline.</p> <p>Capstone Projects should be problem-oriented and there is no restriction to the nature of the problem except that it should be relevant to the student's study programme. The project could be practical, academic or a hybrid in which the student is encouraged but not constrained to have some original contributions. Each student has to submit a proposal, a mid-term checkpoint progress report and a final report. The proposal must be approved by the supervisor before the student can proceed to the capstone project. An oral presentation and demonstration is essential at the end of the project. A mid-term presentation and demonstration may also be required for proper continuous assessment.</p> |  |   |   |   |   |   |   |   |   |    |    |   | Specific<br>assessment<br>methods/tasks | %<br>weighting | Intended subject learning outcomes to be<br>assessed   |           |  |           |  |  |  |  |  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Continuous<br>Assessment | 100% | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Total | 100 % |  |  |  |  |  |  |  |  |  |  |  |
| Specific<br>assessment<br>methods/tasks  | %<br>weighting  | Intended subject learning outcomes to be<br>assessed |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
|  |   | 1  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
| Continuous<br>Assessment   | 100%  | ✓  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓  | ✓  | ✓ |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
| Total  | 100 %   |  |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
| <b>Student Study<br/>Effort Expected</b>   | <p><b>Class contact:</b></p> <table border="1"> <tr> <td>▪ Lectures</td> <td>0 Hour</td> </tr> </table> <p><b>Other student study effort:</b></p> <table border="1"> <tr> <td>▪ Searching and reading materials, meeting with supervisor / others, design and system development, testing, documentation, presentation, etc.</td> <td>210 Hours</td> </tr> </table> <p><b>Total student study effort</b></p> <table border="1"> <tr> <td></td> <td>210 Hours</td> </tr> </table>  |  |   |   |   |   |   |   |   |   |    |    |   | ▪ Lectures                              | 0 Hour         | ▪ Searching and reading materials, meeting with supervisor / others, design and system development, testing, documentation, presentation, etc. | 210 Hours |  | 210 Hours |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
| ▪ Lectures   | 0 Hour  |  |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
| ▪ Searching and reading materials, meeting with supervisor / others, design and system development, testing, documentation, presentation, etc. | 210 Hours   |  |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
|  | 210 Hours   |  |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |
| <b>Reading List and<br/>References</b>   | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Kumar, Ranjit, <i>Research Methodology: A Step-by-step Guide for Beginners</i>, 3<sup>rd</sup> Edition, SAGE Publications, 2011.</li> <li>2. Burns, Robert B., <i>Introduction to Research Methods</i>, 4<sup>th</sup> Edition, SAGE Publications, 2000.</li> <li>3. Roberts, Carol M., <i>The Dissertation Journey: A Practical and Comprehensive Guide to Planning, Writing, and Defending Your Dissertation</i>, 3<sup>rd</sup> Edition, Corwin Press, 2007.</li> <li>4. Mauch, James E. and Park, Namgi, <i>Guide to the Successful Thesis and Dissertation: A Handbook for Students and Faculty</i>, 5<sup>th</sup> Edition, Marcel Dekker, 2003.</li> <li>5. Rudestam, Kjell Erik and Newton, Rae R., <i>Surviving Your Dissertation: A Comprehensive Guide to Content and Process</i>, 2<sup>nd</sup> Edition, Sage Publications, 2001.</li> <li>6. Garson, G. David, <i>Guide to Writing Empirical Papers, Theses and Dissertations</i>, Marcel Dekker, 2002.</li> <li>7. Reinhart, Susan M., <i>Giving Academic Presentations</i>, 2<sup>nd</sup> Edition, University of Michigan Press, 2013.</li> </ol>   |  |   |   |   |   |   |   |   |   |    |    |   |   |                |  |           |  |           |  |  |  |  |  |  |  |   |   |   |   |   |   |   |   |   |    |    |                          |      |   |   |   |   |   |   |   |   |   |   |   |   |       |       |  |  |  |  |  |  |  |  |  |  |  |

|                     |   |
|---------------------|---|
|                     | <ol style="list-style-type: none"> <li>8. Oshima, Alice and Hogue, Ann, <i>Writing Academic English</i>, 4<sup>th</sup> Edition, Pearson Longman, 2006.</li> <li>9. American Psychological Association. <i>Publication Manual of the American Psychological Association</i>, 6<sup>th</sup> Edition, American Psychological Association, 2010.</li> <li>10. Szuchman, Lenore T., <i>Writing with Style: APA Style Made Easy</i>, 5<sup>th</sup> Edition, Wadsworth/Cengage Learning, 2011.</li> <li>11. Statistics, simulation, programming, and relevant books.</li> <li>12. ACM and IEEE magazines, Transactions and Journals.</li> <li>13. Other International Journals.</li> <li>14. Relevant conference proceedings and magazines (including ACM and IEEE conferences).</li> <li>15. Technical reports from universities and major companies.</li> </ol> |
| <b>Last Updated</b> | Jun 2022  |
| <b>Prepared by</b>  | COMP  |

### Subject Description Form

|  |  |
|--|--|
| <b>Subject Code</b>                          | EIE4113  |
| <b>Subject Title</b>                         | Wireless and Mobile Systems  |
| <b>Credit Value</b>                          | 3  |
| <b>Level</b>                                 | 4  |
| <b>Pre-requisite</b>                         | <p><u>For 42480</u><br/>EIE3120 Network Technologies and Security</p> <p><u>For 42470</u><br/>EIE3333 Data and Computer Communications</p>   |
| <b>Exclusion</b>                             | Mobile Networking (EIE4104)  |
| <b>Objectives</b>                            | This subject aims to provide students with an understanding of various security concerns in wireless networks (e.g., WiFi and mobile cellular networks) and mobile systems and applications (e.g., Android and iOS).   |
| <b>Intended Subject Learning Outcomes</b>    | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand the security threats, concerns, and vulnerabilities in wireless and mobile systems, and the corresponding security mechanisms and authentication procedures</li> <li>2. Understand the strategies for developing secure mobile applications, and the use of mobile security penetration tools for evaluating the robustness of mobile applications</li> <li>3. Apply the knowledge to develop practical applications that are robust against mobile platform attack tools</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Understand the creative process when designing solutions to a problem</li> </ol>   |
| <b>Subject Synopsis/ Indicative Syllabus</b> | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Introduction to Mobile and Wireless Networks</u><br/>Mobile cellular networks (3G/4G LTE), IEEE wireless networks (IEEE 802.11, IEEE 802.15), mobile networks (NEMO, MANET).</li> <li>2. <u>Vulnerability of Wireless Networks</u><br/>Threats and risks to telecommunication systems, vulnerabilities from wired to wireless communications, fundamental security mechanisms.</li> <li>3. <u>WiFi Security</u><br/>Attacks on wireless networks, security in the IEEE 802.11 standard, security in 802.11i, authentication in wireless networks, layer 3 security mechanisms.</li> <li>4. <u>Security in Mobile Telecommunication Networks</u><br/>Vulnerability of signaling systems, GSM and GPRS security, 3G security, network interconnection.</li> <li>5. <u>Mobile Systems and Development Strategies</u><br/>Top issues facing mobile devices, tips for secure mobile application development, mobile HTML security, SMS security, mobile geolocation.</li> <li>6. <u>Android and iOS Security</u><br/>Android IPC mechanisms, security model, permission review, security tools. iOS security testing, application format, permissions and user controls. Mobile security penetration testing tools.</li> </ol> |

| <b>Teaching/Learning Methodology</b>  | <p>Lectures: The subject matters will be delivered through lectures. Students will be engaged in the lectures through Q&amp;A, discussions and specially designed classroom activities.</p> <p>Tutorials: During tutorials, students will work on/discuss some chosen topics in small group. This will help strengthen the knowledge taught in lectures.</p> <p>Laboratory and assignments: During laboratory exercises, students will perform hands-on tasks to practice what they have learned. They will evaluate the vulnerability of systems and design solutions to problems. The assignments will help students to review the knowledge taught in class.</p> <p>While lectures and tutorials will help to achieve the professional outcomes, the open-ended questions in laboratory exercises and assignments will provide the chance to students to exercise their creativity in problem solving.</p> |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
|---|---|--|---|------------------|---|--|-------------------------------------|-------------|--|--|--|--|-----------|---|---|---|--------------------------|-------|--|--|--|--|----------------------------|-----|------------------------------------|---|---|---|---------|-----|---|---|--|--|------------------------|-----|---|--|---|---|----------------|-----|------------------------------------|---|--|---|------------------|------|--|--|--|--|
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b>                    | <table border="1"> <thead> <tr> <th rowspan="2">Specific Assessment Methods/Tasks</th> <th rowspan="2">% Weighting</th> <th colspan="4">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td>(50%)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>• Homework and assignments</td> <td>10%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>• Tests</td> <td>10%</td> <td>✓</td> <td>✓</td> <td></td> <td></td> </tr> <tr> <td>• Laboratory exercises</td> <td>30%</td> <td></td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>2. Examination</td> <td>50%</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>Total:</td> <td>100%</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>      |  |   |                  |   |  | Specific Assessment Methods/Tasks   | % Weighting | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |  |  |  | 1         | 2 | 3 | 4 | 1. Continuous Assessment | (50%) |  |  |  |  | • Homework and assignments | 10% | ✓                                  | ✓ | ✓ | ✓ | • Tests | 10% | ✓   | ✓ |  |  | • Laboratory exercises | 30% |   |  | ✓ | ✓ | 2. Examination | 50% | ✓                                  | ✓ |  | ✓ | Total:           | 100% |  |  |  |  |
| Specific Assessment Methods/Tasks   | % Weighting   | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
|   |   | 1  | 2 | 3                | 4 |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| 1. Continuous Assessment  | (50%)   |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Homework and assignments  | 10%   | ✓  | ✓ | ✓                | ✓ |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Tests   | 10%   | ✓  | ✓ |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Laboratory exercises  | 30%   |  |   | ✓                | ✓ |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| 2. Examination  | 50%   | ✓  | ✓ |                  | ✓ |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| Total:  | 100%  |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| <b>Student Study Effort Expected</b>  | <table border="1"> <tr> <td colspan="6"><b>Class contact (time-tabled):</b></td> </tr> <tr> <td colspan="4">• Lecture</td> <td colspan="2">24 Hours</td> </tr> <tr> <td colspan="4">• Tutorial/Laboratory/Practice Classes</td> <td colspan="2">15 Hours</td> </tr> <tr> <td colspan="6"><b>Other student study effort:</b></td> </tr> <tr> <td colspan="4">• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</td> <td colspan="2">36 Hours</td> </tr> <tr> <td colspan="4">• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</td> <td colspan="2">30 Hours</td> </tr> <tr> <td colspan="4"><b>Total student study effort:</b></td> <td colspan="2"><b>105 Hours</b></td> </tr> </table>  |  |   |                  |   |  | <b>Class contact (time-tabled):</b> |             |  |  |  |  | • Lecture |   |   |   | 24 Hours                 |       | • Tutorial/Laboratory/Practice Classes |  |  |  | 15 Hours                   |     | <b>Other student study effort:</b> |   |   |   |         |     | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination |   |  |  | 36 Hours               |     | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing |  |   |   | 30 Hours       |     | <b>Total student study effort:</b> |   |  |   | <b>105 Hours</b> |      |  |  |  |  |
| <b>Class contact (time-tabled):</b>   |   |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Lecture   |   |  |   | 24 Hours         |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Tutorial/Laboratory/Practice Classes  |   |  |   | 15 Hours         |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| <b>Other student study effort:</b>  |   |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination |   |  |   | 36 Hours         |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing     |   |  |   | 30 Hours         |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| <b>Total student study effort:</b>  |   |  |   | <b>105 Hours</b> |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| <b>Reading List and References</b>  | <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. H Chaouchi, M Laurent-Maknavicius, <i>Wireless and Mobile Network Security</i>, Wiley, 2009.</li> <li>2. P. Venkataram, B. Sathish Babu, <i>Wireless and Mobile Network Security</i>, Tata McGraw-Hill, 2010.</li> <li>3. H. Dwivedi, C. Clark, D. Thiel, <i>Mobile Application Security</i>, McGraw-Hill, 2010.</li> </ol>  |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| <b>Last Updated</b>   | November 2014   |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |
| <b>Prepared by</b>  | Dr Ivan Ho  |  |   |                  |   |  |                                     |             |  |  |  |  |           |   |   |   |                          |       |  |  |  |  |                            |     |                                    |   |   |   |         |     |   |   |  |  |                        |     |   |  |   |   |                |     |                                    |   |  |   |                  |      |  |  |  |  |

### Subject Description Form

|   |   |
|---|---|
| <b>Subject Code</b>                           | EIE4114 (for 42480 and 42470)   |
| <b>Subject Title</b>                          | Digital Forensics for Crime Investigation   |
| <b>Credit Value</b>                           | 3   |
| <b>Level</b>                                  | 4   |
| <b>Pre-requisite/ Co-requisite/ Exclusion</b> | Nil   |
| <b>Objectives</b>                             | <ol style="list-style-type: none"> <li>1. To provide students with basic concepts about digital forensic techniques for crime investigation</li> <li>2. To appreciate how different forensic techniques are used for information security</li> </ol>  |
| <b>Intended Subject Learning Outcomes</b>     | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand different approaches for digital forensics</li> <li>2. Use different techniques for forensic investigation</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>3. Present ideas and findings effectively</li> </ol>  |
| <b>Subject Synopsis/ Indicative Syllabus</b>  | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Digital and Computational Forensics Context</u><br/>Introduction to digital and computational forensics; Historical aspects in digital and computational forensics; Introduction to techniques for multimedia manipulation; different classes of techniques for forensics: basic idea, framework and applications.</li> <li>2. <u>Forensics based on Intrinsic/Extrinsic Data</u><br/>Models of digital data capturing device; idea of the use of intrinsic data in digital forensic investigation; introduction to forensics techniques using intrinsic data; applications in source device identification, device linking and integrity verification. Introduction to techniques for multimedia content protection and authentication; attacks modelling.</li> <li>3. <u>Machine Learning Forensics</u><br/>Different types of ML-based Forensics; Extractive Forensics; Inductive forensics; deductive forensics. Example use cases in ML-based Forensics.</li> <li>4. <u>Digital Evidence</u><br/>Models of digital evidence; event analytics: surveillance, monitoring, forensic and security; file carving: idea, different classes of techniques; software tools for file carving.</li> <li>5. <u>Robustness of Forensic Techniques</u><br/>Robustness and security of forensic techniques; adversary model; case studies of reliabilities of forensic techniques.</li> </ol> <p><b>Laboratory Experiments:</b></p> <p>Practical Works:</p> <ol style="list-style-type: none"> <li>1. Evaluation of forensic techniques based on intrinsic data.</li> <li>2. Evaluation of forensic techniques based on extrinsic data.</li> <li>3. Forensic analysis of digital evidence.</li> </ol> |

|                                      |                                     |  |   |
|--------------------------------------|-------------------------------------|--|---|
| <b>Teaching/Learning Methodology</b> | <b>Teaching and Learning Method</b> | <b>Intended Subject Learning Outcome</b> | <b>Remarks</b>  |
|                                      | Lectures                            | 1, 2                                     | Fundamental principles and key concepts of the subject are delivered to students.   |
|                                      | Tutorials                           | 1, 2                                     | Supplementary to lectures;<br>Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br>Problems and application examples are given and discussed. |
|                                      | Laboratory sessions                 | 2, 3                                     | Students will evaluate different kinds of forensic techniques.  |
|                                      | Mini-project                        | 1, 2, 3                                  | Students are required to study a problem in forensic application. Students will need to submit a written report and make a presentation.  |

|  |   |                    |   |          |          |
|--|---|--------------------|---|----------|----------|
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b> | <b>Specific Assessment Methods/Tasks</b>  | <b>% Weighting</b> | <b>Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</b> |          |          |
|  |   |                    | <b>1</b>  | <b>2</b> | <b>3</b> |
|  | 1. Continuous Assessment (total 50%)  |                    |   |          |          |
|  | • Tests   | 14%                | √   | √        |          |
|  | • Laboratory sessions   | 19%                |   | √        | √        |
|  | • Mini-project  | 17%                |   | √        | √        |
|  | 2. Examination  | 50%                | √   | √        |          |
|  | Total   | 100%               |   |          |          |
|  | The continuous assessment consists of tests, laboratory exercises and a mini-project.   |                    |   |          |          |
|  | <b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b>  |                    |   |          |          |
| <b>Specific Assessment Methods/Tasks</b>                                       | <b>Remark</b>   |                    |   |          |          |
| Tests and examination  | end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;<br><br>students need to think critically in order to come with a solution for a problem. |                    |   |          |          |
| Laboratory sessions, mini-project  | oral examination will be conducted to evaluate student's technical knowledge and communication skills.  |                    |   |          |          |

|                                      |  |                  |
|--------------------------------------|--|------------------|
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>  |                  |
|                                      | • Lecture  | 21 Hours         |
|                                      | • Tutorial/Laboratory/Practice Classes   | 18 Hours         |
|                                      | <b>Other student study effort:</b>   |                  |
|                                      | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination  | 36 Hours         |
|                                      | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing  | 30 Hours         |
|                                      | <b>Total student study effort:</b>   | <b>105 Hours</b> |
| <b>Reading List and References</b>   | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. JoakimKavrestad, <i>“Fundamentals of Digital Forensics: Theory, Methods, and Real-Life Applications”</i>, Springer, 2020.</li> <li>2. Darren R. Hayes, <i>“A Practical Guide to Digital Forensics Investigations”</i>, Pearson IT Certification, 2020.</li> <li>3. Nihad A Hassan, <i>“Digital Forensics Basics: A Practical Guide using Windows OS”</i>, Apress 2019.</li> <li>4. Anders Flaglien, Inger Marie Sunde, AusraDilijonaite, Jeff Hamm, Hens Petter Sandvik, PetterBjelland, Katrin Franke, Stefan Axelsson, <i>“Digital Forensics: an academic introduction”</i>, John Wiley &amp; Sons, 2018.</li> <li>5. Husrev Taha Sencar and Nasir Memon (editors), <i>“Digital Image Forensics”</i>, Springer, 2013.</li> <li>6. Frank Y. Shih, <i>“Multimedia Security Watermarking, Steganography and Forensics”</i>, CRC Press, 2013.</li> <li>7. Li Chang-Tsun, <i>“Emerging Digital Forensics Applications for Crime Protection, Prevention and Security”</i>, IGI Global 2013, doi:10.4018/978-1-4666-4006-1, 2013.</li> <li>8. Li Chang-Tsun and Anthony T.S. Ho, <i>“Crime Prevention Technologies and Applications for Advancing Criminal Investigation”</i>, IGI Global 2012, doi:10.4018/978-1-4666-1758-2, 2012.</li> </ol> |                  |
| <b>Last Updated</b>                  | November 2021  |                  |
| <b>Prepared by</b>                   | Dr Wen Chen and Dr Bonnie Law  |                  |

**Subject Description Form**

|   |   |
|---|---|
| <b>Subject Code</b>                                   | EIE4116   |
| <b>Subject Title</b>                                  | Surveillance Studies and Technologies   |
| <b>Credit Value</b>                                   | 3   |
| <b>Level</b>  | 4   |
| <b>Pre-requisite/<br/>Co-requisite/<br/>Exclusion</b> | Nil   |
| <b>Objectives</b>                                     | This course aims at providing students with thorough understanding of recent surveillance technologies and their emerging trends. They will also learn the pros and cons of various surveillance technologies.  |
| <b>Intended Subject Learning Outcomes</b>             | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Introduce a brief history to provide context for the evolution of today's surveillance technologies</li> <li>2. Understand the different surveillance technologies</li> <li>3. Understand the system design principle of CCTV and other related video security and surveillance technologies</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Understand professional, ethical, legal, security and social issues and responsibilities</li> </ol>   |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b>      | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Overview of Surveillance Studies</u><br/>Brief history, key developments leading to current surveillance technologies; public controversy and accountability.</li> <li>2. <u>Surveillance Technologies and Techniques</u><br/>Visual surveillance; audio surveillance; aerial surveillance; radio-wave surveillance; GPS surveillance; sensors; computer, Internet and social media surveillance; data cards; biochemical surveillance; animal surveillance; Biometrics; pros and cons of surveillance technologies.</li> <li>3. <u>Case Study: Video and CCTV Surveillance</u><br/>Video's critical role in the security plan; the evolution of video and CCTV surveillance systems, network videos; cameras – analog, digital and network, cameras technologies; analog and digital video; video compression technologies; video processing equipments; video recorders, servers and storage; video management; video motion detectors; video analytics.</li> <li>4. <u>Privacy and Legislation</u><br/>Ubiquity of surveillance devices; balance between the needs of law enforcement of the privacy of law-abiding citizens.</li> </ol> <p><b>Laboratory Experiments:</b></p> <ol style="list-style-type: none"> <li>1. Analysis of video compression in surveillance systems</li> <li>2. Critical scene detection in surveillance systems</li> <li>3. Video signal analysis.</li> </ol> |

|  |  |  |  |          |          |          |
|--|--|--|--|----------|----------|----------|
| <b>Teaching/Learning Methodology</b>   | <b>Teaching and Learning Method</b>      | <b>Intended Subject Learning Outcome</b> | <b>Remarks</b>   |          |          |          |
|  | Lectures                                 | 1, 2, 3, 4                               | fundamental principles and key concepts of the subject are delivered to students   |          |          |          |
|  | Tutorials                                | 1, 2, 3, 4                               | supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed |          |          |          |
|  | Laboratory sessions                      | 3  | students will make use of the software to develop surveillance applications.   |          |          |          |
| <b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b>                                   | <b>Specific Assessment Methods/Tasks</b> | <b>% Weighting</b>                       | <b>Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</b>  |          |          |          |
|  |  |  | <b>1</b>   | <b>2</b> | <b>3</b> | <b>4</b> |
|  | 1. Continuous Assessment (total 40%)     |  |  |          |          |          |
|  | • Short quizzes/ Assignments             | 10%                                      | ✓  | ✓        | ✓        | ✓        |
|  | • Tests                                  | 20%                                      | ✓  | ✓        | ✓        | ✓        |
|  | • Laboratory sessions                    | 10%                                      |  |          | ✓        |          |
|  | 2. Examination                           | 60%                                      | ✓  | ✓        | ✓        | ✓        |
|  | Total                                    | 100%                                     |  |          |          |          |
| The continuous assessment will consist of laboratory reports, a number of short quizzes, assignments, and tests. |  |  |  |          |          |          |

|                                      |   |  |
|--------------------------------------|---|--|
|                                      | <b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b>  |  |
|                                      | <b>Specific Assessment Methods/Tasks</b>  | <b>Remark</b>  |
|                                      | Short quizzes   | mainly objective tests (e.g., multiple-choice questions, true-false, and matching items) conducted to measure the students' ability to remember facts and figures as well as their comprehension of subject materials  |
|                                      | Assignments, tests and examination  | end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;<br>students need to think critically and creatively in order to come with an alternate solution for an existing problem                               |
|                                      | Laboratory sessions   | Each students is required to produce a written report; accuracy and the presentation of the report will be assessed;<br>oral examination based on the laboratory exercises will be conducted for each student to evaluate his/her technical knowledge and communication skills |
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>   |  |
|                                      | <ul style="list-style-type: none"> <li>• Lecture</li> </ul>   | 24 Hours   |
|                                      | <ul style="list-style-type: none"> <li>• Tutorial/Laboratory/Practice Classes</li> </ul>  | 15 Hours   |
|                                      | <b>Other student study effort:</b>  |  |
|                                      | <ul style="list-style-type: none"> <li>• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination</li> </ul>   | 36 Hours   |
|                                      | <ul style="list-style-type: none"> <li>• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing</li> </ul>   | 30 Hours   |
|                                      | <b>Total student study effort:</b>  |  |
|                                      | <b>105 Hours</b>  |  |
| <b>Reading List and References</b>   | <b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. J.K. Petersen, <i>Introduction to Surveillance Studies</i>, CRC Press, 2013.</li> <li>2. Vlado Damjanovski, <i>CCTV: Networking and Digital Technology</i>, Elsevier, 2005.</li> <li>3. Herman Kruegle, <i>CCTV Surveillance: Analog and Digital Video Practices and Technology</i>, Elsevier Butterworth-Heinemann, 2007.</li> <li>4. Fredrik Nilsson and Axis Communications, <i>Intelligent Network Video: Understanding Modern Video Surveillance Systems</i>, CRC Press, 2009.</li> <li>5. Daniel Neyland, <i>Privacy, Surveillance and Public Trust</i>, Palgrave Macmillan, 2006.</li> <li>6. Fredrika Bjorklund and Ola Svenonius, <i>Video Surveillance and Social Control in a Comparative Perspective</i>, Routledge, 2013.</li> </ol> |  |
| <b>Last Updated</b>                  | November 2014   |  |
| <b>Prepared by</b>                   | Dr YL Chan  |  |

### Subject Description Form

|  |  |
|--|--|
| <b>Subject Code</b>                              | EIE4117  |
| <b>Subject Title</b>                             | Capstone Project   |
| <b>Credit Value</b>                              | 6  |
| <b>Level</b>                                     | 4  |
| <b>Pre-requisite/<br/>Co-requisite</b>           | Nil  |
| <b>Exclusion</b>                                 | Any other equivalent capstone project  |
| <b>Objectives</b>                                | <p>Students will be most benefited from doing projects in order to have the chance to practise hands-on application of the knowledge the student has learned through the curriculum, while producing something useful or valuable. On this ground, the Capstone Project (also called Final-Year Project or FYP in short) component in the curriculum is designed that meets the following objectives:</p> <ol style="list-style-type: none"> <li>1. To provide the opportunity to the students to apply what they have learned in previous stages in a real-life technological problem</li> <li>2. To enable the student to acquire and practise project management skills and discipline on pursuing the Capstone Project</li> <li>3. To enable the student to apply knowledge in information security to analyse problems and synthesize solutions while considering various practical constraints.</li> </ol>   |
| <b>Intended Subject Learning Outcomes</b>        | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand the background, requirements, objectives, and deliverables to be produced for the specific project</li> <li>2. Apply knowledge and skills relevant to information security to achieve the objectives of the project</li> <li>3. Learn to use new tools and facilities, and to gather new information, for the conduction of the project</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>4. Work under the guidance of a supervisor while exercising self-discipline to manage the project</li> <li>5. Communicate effectively with related parties (supervisor, peers, vendors, etc.)</li> <li>6. Work collaboratively with others (team-partners, outsource company, technical support staff, etc.)</li> <li>7. Understand the local and global impact of information security on individuals, organisations, and society</li> </ol> |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b> | <p><b>Syllabus:</b></p> <p>The progression of the project will consist of the following stages:</p> <p><u>Project Specification</u></p> <p>In this stage, the student will work in conjunction with the project supervisor to draw up a concrete project plan specifying at least the following:</p> <ol style="list-style-type: none"> <li>1. Background of the project</li> <li>2. Aims and objectives</li> <li>3. Deliverables</li> <li>4. Methodology to be adopted</li> <li>5. Schedule</li> </ol>  |

Project Execution  
 The project will be pursued so that the objectives are to be met; the deliverables are to be produced in accordance with the schedule. The student and the project supervisor will meet constantly to discuss the progress. In particular the following should be demonstrated:

1. Adherence to the schedule
2. Achievement of objectives by the student's work
3. Initiatives of the student to work, design, and to solve problems
4. Inquisitiveness of the student (e.g. to probe into different phenomena or to try different approaches)
5. Diligence of the student to spend sufficient effort on the project
6. Systematic documentation of data, design, results, etc. during the process of working out the project

Project Report  
 It is important that the student is competent in disseminating the results for others to review. Through this dissemination process, project achievements can be communicated, experience can be shared, and knowledge and skills learned can be retained and transferred. The following elements will be important as evidence of achievement:

1. Project log book (documenting the work done over the year)
2. Project report (hardcopy and softcopy)
3. Presentation
4. Performance in a Question-and-Answer session
5. Demonstration

**Assessment Methods in Alignment with Intended Subject Learning Outcomes**

| Specific Assessment Methods/Tasks | % Weighting | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |   |   |   |   |   |   |
|-----------------------------------|-------------|--|---|---|---|---|---|---|
|                                   |             | 1  | 2 | 3 | 4 | 5 | 6 | 7 |
| Continuous Assessment             | 100%        | ✓  | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Total                             | 100%        |  |   |   |   |   |   |   |

**Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:**

| Specific Assessment Methods/Tasks | Remark  |
|-----------------------------------|---|
| Continuous assessment             | The assessment of the project work is done continuously throughout the whole project period. The evidence of the student's achievement will be documented in the log book and reports submitted in various stages. The student will be required to give a presentation and demonstration so that he/she can communicate with other parties about the project achievement. |

|                                      |   |                  |
|--------------------------------------|---|------------------|
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>   |                  |
|                                      | • Structured study  | 52 Hours         |
|                                      | • Meeting with project supervisor (1 hours per week)  | 26 Hours         |
|                                      | <b>Other student study effort:</b>  |                  |
|                                      | • Project development and guided study  | 102 Hours        |
|                                      | • Reports writing, preparing for presentation and demonstration                               | 30 Hours         |
|                                      | <b>Total student study effort:</b>  | <b>210 Hours</b> |
| <b>Reading List and References</b>   | <b>Reference Books:</b><br><i>To be specified by the project supervisor for each project.</i> |                  |
| <b>Last Updated</b>                  | December 2014   |                  |
| <b>Prepared by</b>                   | Dr Daniel Lun   |                  |

### Subject Description Form

|  |   |
|--|---|
| <b>Subject Code</b>                              | EIE4118 (for 42480 and 42470)   |
| <b>Subject Title</b>                             | Intrusion Detection and Penetration Test  |
| <b>Credit Value</b>                              | 3   |
| <b>Level</b>                                     | 4   |
| <b>Pre-requisite</b>                             | <p><u>For 42480:</u><br/>EIE3120 Network Technologies and Security</p> <p><u>For 42470:</u><br/>EIE4106 Network Management and Security</p>   |
| <b>Co-requisite/<br/>Exclusion</b>               | Nil   |
| <b>Objectives</b>                                | <ol style="list-style-type: none"> <li>1. To provide a solid foundation to the students in network security with a focus on intrusion detection and penetration test;</li> <li>2. To enable the students to master the knowledge about intrusion detection and penetration test in the context of real-life applications;</li> <li>3. To prepare the students for understanding, evaluating critically, and assimilating new knowledge and emerging technology in network security.</li> </ol>  |
| <b>Intended Subject Learning Outcomes</b>        | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand the physical location, the operational characteristics and the various functions performed by the intrusion detection/prevention system</li> <li>2. Describe how components in different layers inter-operate in the intrusion detection/prevention system</li> <li>3. Understand the current network security vulnerabilities and effective procedures of penetration test</li> <li>4. Learn new techniques and to align new security technologies to existing network infrastructure</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>5. Present ideas and findings effectively</li> <li>6. Learn independently</li> </ol>  |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b> | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Vulnerabilities and Security Threats to Computer Networks</u><br/>Sources of vulnerabilities, types of attacks, attacks against various security objectives, countermeasures of attacks.</li> <li>2. <u>Penetration Test Methodologies and Procedures</u><br/>White-box / grey-box testing, security surfaces for evaluation, automated tools for vulnerability scan and penetration test.</li> <li>3. <u>Intrusion Detection and Prevention Technologies</u><br/>Host-based intrusion detection system (IDS) / intrusion prevention system (IPS), network-based IDS/IPS. Intrusion detection techniques, misuse detection: pattern matching, policy-based and state-based; anomaly detection: statistical based, honeypots-based; hybrid detection.</li> <li>4. <u>IDS and IPS Architecture</u><br/>Tiered architectures, single-tiered, multi-tiered, peer-to-peer. Sensor: sensor functions, sensor deployment and security. Agents: agent</li> </ol> |

|   | <p>functions, agent deployment and security. Alert management: alert types, alert manager deployment and security. Information flow in IDS and IPS, defending IDS/IPS.</p> <p>5. <u>Network Security Monitoring</u><br/>Network traffic collection and storage, detection mechanisms and indicators of compromise, packet analysis, friendly and threat intelligence.</p> <p>6. <u>Deployment of IDS/IPS</u><br/>Case study on commercial and open-source IDS.</p> <p><b>Possible Laboratory Experiments:</b></p> <ol style="list-style-type: none"> <li>Vulnerability scan and penetration test</li> <li>Protocol and traffic analysis<br/>Intrusion detection using Snort</li> </ol>   |   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
|---|--|---|-----------------------------------|--|----------|------------|---|-----------|------------------|---|---------------------|---------|---|---|---|--------------------------|-----|--|--|--|--|--|--|--------|-----|---|---|---|--|---|--|-----------|-----|---|---|---|---|---|---|--|-----|---|---|---|--|---|--|----------------|-----|--|--|--|--|--|--|------------------|-----|---|---|---|--|---|--|-------|------|--|--|--|--|--|--|
| <p><b>Teaching/Learning Methodology</b></p>   | <table border="1"> <thead> <tr> <th>Teaching and Learning Method</th> <th>Intended Subject Learning Outcome</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>1, 2, 3, 4</td> <td>Fundamental principles and key concepts of the subject are delivered to students.</td> </tr> <tr> <td>Tutorials</td> <td>1, 2, 3, 4, 5, 6</td> <td>Supplementary to lectures and are conducted with smaller class size;<br/>Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br/>Problems and application examples are given and discussed.</td> </tr> <tr> <td>Laboratory sessions</td> <td>3, 5, 6</td> <td>Students will conduct practical exercises in intrusion detection and prevention to reinforce concepts and techniques learned.</td> </tr> </tbody> </table>   | Teaching and Learning Method  | Intended Subject Learning Outcome | Remarks  | Lectures | 1, 2, 3, 4 | Fundamental principles and key concepts of the subject are delivered to students. | Tutorials | 1, 2, 3, 4, 5, 6 | Supplementary to lectures and are conducted with smaller class size;<br>Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br>Problems and application examples are given and discussed. | Laboratory sessions | 3, 5, 6 | Students will conduct practical exercises in intrusion detection and prevention to reinforce concepts and techniques learned. |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| Teaching and Learning Method  | Intended Subject Learning Outcome  | Remarks   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| Lectures  | 1, 2, 3, 4   | Fundamental principles and key concepts of the subject are delivered to students.   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| Tutorials   | 1, 2, 3, 4, 5, 6   | Supplementary to lectures and are conducted with smaller class size;<br>Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br>Problems and application examples are given and discussed. |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| Laboratory sessions   | 3, 5, 6  | Students will conduct practical exercises in intrusion detection and prevention to reinforce concepts and techniques learned.   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| <p><b>Assessment Methods in Alignment with Intended Subject Learning Outcomes</b></p> | <table border="1"> <thead> <tr> <th rowspan="2">Specific Assessment Methods/ Tasks</th> <th rowspan="2">% Weighting</th> <th colspan="6">Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>1. Continuous Assessment</td> <td>70%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>• Quiz</td> <td>15%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>• Project</td> <td>30%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>• Laboratory demonstration and reports</td> <td>25%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>2. Examination</td> <td>30%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>• Practical Test</td> <td>30%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>Total</td> <td>100%</td> <td colspan="6"></td> </tr> </tbody> </table> | Specific Assessment Methods/ Tasks  | % Weighting                       | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |          |            |   |           |                  | 1   | 2                   | 3       | 4   | 5 | 6 | 1. Continuous Assessment | 70% |  |  |  |  |  |  | • Quiz | 15% | ✓ | ✓ | ✓ |  | ✓ |  | • Project | 30% | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | • Laboratory demonstration and reports | 25% | ✓ | ✓ | ✓ |  | ✓ |  | 2. Examination | 30% |  |  |  |  |  |  | • Practical Test | 30% | ✓ | ✓ | ✓ |  | ✓ |  | Total | 100% |  |  |  |  |  |  |
| Specific Assessment Methods/ Tasks  | % Weighting  |   |                                   | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
|   |  | 1   | 2                                 | 3  | 4        | 5          | 6   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| 1. Continuous Assessment  | 70%  |   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| • Quiz  | 15%  | ✓   | ✓                                 | ✓  |          | ✓          |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| • Project   | 30%  | ✓   | ✓                                 | ✓  | ✓        | ✓          | ✓   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| • Laboratory demonstration and reports  | 25%  | ✓   | ✓                                 | ✓  |          | ✓          |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| 2. Examination  | 30%  |   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| • Practical Test  | 30%  | ✓   | ✓                                 | ✓  |          | ✓          |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |
| Total   | 100%   |   |                                   |  |          |            |   |           |                  |   |                     |         |   |   |   |                          |     |  |  |  |  |  |  |        |     |   |   |   |  |   |  |           |     |   |   |   |   |   |   |  |     |   |   |   |  |   |  |                |     |  |  |  |  |  |  |                  |     |   |   |   |  |   |  |       |      |  |  |  |  |  |  |

|                                      |   |  |
|--------------------------------------|---|--|
|                                      | <b>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</b>  |  |
|                                      | <b>Specific Assessment Methods/Tasks</b>  | <b>Remark</b>  |
|                                      | Project   | Students need to think critically and creatively in order to come with a solution for a practical problem.   |
|                                      | Quiz  | Mainly objective quizzes conducted to measure the students' understanding of the theories and concepts as well as their comprehension of subject materials.  |
|                                      | Examination (Practical Test)  | Hands-on type problems emulate real-life penetration test and intrusion detection scenarios, which are used to evaluate students' ability in applying concepts and skills learnt in the classroom. |
| Laboratory sessions                  | Each student is required to produce a real-life demo and/or a written report to evaluate his/her technical knowledge and communication skills.  |  |
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>   |  |
|                                      | 1. Lecture  | 27 Hours   |
|                                      | 2. Tutorial/Laboratory/Practice Classes   | 12 Hours   |
|                                      | <b>Other student study effort:</b>  |  |
|                                      | 3. Lecture: preview/review of notes; homework/assignment; preparation for test/examination  | 24 Hours   |
|                                      | 4. Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing  | 42 Hours   |
|                                      | <b>Total student study effort:</b>  | <b>105 Hours</b>   |
| <b>Reading List and References</b>   | <b>Reference Books:</b>   |  |
|                                      | <ol style="list-style-type: none"> <li>1. C. Endorf, E. Schultz and J. Mellander, <i>Intrusion Detection &amp; Prevention</i>, McGraw-Hill/Osborne, 2004.</li> <li>2. Ali A. Ghorbani, <i>Network intrusion detection and prevention concepts and techniques</i>, Springer, 2010.</li> <li>3. J. M. Kizza, <i>Computer Network Security</i>, Springer, 2005.</li> <li>4. D. Jacobson, <i>Introduction to Network Security</i>, CRC Press, 2009.</li> <li>5. Chris Sanders and Jason Smith, <i>Applied Network Security Monitoring: Collection, Detection, and Analysis</i>, Syngress, 2013.</li> <li>6. Richard Bejtlich, <i>The Practice of Network Security Monitoring: Understanding Incident Detection and Response</i>, No Starch Press, 2013.</li> <li>7. Peter Kim, <i>The Hacker Playbook 3: Practical Guide To Penetration Testing</i>, May 2018.</li> </ol> |  |
| <b>Last Updated</b>                  | November 2021   |  |
| <b>Prepared by</b>                   | Dr H. Hu  |  |

### Subject Description Form

|  |   |
|--|---|
| <b>Subject Code</b>                              | EIE4121   |
| <b>Subject Title</b>                             | Machine Learning in Cyber-security  |
| <b>Credit Value</b>                              | 3   |
| <b>Level</b>                                     | 4   |
| <b>Pre-requisite</b>                             | Nil   |
| <b>Co-requisite/<br/>Exclusion</b>               | Nil   |
| <b>Objectives</b>                                | <ol style="list-style-type: none"> <li>1. To introduce concepts about machine learning techniques in cyber-security</li> <li>2. To develop skills of using recent techniques for solving practical problems in cyber-security</li> </ol>  |
| <b>Intended Learning Outcomes</b>                | <p><b>Upon completion of the subject, students will be able to:</b></p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> <li>1. Understand different machine learning techniques</li> <li>2. Use different techniques for solving problems in cyber security</li> </ol> <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> <li>3. Present ideas and findings effectively</li> </ol>   |
| <b>Subject Synopsis/<br/>Indicative Syllabus</b> | <p><b>Syllabus:</b></p> <ol style="list-style-type: none"> <li>1. <u>Machine learning techniques</u><br/>Introduction to machine learning; Basic concepts and classification; Supervised learning and unsupervised learning; classification; clustering; Neural Networks; Support vector machines; Dimensionality reduction; Deep learning</li> <li>2. <u>Machine learning development environments</u><br/>Software tools for implementing machine learning techniques; Generalization performance; Issues of over-fitting.</li> <li>3. <u>Malware Analysis</u><br/>Introduction to malware analysis; Types of malware analysis; static analysis, dynamic analysis; Behavioral vs code analysis; Use of machine learning techniques for malware detection such as K-Means, support vector machines, convolutional neural networks.</li> <li>4. <u>Phishing detection</u><br/>Introduction to phishing detection; Analysis of email/websites/message features for phishing characterization; Use of techniques such as logistic regression and decision tree for phishing detection.</li> <li>5. <u>Anomaly Detection</u><br/>Introduction to the anomaly definition; overview of anomaly detection techniques; static rules technique; use of machine learning techniques such as autoencoder for anomaly detection.</li> </ol> <p><b>Laboratory Experiments:</b></p> <p>Practical Works:</p> <ol style="list-style-type: none"> <li>1. Introduction to machine learning framework</li> <li>2. Evaluation of machine learning techniques in malware detection</li> <li>3. Evaluation of machine learning techniques in phishing detection</li> </ol> |

| Teaching/Learning Methodology | Teaching and Learning Method | Intended Subject Learning Outcome | Remarks   |
|-------------------------------|------------------------------|-----------------------------------|---|
|                               | Lectures                     | 1, 2                              | Fundamental principles and key concepts of the subject are delivered to students.   |
|                               | Tutorials                    | 1, 2                              | Supplementary to lectures;<br>Students will be able to clarify concepts and to have a deeper understanding of the lecture material;<br>Problems and application examples are given and discussed. |
|                               | Laboratory sessions          | 2, 3                              | Students will evaluate different kinds of machine learning techniques.  |
|                               | Mini-project                 | 1, 2, 3                           | Students are required to study the use of machine learning techniques in cyber-security application. Students will need to submit a written report and make a presentation.                       |

| Assessment Methods in Alignment with Intended Learning Outcomes | Specific Assessment Methods/Tasks    | % Weighting | Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate) |   |   |
|---|--------------------------------------|-------------|--|---|---|
|   |                                      |             | 1  | 2 | 3 |
|   | 1. Continuous Assessment (total 50%) |             |  |   |   |
| • Tests   | 18%                                  | √           | √  |   |   |
| • Laboratory sessions   | 13%                                  |             | √  | √ |   |
| • Mini-project  | 19%                                  |             | √  | √ |   |
| 2. Examination  | 50%                                  | √           | √  |   |   |
| Total   | 100%                                 |             |  |   |   |

The continuous assessment consists of tests, laboratory exercises and a mini-project.

**Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:**

| Specific Assessment Methods/Tasks | Remark  |
|-----------------------------------|---|
| Tests                             | These can measure students' understanding of the theories and concepts as well as their comprehension of subject materials.   |
| Examination                       | end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom;<br><br>students need to think critically in order to come with a solution for a problem. |
| Laboratory sessions, mini-project | oral examination will be conducted to evaluate student's technical knowledge and communication skills.  |

|                                      |  |                  |
|--------------------------------------|--|------------------|
| <b>Student Study Effort Expected</b> | <b>Class contact (time-tabled):</b>  |                  |
|                                      | • Lecture  | 24 Hours         |
|                                      | • Tutorial/Laboratory/Practice Classes   | 15 Hours         |
|                                      | <b>Other student study effort:</b>   |                  |
|                                      | • Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination  | 26 Hours         |
|                                      | • Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing  | 40 Hours         |
|                                      | <b>Total student study effort:</b>   | <b>105 Hours</b> |
| <b>Reading List and References</b>   | <ol style="list-style-type: none"> <li>1. Thomas Tony, Athira P. Vijayaraghavan, Sabu Emmanuel, "Machine learning approaches in cyber security analytics", Springer, 2020.</li> <li>2. Padmavathi Ganapathi and D. Shanmugapriya, "Handbook of Research on Machine and Deep Learning Application for Cyber security", IGI Global, 2020.</li> <li>3. Mark Stamp, Introduction to Machine Learning with Applications in Information Security, Chapman and Hall/CRC, 2017.</li> <li>4. Chiheb Chebbi, Mastering Machine Learning for Penetration Testing, Packt Publishing Ltd, 2018.</li> <li>5. Monnappa K A, Learning Malware Analysis, Packt Publishing Ltd, 2018.</li> <li>6. Dipanjan Sarkar, Raghav Bali and Tushar Sharma, Practical Machine Learning with Python, Apress, 2018.</li> </ol> |                  |
| <b>Last Updated</b>                  | June 2021  |                  |
| <b>Prepared by</b>                   | Bonnie Law   |                  |

**Different types of GPA, and their calculation methods**

| <b>Types of GPA</b> | <b>Purpose</b>  | <b>Rules for GPA calculation</b>  |
|---------------------|---|---|
| GPA                 | Determine Progression/ Graduation                     | <p>(1) All academic subjects taken by the student throughout his study, both inside and outside the programme curriculum, are included in the GPA calculation.</p> <p>(2) IC training subjects will be included in the GPA calculation while WIE/Sandwich Training will not.</p> <p>(3) For retake subjects, only the last attempt will be taken in the GPA calculation.</p> <p>(4) Level weighting, if any, will be ignored.</p>   |
| Semester GPA        | Determine Progression                                 | Similar to the rules for GPA as described above, except that only subjects taken in that Semester, including retaken subjects, will be included in the calculation.   |
| Weighted GPA        | To give an interim indication on the likely Award GPA | <p>(1) Similar to the rules for GPA, except that only subjects inside the programme curriculum concerned will be included in the calculation. Subjects outside the programme curriculum will be excluded.</p> <p>(2) Only academic subjects will be counted towards the Weighted GPA.</p> <p>(3) For retake subjects, only the last attempt will be taken in the Weighted GPA calculation.</p> <p>(4) A weighting of 2 for Level 1 and 2 subjects, and a weighting of 3 for Level 3, 4 and 5 subjects, will be included in the calculation to determine the Honours classifications for Bachelor's degree programmes.</p> <p>(5) The weighted GPA will be the same as the Award GPA unless a student has taken more subjects than required.</p> |
| Award GPA           | For determination of award classification             | <p>If the student has not taken more subjects than required, the Award GPA will be as follows:</p> <p>(1) For programmes with level weightings:<br/>Award GPA = Weighted GPA</p> <p>(2) For Major/Minor programmes:<br/>Award GPA = Major GPA</p> <p>If students have taken more subjects than required, refer to Section 27.3.</p>   |

**University Graduation Requirements for  
New Articulation Degree Programmes offered from 2023/24 Onward**

All students qualifying for a 2-year Full-time Articulation Degree offered from 2023/24 onward must meet:

1. the University Graduation Requirements, and
2. the specific graduation requirements of their chosen programme of study.

The minimum University Graduation Requirements are explained in the sections below. For the graduation requirements of specific programmes of study, candidates should refer to the relevant section of the Programme Requirement Document or consult the programme-offering Departments concerned.

### Summary of University Graduation Requirements

To be eligible for a PolyU Bachelor's Degree under the revised framework for new articulation degree Programmes, a student must:

1. Complete successfully a minimum of 60 credits.

|   |                              |            |
|---|------------------------------|------------|
| Minimum credit requirement for graduation   |                              |            |
| <ul style="list-style-type: none"> <li>▪ General University Requirements (GUR)</li> <li>▪ Discipline-Specific Requirements (DSR)</li> </ul> | 9 credits<br>51 – 57 credits | 60 credits |
| Maximum total credits allowed without incurring a higher tuition fee*   |                              | 75 credits |

2. Earn a cumulative GPA of 1.70 or above at graduation.
3. Complete successfully the mandatory Work-Integrated Education (WIE) component as specified by their programme.
4. Satisfy the residential requirement for at least 1/3 of the credits to be completed for the award the student is currently enrolled, unless the professional bodies stipulate otherwise.
5. Satisfy the 9 credits of GUR distributed as follows:

| Area and Credit Requirement  | Curriculum Requirement   |
|--|--|
| Cluster-Area Requirements (CAR) [6 credits from the following two Cluster Areas:<br>1) Human Nature, Relations and Development (CAR-English Language)<br>2) Chinese History and Culture (CAR M)] | <ul style="list-style-type: none"> <li>• Students should take one 3-credit subject from both CAR M and a specially-designed CAR with English Language.</li> <li>• Students need to fulfil the Chinese reading and writing requirements.</li> <li>• Students may apply for a waiver if they have fulfilled the Chinese reading and writing requirements in their previous studies.</li> </ul> |
| Service Learning [3 credits]   | -  |

Regarding Language and Communication Requirements (LCR), this is normally not required. Only those students not meeting the equivalent standard of the Undergraduate Degree LCR (based on their previous studies in AD/HD programmes and their academic performance) will be required to take degree LCR subjects on top of the normal curriculum requirement. The Programme offering department will refer to the guidelines provided by the Language Centres (ELC and CLC) to determine whether a

new student has met the equivalent standard. Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR - Chinese and CAR - Chinese Reading and Writing requirements. However, this group of students would still be required to take one Chinese LCR subject recommended by CLC/EIE to fulfil their Chinese LCR.

**(a) Language and Communication Requirements (LCR)**

**English**

All undergraduate students must successfully complete two 3-credit English language subjects as stipulated by the University, according to their English language proficiency level (**Table A**). These subjects are designed to suit students' different levels of English language proficiency at entry, as determined by their HKDSE score or the English Language Centre (ELC) entry assessment (when no HKDSE score is available, e.g. in the case of non-local students).

Students entering the University with specified attainment grades in certain public examinations can be given credit transfer or exemption for one or both LCR English subjects.

*Table A: English LCR subjects (each 3 credits)*

| <b>English language competence level/<br/>Subject</b> | <b><i>Practical English<br/>for University<br/>Studies</i></b> | <b><i>English for<br/>University Studies</i></b> | <b>Any LCR Proficient<br/>level elective subject<br/>in English (Table B)</b> |
|---|--|--|---|
| HKDSE Level 4 and above or equivalent                 | --   | Subject 1  | Subject 2   |
| HKDSE Level 3 or equivalent                           | Subject 1  | Subject 2  | --  |

*Table B: Proficient level elective subjects for DSE Level 4 students and above (or equivalent) (each 3 credits)*

|   |   |
|---|---|
| LCR Proficient level<br>elective subjects | Advanced English for University Studies     |
|   | Advanced English Reading and Writing Skills |
|   | English in Literature and Film              |
|   | Persuasive Communication                    |

## Chinese

All undergraduate students are required to successfully complete one 3-credit Chinese language subject as stipulated by the University, according to their Chinese language proficiency level (**Table C**).

*Table C: Chinese LCR subjects*

| Categories of students  | Required subject                      |
|---|---------------------------------------|
| For Chinese speaking students   | A Chinese LCR subject                 |
| For non-Chinese speakers or students whose Chinese standards are at junior secondary level or below | One subject from <b>Table D</b> below |

*Table D: Chinese LCR subjects for non-Chinese speakers or students whose Chinese standards are at junior secondary level or below*

| Subject (3 credits)  | Pre-requisite/exclusion   |
|--|---|
| Chinese I (for non-Chinese speaking students)  | For non-Chinese speaking students at beginners' level   |
| Chinese II (for non-Chinese speaking students)   | <ul style="list-style-type: none"><li>• For non-Chinese speaking students; and</li><li>• Students who have completed Chinese I or equivalent</li></ul>                              |
| Chinese III (for non-Chinese speaking students)  | <ul style="list-style-type: none"><li>• For non-Chinese speaking students at higher competence levels; and</li><li>• Students who have completed Chinese II or equivalent</li></ul> |
| Chinese IV (for Non-Chinese speaking students)   | <ul style="list-style-type: none"><li>• For non-Chinese students at intermediate competence levels; and</li><li>• Students who have completed Chinese III or equivalent</li></ul>   |
| Chinese Literature – Linguistics and Cultural Perspectives (for non-Chinese speaking students) | For non-Chinese speaking students at higher competence levels   |

Students who have obtained verified qualifications or certain results in some public examinations [e.g. HKDSE, HKALE, JEE, GSAT(Taiwan)] may be granted credit transfer/exemption for the Chinese LCR subject.

## Writing Requirement

In addition to the LCR in English and Chinese explained above, all students must also, among the Cluster Areas Requirement (CAR) subjects they take (see section (c) below), pass one subject that includes the requirement for a substantial piece of writing in English and one subject with the requirement for a substantial piece of writing in Chinese.

### **Reading Requirement**

All students must, among the CAR subjects they take, pass one subject that includes the requirement for the reading of an extensive text in English and one subject with the requirement for the reading of an extensive text in Chinese.

A list of approved CAR subjects for meeting the Writing Requirement (with a "W" designation) and for meeting the Reading Requirement (with an "R" designation) is shown at: <https://www.polyu.edu.hk/ous/GURSubjects/CAR.php>

Non-Chinese speakers and those students whose Chinese standards are at junior secondary level or below will by default be exempted from the DSR - Chinese and CAR - Chinese Reading and Writing requirements. However, this group of students would still be required to take one Chinese LCR subject recommended by CLC/EEE to fulfil their Chinese LCR.

### **Discipline-Specific Language Requirement**

In addition to the LCR mentioned above, students also have to complete the subject "ELC3521 Professional Communication in English" (2 credits) as the discipline-specific language requirements.

## **(b) Service-Learning**

All students must successfully complete one 3-credit subject designated to meet the Service-Learning Requirement, in which they are required to (i) participate in substantial community service or civic engagement activities that will benefit the service users or the community at large in a meaningful way, (ii) apply the knowledge and skills acquired from their Major or other learning experiences at the University to the community service activities, and (iii) reflect on their service learning experience in order to link theory with practice for the development of a stronger sense of ethical, social and national responsibility.

These subjects may take the form of:

- An open-to-all GUR service-learning subject
- A GUR service-learning subject targeted at a particular student group (e.g. a Broad Discipline), or
- A customised DSR subject (core or elective) within the Major/Minor with all the required features and components to meet the Service-Learning Requirement.

Students who have satisfied the Service-Learning Requirement via a customised DSR subject will be required to take another 3-credit subject to make up for the total credit requirement.

A list of designated subjects for meeting the service-learning requirement is available at: <https://www.polyu.edu.hk/ous/GURSubjects/SL.php>.

## **(c) Cluster Areas Requirement (CAR)**

To expand students' intellectual capacity beyond their disciplinary domain and to enable them to tackle professional and global issues from a multidisciplinary perspective, students are required to successfully complete one 3-credit subject from both of the following two Cluster Areas:

- Human Nature, Relations and Development (CAR-English Language)
- Chinese History and Culture (CAR M)

A list of CAR subjects under each Cluster Area is available at:  
<https://www.polyu.edu.hk/ous/GURSubjects/CAR.php>

**(d) Essential Components of General Education E-modules (a non-credit bearing subject)**

Students will be required to take the General Education which comprises of National Education (NE), Online Tutorials in Academic Integrity (OTAI), Artificial Intelligence and Data Analytics (AIDA) and Innovation and Entrepreneurship (IE) e-modules.

This subject is graded on a Pass/Fail basis. Students are required to complete and pass all four elearning modules in order to pass this subject.

More details about this requirement is available at:  
<https://www.polyu.edu.hk/ous/GURSubjects/ECGESYS.php>

August 2023