

## CURRICULUM

*(Issued under Decision No. .... /QD-SIU dated... 2023  
of the Chancellor of the Saigon International University)*

**Program:** Bachelor of Computer Science  
**Level:** Undergraduate  
**Mode of Study:** Full-time  
**Major:** Computer Science  
**Code:** 7480101  
**Concentrations:** Artificial Intelligence (AI)  
Big Data  
Software Engineering  
Computer Networks and Information Security

### 1. Program Educational Objectives (PEOs):

#### 1.1. General Objective:

The program aims to train the top international-standard information technology bachelors in Vietnam, meeting the demand for human resources in the domestic, regional and international information technology industry.

#### 1.2. Detailed Objectives:

**PEO1:** to work effectively and successfully in their chosen profession, and pursue higher education.

**PEO2:** to take social responsibility, especially in decision-making and recognizing the impact of technology on society, thus, becoming global citizens.

**PEO3:** to lead and plan the projects in the field of computer science.

**PEO4:** to become computer science specialists, professionals, or academics whose knowledge and expertise contribute to the development of science and technology in the country.

## 2. Student Outcomes (SOs):

| SOs                                          | SOs                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Knowledge</b>                             | <b>SO1:</b> Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.                                                                                                                                                                                                                                                               |
| <b>Skills</b>                                | <b>SO2:</b> Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.<br><b>SO3:</b> Communicate effectively in a variety of professional contexts.                                                                                                                                                           |
| <b>Levels of autonomy and responsibility</b> | <b>SO4:</b> Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.<br><b>SO5:</b> Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.<br><b>SO6:</b> Apply computer science theory and software development fundamentals to produce computing-based solutions. |

## 3. Matrix of program educational objectives and student outcomes:

| Program Educational Objectives | Student Outcomes |        |     |                                       |     |     |
|--------------------------------|------------------|--------|-----|---------------------------------------|-----|-----|
|                                | Knowledge        | Skills |     | Levels of autonomy and responsibility |     |     |
|                                | SO1              | SO2    | SO3 | SO4                                   | SO5 | SO6 |
| <b>PEO1</b>                    | X                | X      |     |                                       | X   | X   |
| <b>PEO2</b>                    |                  |        | X   | X                                     |     |     |
| <b>PEO3</b>                    |                  |        | X   | X                                     | X   |     |
| <b>PEO4</b>                    | X                | X      |     | X                                     |     | X   |

## 4. Career:

After graduation, students are capable of working in the following positions:

- Engineers specializing in developing applications and software for AI, big data

systems, computer network systems as well as robots in accordance with the trained disciplines/majors at technology companies;

- Taking various positions at software and artificial intelligence development departments as well as big data processing/analysis/exploitation departments. Handling computer network systems and information security at domestic and foreign technology corporations;
- Engineers specializing in designing, manufacturing, deploying, operating, installing, maintaining and repairing automation systems, equipment and robots at domestic and foreign enterprises;
- Experts in consulting and transferring technology for businesses in the field related to Information Technology and Computer Science;
- Researchers and lecturers working at institutes, research centers and universities related to the trained disciplines/majors;
- Starting new businesses specializing in developing Information Technology applications for real-life purposes.

**5. Training duration: 4 years**

**6. Number of credits: 135 credits**

**7. Admission requirements:**

Follow the current Admissions Regulations issued by the Ministry of Education and Training and the Admission Schemes issued by the Saigon International University.

7.1. Eligible candidate: Students who have graduated from high school according to the admission standards set by the Ministry of Education and Training and the admission criteria set by the Saigon International University.

7.2. Admission method: Updated annually according to the admission scheme of the Saigon International University and in accordance with the regulations set by the Ministry of Education and Training and the University."

**8. Academic procedure and graduation requirements:**

**8.1. Academic procedure:**

Follow the current Regulation on academic affairs issued by the Ministry of Education and Training and the Saigon International University.

**8.2. Graduation requirements:**

Follow the current Regulation on academic affairs issued by the Ministry of Education

and Training and the Saigon International University.

## 9. Evaluation methods:

Follow the current Regulation on academic affairs issued by the Saigon International University.

## 10. Content:

### 10.1. Knowledge blocks:

| Knowledge block                            |                         | Number of credits | Percentage % |
|--------------------------------------------|-------------------------|-------------------|--------------|
| <b>1. General knowledge</b>                |                         | <b>53</b>         | <b>39%</b>   |
| 1.1                                        | Politics - Economics    | 13                | 10%          |
| 1.2                                        | Math – Natural Sciences | 15                | 11%          |
| 1.3                                        | Foreign Language        | 13                | 10%          |
| 1.4                                        | Culture - Skills        | 6                 | 4%           |
| 1.5                                        | Natural Sciences        | 6                 | 4%           |
| <b>2. Professional knowledge</b>           |                         | <b>72</b>         | <b>53%</b>   |
| 2.1                                        | Foundation knowledge    | 51                | 38%          |
| 2.2                                        | Specialized knowledge   | 21                | 15%          |
| <b>3. Internship and graduation thesis</b> |                         | <b>10</b>         | <b>8%</b>    |
| <b>Total</b>                               |                         | <b>135</b>        | <b>100%</b>  |

### 10.2. Detailed content:

| No                   | Code      | Name of course                 |                                             | Credits | Allocation |      |      |      |    | Prereq |
|----------------------|-----------|--------------------------------|---------------------------------------------|---------|------------|------|------|------|----|--------|
|                      |           | Vietnamese                     | English                                     |         | Total      | Theo | Prac | Proj | TT |        |
| I. GENERAL KNOWLEDGE |           |                                |                                             |         |            |      |      |      |    |        |
| I.1. Politics        |           |                                |                                             | 13      |            |      |      |      |    |        |
| I.1.01               | 2GEN0011  | Triết học Mác-Lênin            | Philosophy of Marxism and Leninism          | 3       | 45         | 45   |      |      |    |        |
| I.1.02               | 2GEN0012  | Kinh tế chính trị Mác-Lênin    | Political Economics of Marxism and Leninism | 2       | 30         | 30   |      |      |    |        |
| I.1.03               | 2GEN0013  | Chủ nghĩa Xã hội khoa học      | Scientific Socialism                        | 2       | 30         | 30   |      |      |    |        |
| I.1.04               | 2GEN0007  | Tư tưởng Hồ Chí Minh           | Ho Chi Minh Thought                         | 2       | 30         | 30   |      |      |    |        |
| I.1.05               | 2GEN0014  | Lịch sử Đảng Cộng sản Việt Nam | History of the Communist Party of Vietnam   | 2       | 30         | 30   |      |      |    |        |
| I.1.06               | 2GEN0008  | Pháp luật đại cương            | General Laws                                | 2       | 30         | 30   |      |      |    |        |
| I.2. Mathematics     |           |                                |                                             |         |            |      |      |      |    |        |
| Compulsory           |           |                                |                                             | 15      |            |      |      |      |    |        |
| I.2.01               | 2SOC11497 | Đại số tuyến tính              | Linear Algebra                              | 3       | 45         | 45   |      |      |    |        |

|                                   |           |                                         |                                             |           |    |    |    |  |        |           |
|-----------------------------------|-----------|-----------------------------------------|---------------------------------------------|-----------|----|----|----|--|--------|-----------|
| I.2.02                            | 2SOC2485  | Toán rời rạc                            | Discrete Mathematics                        | 3         | 45 | 45 |    |  |        |           |
| I.2.03                            | 2BUS11440 | Xác suất thống kê                       | Probability & Statistics                    | 3         | 45 | 45 |    |  |        |           |
| I.2.04                            | 2SOC1498  | Giải tích                               | Mathematics Analytics                       | 3         | 45 | 45 |    |  |        |           |
| I.2.05                            | 2SOC1499  | Phương pháp số                          | Numerical Methods                           | 3         | 45 | 45 |    |  |        |           |
| <b>I.3. Foreign language</b>      |           |                                         |                                             | <b>13</b> |    |    |    |  |        |           |
| I.3.01                            | 2LAN11453 | English Proficiency 1                   | English Proficiency 1                       | 4         | 90 | 30 | 60 |  |        | 2LAN11452 |
| I.3.02                            | 2LAN11454 | English Proficiency 2                   | English Proficiency 2                       | 4         | 90 | 30 | 60 |  |        | 2LAN11453 |
| I.3.03                            | 2LAN11455 | English Proficiency 3                   | English Proficiency 3                       | 5         | 90 | 60 | 30 |  |        | 2LAN11454 |
| <b>I.4. Culture</b>               |           |                                         |                                             | <b>6</b>  |    |    |    |  |        |           |
| I.4.01                            | CTS53178  | Khởi nghiệp sáng tạo                    | Creative Entrepreneurship                   | 3         | 45 | 45 |    |  |        |           |
| I.4.02                            | 2ENG11491 | Viết luận Anh                           | English Composition                         | 3         | 45 | 45 |    |  |        |           |
| <b>I.5. Natural Sciences</b>      |           |                                         |                                             | <b>6</b>  |    |    |    |  |        |           |
| I.5.01                            | 2SCE1104  | Lý                                      | Physics                                     | 3         | 45 | 45 |    |  |        |           |
| I.5.02                            | 2SCE1113  | Hoá                                     | Chemistry                                   | 3         | 45 | 45 |    |  |        |           |
| <b>II. PROFESSIONAL KNOWLEDGE</b> |           |                                         |                                             |           |    |    |    |  |        |           |
| <b>II.1 Foundation knowledge</b>  |           |                                         |                                             | <b>51</b> |    |    |    |  |        |           |
| II.1.01                           | CTS14123  | Cơ sở lập trình                         | Introduction to Programming                 | 4         | 90 | 30 | 60 |  |        |           |
| II.1.02                           | CTS13124  | Cơ sở dữ liệu                           | Introduction to Databases                   | 3         | 60 | 30 | 30 |  |        |           |
| II.1.03                           | CTS12125  | Kiến trúc máy tính                      | Computer Architecture                       | 2         | 30 | 30 |    |  |        |           |
| II.1.04                           | CTS13126  | Mạng máy tính                           | Computer Networks                           | 3         | 60 | 30 | 30 |  |        |           |
| II.1.05                           | CTS22127  | Hệ điều hành                            | Operating Systems                           | 2         | 30 | 30 |    |  |        |           |
| II.1.06                           | CTS24128  | Cấu trúc dữ liệu và giải thuật          | Data Structures and Algorithms              | 4         | 90 | 30 | 60 |  |        | CTS14123  |
| II.1.07                           | CTS24129  | Lập trình hướng đối tượng               | Object-Oriented Programming                 | 4         | 90 | 30 | 60 |  |        | CTS14123  |
| II.1.08                           | CTS23130  | Phân tích, trực quan dữ liệu với Python | Data Analysis and Visualization with Python | 3         | 60 | 30 | 30 |  | (*) TA | CTS13124  |
| II.1.09                           | CTS33131  | Trí tuệ nhân tạo                        | Artificial Intelligence                     | 3         | 60 | 30 | 30 |  | (*) TA | CTS24129  |
| II.1.10                           | CTS34132  | Lập trình Web và ứng dụng               | Web and Application Programming             | 3         | 60 | 30 | 30 |  |        | CTS24129  |
| II.1.11                           | CTS33133  | Công nghệ phần mềm                      | Software Engineering                        | 3         | 60 | 30 | 30 |  |        | CTS24129  |
| II.1.12                           | CTS34134  | Máy học                                 | Machine Learning                            | 3         | 60 | 30 | 30 |  | (*) TA | CTS24128  |
| II.1.13                           | 2BAS0007  | Phương pháp nghiên cứu khoa học         | Research Methods                            | 2         | 30 | 30 |    |  |        |           |
| II.1.14                           | CTS43135  | Dữ liệu lớn                             | Big Data                                    | 3         | 60 | 30 | 30 |  |        | CTS24128  |

|                                                                                                |          |                                               |                              |           |    |    |    |  |        |                    |
|------------------------------------------------------------------------------------------------|----------|-----------------------------------------------|------------------------------|-----------|----|----|----|--|--------|--------------------|
| II.1.15                                                                                        | CTS44136 | Đồ án 1 (Đồ án cơ sở)                         | Project 1                    | 3         | 45 | 45 |    |  |        |                    |
| II.1.16                                                                                        | CTS53145 | Điện toán đám mây                             | Cloud Computing              | 3         | 45 | 45 |    |  |        | CTS24129           |
| II.1.17                                                                                        | CTS53176 | Lập trình thiết bị di động                    | Mobile Device Programming    | 3         | 60 | 30 | 30 |  |        | CTS24129           |
| <b>II.2. Specialized knowledge</b>                                                             |          |                                               |                              | <b>21</b> |    |    |    |  |        |                    |
| <b>II.2.1. Artificial Intelligence (AI)</b>                                                    |          |                                               |                              |           |    |    |    |  |        |                    |
| <b>Compulsory</b>                                                                              |          |                                               |                              | <b>15</b> |    |    |    |  |        |                    |
| II.2.1.01                                                                                      | CTS53148 | Thị giác máy tính                             | Computer Vision              | 3         | 60 | 30 | 30 |  | (*) TA | CTS13124           |
| II.2.1.02                                                                                      | CTS43137 | Robotics và ứng dụng                          | Robotics                     | 3         | 60 | 30 | 30 |  | (*) TA | CTS14123           |
| II.2.1.03                                                                                      | CTS53147 | Xử lý ngôn ngữ tự nhiên                       | Natural Language Processing  | 3         | 60 | 30 | 30 |  |        | CTS34134           |
| II.2.1.04                                                                                      | CTS43138 | Các mô hình học sâu và ứng dụng               | Deep Learning                | 3         | 60 | 30 | 30 |  |        | CTS34134           |
| II.2.1.05                                                                                      | CTS53179 | Đồ án chuyên ngành 2                          | Project 2                    | 3         | 45 | 45 |    |  |        | CTS33131           |
| <b>Elective (choose 2 among the following courses or 2 compulsory courses of other majors)</b> |          |                                               |                              | <b>6</b>  |    |    |    |  |        |                    |
| II.2.1.06                                                                                      | CTS53155 | Lập trình Hệ thống nhúng                      | Embedded Systems Programming | 3         | 60 | 30 | 30 |  |        | CTS14123, CTS12125 |
| II.2.1.07                                                                                      | CTS53156 | Xử lý âm thanh và tiếng nói                   | Audio and Speech Processing  | 3         | 60 | 30 | 30 |  |        | CTS24128           |
| II.2.1.8                                                                                       | CTS43140 | Khai thác dữ liệu và ứng dụng                 | Data Mining                  | 3         | 60 | 30 | 30 |  |        | CTS34134           |
| II.2.1.09                                                                                      | CTS53158 | Dịch máy                                      | Computer Linguistics         | 3         | 60 | 30 | 30 |  |        | CTS34134           |
| II.2.1.10                                                                                      | CTS53159 | Thị giác máy tính trong tương tác người – máy | Advanced Computer Vision     | 3         | 60 | 30 | 30 |  |        | CTS4324            |
| II.2.1.12                                                                                      | CTS53160 | Hệ khuyến nghị                                | Recommender Systems          | 3         | 60 | 30 | 30 |  |        | CTS34134           |
| II.2.1.13                                                                                      | CTS53161 | Triển khai và vận hành các mô hình học máy    | Machine Learning DevOps      | 3         | 60 | 30 | 30 |  |        | CTS34134           |
| <b>II.2.2. Big Data</b>                                                                        |          |                                               |                              |           |    |    |    |  |        |                    |
| <b>Compulsory</b>                                                                              |          |                                               |                              | <b>15</b> |    |    |    |  |        |                    |
| II.2.2.01                                                                                      | CTS43139 | Dữ liệu lớn chuyên sâu                        | Advanced Big Data            | 3         | 60 | 30 | 30 |  |        | CTS43135           |
| II.2.2.02                                                                                      | CTS43140 | Khai thác dữ liệu và ứng dụng                 | Data Mining                  | 3         | 60 | 30 | 30 |  | (*) TA |                    |
| II.2.2.03                                                                                      | CTS53149 | Cơ sở dữ liệu phân tán                        | Distributed Database         | 3         | 60 | 30 | 30 |  |        | CTS13124           |
| II.2.2.04                                                                                      | CTS53150 | Lập trình phân tán                            | Distributed Programming      | 3         | 60 | 30 | 30 |  | (*) TA | CTS24129           |
| II.2.2.05                                                                                      | CTS53179 | Đồ án 2 (Đồ án chuyên ngành)                  | Project 2                    | 3         | 45 | 45 |    |  |        |                    |

|                                                                                                |          |                                         |                                                 |           |    |    |    |  |        |                    |
|------------------------------------------------------------------------------------------------|----------|-----------------------------------------|-------------------------------------------------|-----------|----|----|----|--|--------|--------------------|
| <b>Elective (choose 2 among the following courses or 2 compulsory courses of other majors)</b> |          |                                         |                                                 | <b>6</b>  |    |    |    |  |        |                    |
| II.2.2.06                                                                                      | CTS83112 | Hệ cơ sở tri thức                       | Knowledge-Based Systems                         | 3         | 60 | 30 | 30 |  |        | CTS24128           |
| II.2.2.07                                                                                      | CTS53162 | Python nâng cao                         | Advanced Python Programming                     | 3         | 60 | 30 | 30 |  |        | CTS4324            |
| II.2.2.08                                                                                      | CTS53163 | Kiểm thử Phần mềm                       | Software Testing                                | 3         | 60 | 30 | 30 |  |        | CTS24129           |
| II.2.2.09                                                                                      | CTS53164 | Blockchain                              | Blockchain                                      | 3         | 45 | 45 |    |  |        |                    |
| II.2.2.10                                                                                      | CTS83116 | Các mô hình học sâu và ứng dụng         | Deep Learning                                   | 3         | 60 | 30 | 30 |  |        | CTS23130, CTS43139 |
| <b>II.2.3. Software Engineering</b>                                                            |          |                                         |                                                 |           |    |    |    |  |        |                    |
| <b>Compulsory</b>                                                                              |          |                                         |                                                 | <b>15</b> |    |    |    |  |        |                    |
| II.2.3.01                                                                                      | CTS43141 | Thiết kế phần mềm hướng đối tượng       | Object-Oriented Software Development            | 3         | 60 | 30 | 30 |  | (*) TA | CTS24129           |
| II.2.3.02                                                                                      | CTS43142 | Kiến trúc phần mềm                      | Software Architecture                           | 3         | 60 | 30 | 30 |  |        | CTS33133           |
| II.2.3.03                                                                                      | CTS53152 | Một số vấn đề hiện đại trong CNPM       | Modern Issues in Software Engineering           | 3         | 60 | 30 | 30 |  | (*) TA | CTS33133           |
| II.2.3.04                                                                                      | CTS53151 | Phát triển vận hành và bảo trì phần mềm | Software Deployment, Maintenance and Operations | 3         | 60 | 30 | 30 |  |        | CTS33133           |
| II.2.3.05                                                                                      | CTS53179 | Đồ án 2 (Đồ án chuyên ngành)            | Project 2                                       | 3         | 45 | 45 |    |  |        | CTS24129           |
| <b>Elective (choose 2 among the following courses or 2 compulsory courses of other majors)</b> |          |                                         |                                                 | <b>6</b>  |    |    |    |  |        |                    |
| II.2.3.06                                                                                      | CTS53166 | Phát triển phần mềm mã nguồn mở         | Open-Source Software Development                | 3         | 60 | 30 | 30 |  |        | CTS24129           |
| II.2.3.07                                                                                      | CTS53167 | Nhập môn lập trình game                 | Introduction to Game Programming                | 3         | 60 | 30 | 30 |  |        | CTS24129           |
| II.2.3.08                                                                                      | CTS53168 | Quản lý dự án công nghệ thông tin       | Information Technology Project Management       | 3         | 60 | 30 | 30 |  |        | CTS33133           |
| II.2.3.09                                                                                      | CTS53149 | Cơ sở dữ liệu phân tán                  | Distributed Database                            | 3         | 60 | 30 | 30 |  |        | CTS13124           |
| II.2.3.10                                                                                      | CTS53163 | Kiểm thử Phần mềm                       | Software Testing                                | 3         | 60 | 30 | 30 |  |        | CTS33133           |
| II.2.3.11                                                                                      | CTS53175 | Lập trình Java                          | Java Programming                                | 3         | 60 | 30 | 30 |  |        | CTS24129           |
| <b>II.2.4. Computer Network and Information Security</b>                                       |          |                                         |                                                 |           |    |    |    |  |        |                    |
| <b>Compulsory</b>                                                                              |          |                                         |                                                 | <b>15</b> |    |    |    |  |        |                    |
| II.2.4.01                                                                                      | CTS43143 | Mạng nâng cao                           | Advanced Computer Networks                      | 3         | 45 | 45 |    |  | (*) TA | CTS13126           |
| II.2.4.02                                                                                      | CTS43144 | Quản trị mạng                           | Network Management                              | 3         | 45 | 45 |    |  |        | CTS13126           |
| II.2.4.03                                                                                      | CTS53153 | An ninh thông tin                       | Information Security                            | 3         | 60 | 30 | 30 |  | (*) TA | CTS24129           |

|                                                                                         |          |                                 |                                                      |    |     |     |     |  |  |          |
|-----------------------------------------------------------------------------------------|----------|---------------------------------|------------------------------------------------------|----|-----|-----|-----|--|--|----------|
| II.2.4.04                                                                               | CTS53154 | Phân tích đánh giá an toàn mạng | Computer Networking Security Analysis and Evaluation | 3  | 60  | 30  | 30  |  |  | CTS13126 |
| II.2.4.05                                                                               | CTS53179 | Đồ án 2 (Đồ án chuyên ngành)    | Project 2                                            | 3  | 45  | 45  |     |  |  |          |
| Elective (choose 2 among the following courses or 2 compulsory courses of other majors) |          |                                 |                                                      | 6  |     |     |     |  |  |          |
| II.2.4.06                                                                               | CTS53170 | An toàn IoTs                    | Cybersecurity and the Internet of Things             | 3  | 60  | 30  | 30  |  |  | CTS53153 |
| II.2.4.07                                                                               | CTS53171 | Mạng không dây                  | Wireless Network                                     | 3  | 60  | 30  | 30  |  |  | CTS43144 |
| II.2.4.08                                                                               | CTS53172 | Hệ điều hành Linux              | Linux Operating Systems                              | 3  | 60  | 30  | 30  |  |  | CTS43143 |
| II.2.4.09                                                                               | CTS53173 | Đánh giá hiệu năng mạng         | Network Performance Analysis                         | 3  | 45  | 45  |     |  |  | CTS43144 |
| II.2.4.10                                                                               | CTS53174 | Thiết kế hệ thống mạng          | Computer Networks Design                             | 3  | 60  | 30  | 30  |  |  | CTS43144 |
| II.2.4.11                                                                               | CTS53149 | Cơ sở dữ liệu phân tán          | Distributed Database                                 | 3  | 60  | 30  | 30  |  |  | CTS13124 |
| II.2.3.12                                                                               | CTS53175 | Lập trình Java                  | Java Programming                                     | 3  | 60  | 30  | 30  |  |  | CTS24129 |
| II.3. Internship and graduation thesis                                                  |          |                                 |                                                      | 10 |     |     |     |  |  |          |
| II.3.01                                                                                 | CTS73180 | Thực tập tốt nghiệp             | Graduation Internship                                | 3  | 45  |     |     |  |  |          |
| II.3.02                                                                                 | CTS77181 | Khóa luận tốt nghiệp            | Graduation Thesis                                    | 7  | 105 |     |     |  |  | CTS53179 |
| III. NATIONAL DEFENSE AND SECURITY EDUCATION, PHYSICAL EDUCATION                        |          |                                 |                                                      | 16 |     |     |     |  |  |          |
| (According to regulations of the Ministry of Education and Training)                    |          |                                 |                                                      |    |     |     |     |  |  |          |
| Compulsory, uncumulative                                                                |          |                                 |                                                      | 16 |     |     |     |  |  |          |
| III.1.01                                                                                | 2GEN0001 | Giáo dục quốc phòng và an ninh  | National Defense and Security Education              | 11 | 165 | 165 |     |  |  |          |
| III.1.02                                                                                | 2GEN0002 | Giáo dục thể chất               | Physical Education                                   | 5  | 150 |     | 150 |  |  |          |

### 10.3. Matrix of correspondence between courses and student outcomes

(Level of correspondence: 1: Not directly relevant; 2: Partially relevant; 3. Relevant; 4: Closely relevant; 5: Specially relevant)

| COURSE                                                                     | STUDENT OUTCOMES |     |     |     |     |     |
|----------------------------------------------------------------------------|------------------|-----|-----|-----|-----|-----|
|                                                                            | SO1              | SO2 | SO3 | SO4 | SO5 | SO6 |
| <b>GENERAL KNOWLEDGE</b>                                                   |                  |     |     |     |     |     |
| <b>Politics - Economics</b>                                                |                  |     |     |     |     |     |
| Triết học Mác – Lênin/ Philosophy of Marxism and Leninism                  |                  |     | X   | X   |     |     |
| Kinh tế chính trị Mác – Lênin/ Political Economics of Marxism and Leninism | X                |     | X   | X   |     |     |
| Chủ nghĩa Xã hội khoa học/ Scientific Socialism                            |                  |     | X   | X   |     |     |



|                                                                                      |   |   |   |   |   |   |
|--------------------------------------------------------------------------------------|---|---|---|---|---|---|
| Tư tưởng Hồ Chí Minh/ Ho Chi Minh Thought                                            |   |   | X | X |   |   |
| Lịch sử Đảng Cộng sản Việt Nam/ History of The Communist Party Of Vietnam            |   |   | X | X |   |   |
| Pháp luật đại cương/ General Laws                                                    | X |   | X | X |   |   |
| <b>Mathematics</b>                                                                   |   |   |   |   |   |   |
| <b>Compulsory</b>                                                                    |   |   |   |   |   |   |
| Đại số tuyến tính/ Linear Algebra                                                    | X | X |   |   |   | X |
| Toán rời rạc/ Discrete Mathematics                                                   | X | X |   |   |   | X |
| Xác suất thống kê/ Probability & Statistics                                          | X | X |   |   |   | X |
| Giải tích/ Mathematics Analytics                                                     | X | X |   |   |   | X |
| Phương pháp số/ Numerical Methods                                                    | X | X |   |   |   | X |
| <b>Foreign Language</b>                                                              |   |   |   |   |   |   |
| English Proficiency 1/ English Proficiency 1                                         |   |   | X |   | X |   |
| English Proficiency X/ English Proficiency 2                                         |   |   | X |   | X |   |
| English Proficiency X/ English Proficiency 3                                         |   |   | X |   | X |   |
| <b>Culture - Skill</b>                                                               |   |   |   |   |   |   |
| Khởi nghiệp sáng tạo/ Creative Entrepreneurship                                      |   |   | X | X | X |   |
| Viết luận anh/ English Composition                                                   | X | X | X |   | X | X |
| <b>Natural Sciences</b>                                                              |   |   |   |   |   |   |
| Lý/ Physics                                                                          | X |   |   | X |   |   |
| Hoá/ Chemistry                                                                       | X |   |   | X |   |   |
| <b>PROFESSIONAL KNOWLEDGE</b>                                                        |   |   |   |   |   |   |
| <b>Foundation knowledge</b>                                                          |   |   |   |   |   |   |
| Cơ sở lập trình/ Introduction to Programming                                         | X | X |   |   |   | X |
| Cơ sở dữ liệu/ Introduction to Databases                                             | X | X |   |   | X | X |
| Kiến trúc máy tính/ Computer Architecture                                            | X | X |   | X |   | X |
| Mạng máy tính/ Computer Networks                                                     | X | X |   |   |   | X |
| Hệ điều hành/ Operating Systems                                                      | X | X |   | X |   | X |
| Cấu trúc dữ liệu và giải thuật/ Data Structures and Algorithms                       | X | X |   |   |   | X |
| Lập trình hướng đối tượng/ Object-Oriented Programming                               | X | X |   |   |   | X |
| Phân tích, trực quan dữ liệu với Python/ Data Analysis and Visualization with Python | X | X |   |   | X | X |
| Trí tuệ nhân tạo/ Artificial Intelligence                                            | X | X |   |   | X | X |
| Lập trình web và ứng dụng/ Web and Application Programming                           | X | X |   | X |   | X |
| Công nghệ phần mềm/ Software Engineering                                             | X | X |   | X |   | X |
| Máy học/ Machine Learning                                                            | X | X |   |   | X | X |
| Phương pháp nghiên cứu khoa học / Research Methods                                   |   |   | X | X | X |   |
| Dữ liệu lớn/ Big Data                                                                | X | X |   |   | X | X |
| Đồ án 1 (Đồ án có sở)/Project 1                                                      | X | X | X | X | X | X |
| Điện toán đám mây / Cloud Computing                                                  | X | X |   | X |   | X |
| Lập trình thiết bị di động/ Mobile Device Programming                                | X | X |   | X |   | X |
| <b>Artificial Intelligence</b>                                                       |   |   |   |   |   |   |
| <b>Compulsory</b>                                                                    |   |   |   |   |   |   |
| Thị giác máy tính/ Computer Vision                                                   | X | X |   |   | X | X |
| Robotics và ứng dụng/ Robotics                                                       | X | X |   | X |   | X |
| Xử lý ngôn ngữ tự nhiên/ Natural Language Processing                                 | X | X |   | X |   | X |
| Các mô hình học sâu và ứng dụng/ Deep Learning                                       | X | X |   |   | X | X |
| Đồ án 2 (Đồ án chuyên ngành)/ Project 2                                              | X | X | X | X | X | X |
| <b>Elective (choose 2 courses)</b>                                                   |   |   |   |   |   |   |
| Lập trình Hệ thống nhúng/ Embedded Systems Programming                               | X | X |   | X |   | X |
| Xử lý âm thanh và tiếng nói/ Audio and Speech Processing                             | X | X |   | X |   | X |
| Khai thác dữ liệu và ứng dụng/ Data Mining                                           | X | X |   | X |   | X |
| Dịch máy/ Computer Linguistics                                                       | X | X |   | X |   | X |

|                                                                                          |   |   |   |   |   |   |
|------------------------------------------------------------------------------------------|---|---|---|---|---|---|
| Thị giác máy tính trong tương tác người – máy/<br>Advanced Computer Vision               | X | X |   | X |   | X |
| Hệ khuyến nghị/ Recommender Systems                                                      | X | X |   | X |   | X |
| Triển khai và vận hành các mô hình học máy/ Machine Learning DevOps                      | X | X |   | X |   | X |
| <b>Big Data</b>                                                                          |   |   |   |   |   |   |
| <b>Compulsory</b>                                                                        |   |   |   |   |   |   |
| Dữ liệu lớn chuyên sâu/Advanced Big Data                                                 | X | X |   | X |   | X |
| Khai thác dữ liệu và ứng dụng/ Data Mining                                               | X | X |   | X |   | X |
| Cơ sở dữ liệu phân tán/ Distributed Database                                             | X | X |   | X |   | X |
| Lập trình phân tán/ Distributed Programming                                              | X | X |   | X |   | X |
| Đồ án 2 (Đồ án chuyên ngành)/ Project 2                                                  | X | X | X | X | X | X |
| <b>Elective (choose 2 courses)</b>                                                       |   |   |   |   |   |   |
| Hệ sơ sở tri thức/ Knowledge-Based Systems                                               | X | X |   | X |   | X |
| Python nâng cao/ Advanced Python Programming                                             | X | X |   | X |   | X |
| Kiểm thử phần mềm/ Software Testing                                                      | X | X |   | X |   | X |
| Blockchain/ Blockchain                                                                   | X | X |   | X |   | X |
| Các mô hình học sâu và ứng dụng / Deep Learning                                          | X | X |   |   | X | X |
| <b>Software Engineering</b>                                                              |   |   |   |   |   |   |
| <b>Compulsory</b>                                                                        |   |   |   |   |   |   |
| Thiết kế phần mềm hướng đối tượng/ Object-Oriented Software Development                  | X | X |   | X |   | X |
| Kiến trúc phần mềm/ Software Architecture                                                | X | X |   | X |   | X |
| Một số vấn đề hiện đại trong CNPM/ Modern Issues in Software Engineering                 | X | X |   | X |   | X |
| Phát triển vận hành và bảo trì phần mềm/ Software Deployment, Operations and Maintenance | X | X |   | X |   | X |
| Đồ án 2 (Đồ án chuyên ngành)/ Project 2                                                  | X | X | X | X | X | X |
| <b>Elective (choose 2 courses)</b>                                                       |   |   |   |   |   |   |
| Phát triển phần mềm mã nguồn mở/ Open-Source Software Development                        | X | X |   | X |   | X |
| Nhập môn lập trình game/ Introduction to Game Programming                                | X | X |   | X |   | X |
| Quản lý dự án công nghệ thông tin/ Information Technology Project Management             | X | X |   | X |   | X |
| Cơ sở dữ liệu phân tán/ Distributed Database                                             | X | X |   | X |   | X |
| Kiểm thử Phần mềm/ Software Testing                                                      | X | X |   | X |   | X |
| Lập trình Java/ Java Programming                                                         | X | X |   |   |   | X |
| <b>Computer Network and Information Security</b>                                         |   |   |   |   |   |   |
| <b>Compulsory</b>                                                                        |   |   |   |   |   |   |
| Mạng nâng cao/ Advanced Computer Networks                                                | X | X |   |   |   | X |
| Quản trị mạng/ Network Management                                                        | X | X |   |   |   | X |
| An ninh thông tin/ Information Security                                                  | X | X |   | X |   |   |
| Phân tích đánh giá an toàn mạng/ Computer Networking Security Analysis and Evaluation    | X | X |   | X |   |   |
| Đồ án 2 (Đồ án chuyên ngành)/ Project 2                                                  | X | X | X | X | X | X |
| <b>Elective (choose 2 courses)</b>                                                       |   |   |   |   |   |   |
| An toàn IoTs/ Cybersecurity and the Internet of Things                                   | X | X |   | X |   |   |
| Mạng không dây/ Wireless Network                                                         | X | X |   |   |   | X |
| Hệ điều hành Linux/Linux Operating Systems                                               | X | X |   |   |   | X |
| Đánh giá hiệu năng mạng / Network Performance Analysis                                   | X | X |   |   |   | X |
| Thiết kế hệ thống mạng/ Computer Networks Design                                         | X | X |   |   |   | X |
| Cơ sở dữ liệu phân tán/ Distributed database                                             | X | X |   | X |   | X |
| Lập trình Java/ Java Programming                                                         | X | X |   |   |   | X |
| <b>Internship and graduation thesis</b>                                                  |   |   |   |   |   |   |
| Thực tập tốt nghiệp / Graduation Internship                                              | X | X | X | X | X | X |
| Khóa luận tốt nghiệp / Graduation Thesis                                                 | X | X | X | X | X | X |

|                                                                       |  |   |   |   |   |  |
|-----------------------------------------------------------------------|--|---|---|---|---|--|
| <b>UNCUMMULATIVE KNOWLEDGE</b>                                        |  |   |   |   |   |  |
| Compulsory, uncumulative                                              |  |   |   |   |   |  |
| <b>NATIONAL DEFENSE AND SECURITY EDUCATION, PHYSICAL EDUCATION</b>    |  |   |   |   |   |  |
| Giáo dục quốc phòng an ninh / National Defense and Security Education |  | X | X | X | X |  |
| Giáo dục thể chất/ Physical Education                                 |  | X | X | X | X |  |

#### 10.4. Teaching plan (expected):

| No                                             | Course    | Name of course                                                                     | Num of cred | Num of period | Allocation |      |      |    | Note         |
|------------------------------------------------|-----------|------------------------------------------------------------------------------------|-------------|---------------|------------|------|------|----|--------------|
|                                                |           |                                                                                    |             |               | Theo       | Prac | Proj | TT |              |
| Semester 1                                     |           |                                                                                    |             |               |            |      |      |    |              |
| 1                                              | CTS14123  | Introduction to Programming                                                        | 4           | 90            | 30         | 60   |      |    |              |
| 2                                              | CTS13124  | Introduction to Databases                                                          | 3           | 60            | 30         | 30   |      |    |              |
| 3                                              | CTS12125  | Computer Architecture                                                              | 2           | 30            | 30         |      |      |    |              |
| 4                                              | CTS13126  | Computer Networks                                                                  | 3           | 60            | 30         | 30   |      |    |              |
| 5                                              | 2BUS11440 | Probability & Statistics                                                           | 3           | 45            | 45         |      |      |    |              |
| Total accumulated credits of Semester 1        |           |                                                                                    | 15          |               |            |      |      |    |              |
| Total credit of Semester 1                     |           |                                                                                    | 15          |               |            |      |      |    |              |
| Semester 2                                     |           |                                                                                    |             |               |            |      |      |    |              |
| 6                                              | CTS22127  | Operating Systems                                                                  | 2           | 30            | 30         |      |      |    |              |
| 7                                              | CTS24128  | Data Structures and Algorithms                                                     | 4           | 90            | 30         | 60   |      |    |              |
| 8                                              | CTS24129  | Object-Oriented Programming                                                        | 4           | 90            | 30         | 60   |      |    |              |
| 9                                              | CTS23130  | Data Analysis and Visualization with Python                                        | 3           | 60            | 30         | 30   |      |    |              |
| 10                                             | 2SOC11497 | Linear Algebra                                                                     | 3           | 45            | 45         |      |      |    |              |
| Total accumulated credits of Semester 2        |           |                                                                                    | 16          |               |            |      |      |    |              |
| Total credit of Semester 2                     |           |                                                                                    | 16          |               |            |      |      |    |              |
| Summer Semester 1                              |           |                                                                                    |             |               |            |      |      |    |              |
| 11                                             | 2GEN0008  | General Laws (follow the allocation made by academic office)                       | 2           | 30            | 30         |      |      |    |              |
| 12                                             | 2GEN0002  | PE 1 (follow the allocation made by academic office)                               | 1           | 30            |            | 30   |      |    | uncumulative |
| 13                                             | 2GEN0011  | Philosophy of Marxism and Leninism (follow the allocation made by academic office) | 3           | 45            | 45         |      |      |    |              |
| Total accumulated credits of Summer Semester 1 |           |                                                                                    | 5           |               |            |      |      |    |              |
| Total credit of Summer Semester 1              |           |                                                                                    | 6           |               |            |      |      |    |              |
| Semester 3                                     |           |                                                                                    |             |               |            |      |      |    |              |
| 14                                             | CTS33131  | Artificial Intelligence                                                            | 3           | 60            | 30         | 30   |      |    |              |
| 15                                             | 2SOC2485  | Discrete Mathematics                                                               | 3           | 45            | 45         |      |      |    |              |

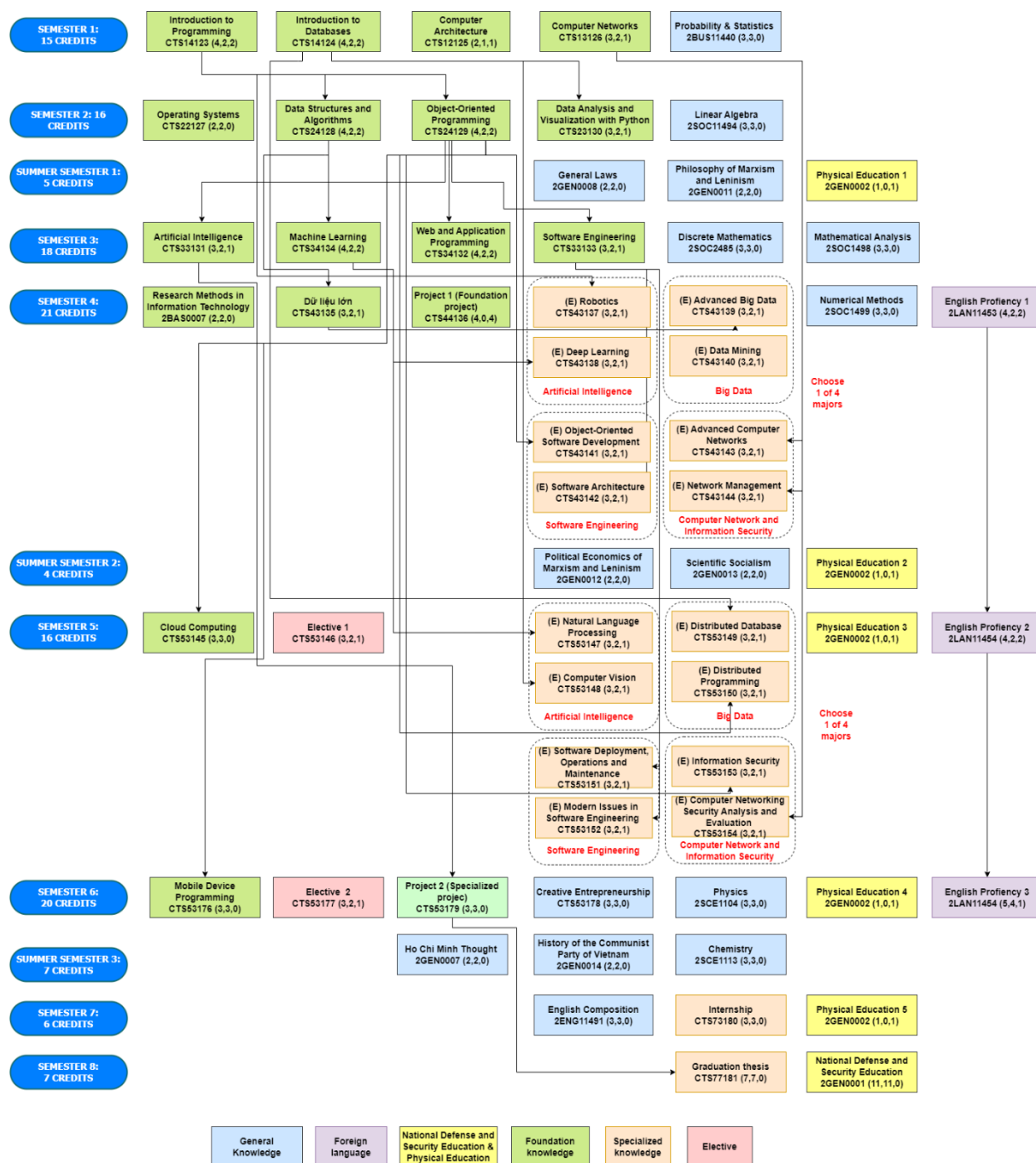
|                                                       |           |                                                                                             |           |    |    |    |  |  |              |
|-------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------|-----------|----|----|----|--|--|--------------|
| 16                                                    | CTS34132  | Web and Application Programming                                                             | 3         | 60 | 30 | 30 |  |  |              |
| 17                                                    | CTS33133  | Software Engineering                                                                        | 3         | 60 | 30 | 30 |  |  |              |
| 18                                                    | CTS34134  | Machine Learning                                                                            | 3         | 60 | 30 | 30 |  |  |              |
| 19                                                    | 2SOC1498  | Mathematics Analytics                                                                       | 3         | 45 | 45 |    |  |  |              |
| <b>Total accumulated credits of Semester 3</b>        |           |                                                                                             | <b>18</b> |    |    |    |  |  |              |
| <b>Total credit of Semester 3</b>                     |           |                                                                                             | <b>18</b> |    |    |    |  |  |              |
| <b>Semester 4</b>                                     |           |                                                                                             |           |    |    |    |  |  |              |
| 20                                                    | 2BAS0007  | Research Methods                                                                            | 2         | 30 | 30 |    |  |  |              |
| 21                                                    | CTS43135  | Big Data                                                                                    | 3         | 60 | 30 | 30 |  |  |              |
| 22                                                    | CTS44136  | Project 1 (Foundation project)                                                              | 3         | 45 | 45 |    |  |  |              |
| 23                                                    | 2LAN11453 | English Proficiency 1                                                                       | 4         | 90 | 30 | 60 |  |  |              |
| 24                                                    | 2SOC1499  | Numerical Methods                                                                           | 3         |    |    |    |  |  |              |
| <b>Artificial Intelligence</b>                        |           |                                                                                             |           |    |    |    |  |  |              |
| 25                                                    | CTS43137  | Robotics                                                                                    | 3         | 60 | 30 | 30 |  |  |              |
| 26                                                    | CTS43138  | Deep Learning                                                                               | 3         | 60 | 30 | 30 |  |  |              |
| <b>Big Data</b>                                       |           |                                                                                             |           |    |    |    |  |  |              |
| 27                                                    | CTS43139  | Advanced Big Data                                                                           | 3         | 60 | 30 | 30 |  |  |              |
| 28                                                    | CTS43140  | Data Mining                                                                                 | 3         | 60 | 30 | 30 |  |  |              |
| <b>Software Engineering</b>                           |           |                                                                                             |           |    |    |    |  |  |              |
| 29                                                    | CTS43141  | Object-Oriented Software Development                                                        | 3         | 60 | 30 | 30 |  |  |              |
| 30                                                    | CTS43142  | Software Architecture                                                                       | 3         | 60 | 30 | 30 |  |  |              |
| <b>Computer Network and Information Security</b>      |           |                                                                                             |           |    |    |    |  |  |              |
| 31                                                    | CTS43143  | Advanced Computer Networks                                                                  | 3         | 60 | 30 | 30 |  |  |              |
| 32                                                    | CTS43144  | Network Management                                                                          | 3         | 60 | 30 | 30 |  |  |              |
| <b>Total accumulated credits of Semester 4</b>        |           |                                                                                             | <b>21</b> |    |    |    |  |  |              |
| <b>Total credit of Semester 4</b>                     |           |                                                                                             | <b>21</b> |    |    |    |  |  |              |
| <b>Summer Semester 2</b>                              |           |                                                                                             |           |    |    |    |  |  |              |
| 33                                                    | 2GEN0012  | Political Economics of Marxism and Leninism (follow the allocation made by academic office) | 2         | 30 | 30 |    |  |  |              |
| 34                                                    | 2GEN0002  | PE 2 (follow the allocation made by academic office)                                        | 1         | 30 |    | 30 |  |  | uncumulative |
| 35                                                    | 2GEN0013  | Scientific Socialism (follow the allocation made by academic office)                        | 2         | 30 | 30 |    |  |  |              |
| <b>Total accumulated credits of Summer Semester 2</b> |           |                                                                                             | <b>4</b>  |    |    |    |  |  |              |
| <b>Total credit of Summer Semester 2</b>              |           |                                                                                             | <b>5</b>  |    |    |    |  |  |              |
| <b>Semester 5</b>                                     |           |                                                                                             |           |    |    |    |  |  |              |
| 36                                                    | CTS53145  | Cloud Computing                                                                             | 3         | 45 | 45 |    |  |  |              |

|                                                                                        |           |                                                                                      |   |    |    |    |  |  |              |
|----------------------------------------------------------------------------------------|-----------|--------------------------------------------------------------------------------------|---|----|----|----|--|--|--------------|
| 37                                                                                     | CTS53146  | 3 credits of elective (Choose among the elective courses or courses of other majors) | 3 | 60 | 30 | 30 |  |  |              |
| 38                                                                                     | 2GEN0002  | PE 3 (follow the allocation made by academic office)                                 | 1 | 30 |    | 30 |  |  | uncumulative |
| 39                                                                                     | 2LAN11454 | English Proficiency 2                                                                | 4 | 90 | 30 | 60 |  |  |              |
| <b>Artificial Intelligence</b>                                                         |           |                                                                                      |   |    |    |    |  |  |              |
| 40                                                                                     | CTS53147  | Natural Language Processing                                                          | 3 | 60 | 30 | 30 |  |  |              |
| 41                                                                                     | CTS53148  | Computer Vision                                                                      | 3 | 60 | 30 | 30 |  |  |              |
| <b>Big Data</b>                                                                        |           |                                                                                      |   |    |    |    |  |  |              |
| 42                                                                                     | CTS53149  | Distributed Database                                                                 | 3 | 60 | 30 | 30 |  |  |              |
| 43                                                                                     | CTS53150  | Distributed Programming                                                              | 3 | 60 | 30 | 30 |  |  |              |
| <b>Software Engineering</b>                                                            |           |                                                                                      |   |    |    |    |  |  |              |
| 44                                                                                     | CTS53151  | Software Deployment, Operations and Maintenance                                      | 3 | 60 | 30 | 30 |  |  |              |
| 45                                                                                     | CTS53152  | Modern Issues in Software Engineering                                                | 3 | 60 | 30 | 30 |  |  |              |
| <b>Computer Network and Information Security</b>                                       |           |                                                                                      |   |    |    |    |  |  |              |
| 46                                                                                     | CTS53153  | Information Security                                                                 | 3 | 60 | 30 | 30 |  |  |              |
| 47                                                                                     | CTS53154  | Computer Networking Security Analysis and Evaluation                                 | 3 | 60 | 30 | 30 |  |  |              |
| <b>Elective Courses (Choose among the elective courses or courses of other majors)</b> |           |                                                                                      |   |    |    |    |  |  |              |
| 48                                                                                     | CTS53155  | Embedded Systems Programming                                                         | 3 | 60 | 30 | 30 |  |  |              |
| 49                                                                                     | CTS53156  | Audio and Speech Processing                                                          | 3 | 60 | 30 | 30 |  |  |              |
| 50                                                                                     | CTS43140  | Data Mining                                                                          | 3 | 60 | 30 | 30 |  |  |              |
| 51                                                                                     | CTS53158  | Computer Linguistics                                                                 | 3 | 60 | 30 | 30 |  |  |              |
| 52                                                                                     | CTS53159  | Advanced Computer Vision                                                             | 3 | 60 | 30 | 30 |  |  |              |
| 53                                                                                     | CTS53160  | Recommender Systems                                                                  | 3 | 60 | 30 | 30 |  |  |              |
| 54                                                                                     | CTS53161  | Machine Learning DevOps                                                              | 3 | 60 | 30 | 30 |  |  |              |
| 55                                                                                     | CTS53162  | Advanced Python Programming                                                          | 3 | 60 | 30 | 30 |  |  |              |
| 56                                                                                     | CTS53163  | Software Testing                                                                     | 3 | 60 | 30 | 30 |  |  |              |
| 57                                                                                     | CTS53164  | Blockchain                                                                           | 3 | 45 | 45 |    |  |  |              |
| 58                                                                                     | CTS53165  | Distributed Database                                                                 | 3 | 60 | 30 | 30 |  |  |              |
| 59                                                                                     | CTS53166  | Open-Source Software Development                                                     | 3 | 60 | 30 | 30 |  |  |              |
| 60                                                                                     | CTS53167  | Introduction to Game Programming                                                     | 3 | 60 | 30 | 30 |  |  |              |
| 61                                                                                     | CTS53168  | Information Technology Project Management                                            | 3 | 60 | 30 | 30 |  |  |              |
| 62                                                                                     | CTS53169  | Distributed Programming                                                              | 3 | 60 | 30 | 30 |  |  |              |

|                                                       |           |                                                                                           |           |    |    |    |  |  |              |
|-------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------|-----------|----|----|----|--|--|--------------|
| 63                                                    | CTS53170  | Cybersecurity and the Internet of Things                                                  | 3         | 60 | 30 | 30 |  |  |              |
| 64                                                    | CTS53171  | Wireless Network                                                                          | 3         | 60 | 30 | 30 |  |  |              |
| 65                                                    | CTS53172  | Linux Operating Systems                                                                   | 3         | 60 | 30 | 30 |  |  |              |
| 66                                                    | CTS53173  | Network Performance Analysis                                                              | 3         | 45 | 45 |    |  |  |              |
| 67                                                    | CTS53174  | Computer Networks Design                                                                  | 3         | 60 | 30 | 30 |  |  |              |
| 68                                                    | CTS53175  | Java Programming                                                                          | 3         | 60 | 30 | 30 |  |  |              |
| <b>Total accumulated credits of Semester 5</b>        |           |                                                                                           | <b>16</b> |    |    |    |  |  |              |
| <b>Total credit of Semester 5</b>                     |           |                                                                                           | <b>17</b> |    |    |    |  |  |              |
| <b>Semester 6</b>                                     |           |                                                                                           |           |    |    |    |  |  |              |
| 69                                                    | CTS53176  | Mobile Device Programming                                                                 | 3         | 60 | 30 | 30 |  |  |              |
| 70                                                    | CTS53177  | Elective (Choose 1 among the elective courses or courses of other majors)                 | 3         | 60 | 30 | 30 |  |  |              |
| 71                                                    | 2GEN0002  | PE 4                                                                                      | 1         | 30 |    | 30 |  |  | uncumulative |
| 72                                                    | CTS53178  | Creative Entrepreneurship                                                                 | 3         | 45 | 45 |    |  |  |              |
| 73                                                    | CTS53179  | Project 2 (Specialized projec)                                                            | 3         | 45 | 45 |    |  |  |              |
| 74                                                    | 2LAN11455 | English Proficiency 3                                                                     | 5         | 90 | 60 | 30 |  |  |              |
| 75                                                    | 2SCE1104  | Physics                                                                                   | 3         | 45 | 45 |    |  |  |              |
| <b>Total accumulated credits of Semester 6</b>        |           |                                                                                           | <b>20</b> |    |    |    |  |  |              |
| <b>Total credit of Semester 6</b>                     |           |                                                                                           | <b>21</b> |    |    |    |  |  |              |
| <b>Summer Semester 3</b>                              |           |                                                                                           |           |    |    |    |  |  |              |
| 76                                                    | 2GEN0007  | Ho Chi Minh Thought (follow the allocation made by academic office)                       | 2         | 30 | 30 |    |  |  |              |
| 77                                                    | 2GEN0014  | History of the Communist Party of Vietnam (follow the allocation made by academic office) | 2         | 30 | 30 |    |  |  |              |
| 78                                                    | 2SCE1113  | Chemistry                                                                                 | 3         | 45 | 45 |    |  |  |              |
| <b>Total accumulated credits of Summer Semester 3</b> |           |                                                                                           | <b>7</b>  |    |    |    |  |  |              |
| <b>Total credit of Summer Semester 3</b>              |           |                                                                                           | <b>7</b>  |    |    |    |  |  |              |
| <b>Semester 7</b>                                     |           |                                                                                           |           |    |    |    |  |  |              |
| <b>Internship and Graduation Thesis</b>               |           |                                                                                           |           |    |    |    |  |  |              |
| 79                                                    | 2GEN0002  | PE 5                                                                                      | 1         | 30 |    | 30 |  |  | uncumulative |
| 80                                                    | CTS73180  | Internship                                                                                | 3         | 45 |    |    |  |  |              |
| 81                                                    | 2ENG11491 | English Composition                                                                       | 3         | 45 | 45 | 0  |  |  |              |
| <b>Total accumulated credits of Semester 7</b>        |           |                                                                                           | <b>6</b>  |    |    |    |  |  |              |
| <b>Total credit of Semester 7</b>                     |           |                                                                                           | <b>7</b>  |    |    |    |  |  |              |
| <b>Semester 8</b>                                     |           |                                                                                           |           |    |    |    |  |  |              |

|                                                |          |                                                                               |           |     |     |  |  |  |              |
|------------------------------------------------|----------|-------------------------------------------------------------------------------|-----------|-----|-----|--|--|--|--------------|
| 82                                             | CTS77181 | Graduation thesis                                                             | 7         | 105 |     |  |  |  |              |
| 83                                             | 2GEN0001 | National Defense Education<br>(follow the University's<br>academic year plan) | 11        | 165 | 165 |  |  |  | uncumulative |
| <b>Total accumulated credits of Semester 8</b> |          |                                                                               | <b>7</b>  |     |     |  |  |  |              |
| <b>Total credit of Semester 8</b>              |          |                                                                               | <b>18</b> |     |     |  |  |  |              |

## 11. Teaching mapping



## **12. Guidelines to implementation of curriculum**

- The curriculum is implemented according to the University's Teaching Plan.
- The courses are assigned to lecturers by the corresponding schools/course management units and are taught according to the approved course syllabus.
- The organization of teaching, testing and assessment of courses is implemented in accordance with the Regulation on academic affairs and relevant regulations of the Saigon International University.

## **13. Course descriptions**

### **13.1. Philosophy of Marxism and Leninism**

This course lays out the basic issues regarding the world view and methodology of Marxism – Leninism conducive to the study and research of other courses within this curriculum as well as knowledge attainment and real-life applications.

### **13.2. Political Economics of Marxism and Leninism**

This course systematically and selectively provides basic knowledge for Political Economics of Marxism – Leninism, on which students will comprehend the Communist Party's platforms and policies in the context of late-stage society in Vietnam, therefore building and reinforcing trust in the Party and in Socialist Regime of Vietnam.

### **13.3. Scientific Socialism**

Combined with Marxism – Leninism, Ho Chi Minh Thought, and other relevant subjects, this course provides a comprehensive understanding of Marxism – Leninism, Ho Chi Minh thoughts, and the path to socialism in Vietnam.

### **13.4. Ho Chi Minh Thought**

This course provides knowledge on: the origin, formation, and development of Ho Chi Minh thoughts; key Ho Chi Minh thoughts on revolution in Vietnam, on culture, morals, and human development. Students will grasp scientific, revolutionary, and humane values of Ho Chi Minh thoughts and life.

### **13.5. History of the Communist Party of Vietnam**

This course helps students understand that the Vietnam Communist Party is the pioneering force of the proletariat, their royal representatives, with Marxism – Leninism and Ho Chi Minh Thought as ideological foundation for actions, with continual strive for sovereignty, powerful and prosperous nation, equal, democratic, and civil society with socialist orientation.



### **13.6. General Laws**

This course provides fundamental knowledge regarding state and laws, including: theoretical frameworks of state and laws (their origin, nature, functions, and key characteristics of the state; origin, forms, concepts, and features of laws); legal system and relations; legal violations and responsibilities; basic institutions of important laws.

### **13.7. Linear Algebra**

This course provides knowledge on matrix, operands, determinants, and linear equations. Other modules include: How to solve linear equations employing Cramer's rule, Gaussian quadrature, Gauss-Jordan elimination; Vector space, linear dependence and independence, generating set, basis, and dimension; Diagonalizable matrix and its significance; Linear mapping, linear operator, quadratic and canonical forms and their conversion. Upon completion, students will grasp basic knowledge conducive to studying other engineering courses, develop the ability to reason, analyze, detect and solve problems, generating a mathematical model for any given engineering problem.

### **13.8. Discrete Mathematics**

This course provides knowledge on logic, relations, set theory, counting problem, pigeonhole principle, listing problem, Boolean logic, graph theory and trees.

### **13.9. Probability & Statistics**

This course provides concepts concerning probability theory (probability space; random variable; characteristic function; sequence of random variables; probability distribution rules; limit of distributions) and statistics (random sample; point and interval estimation; statistical hypothesis testing; correlation and regression analysis; issues concerning random processes). Students will be guided to detect, analyze, and solve practical problems; process statistical data to draw appropriate inference (for decision making process).

### **13.10. English Proficiency 1**

Upon completion, students will be able to compose simple paragraphs on familiar topics or areas of interest; to describe their experiences, events, dreams, hopes, ambitions; to make simple elaborations for their opinions or plans.

### **13.11. English Proficiency 2**

Upon completion, students will be able to comprehend the main ideas of a complex text on specific and abstract issues, including those pertaining to their specialization; to

communicate fluently with native speakers.

### **13.12. English Proficiency 3**

Upon completion, students will be able to compose thorough and detailed text on various topics, to elaborate their position regarding a particular issue, to point out the pros and cons of different options.

### **13.13. Creative Entrepreneurship**

This course provides general understanding of creativity, innovation, and formation of startup ideas, as well as intellectual property. Students will also learn basic skills and knowledge pertaining to the market such as assessment of advantages, opportunities, risks of product commercialization, discovery of business potential, and establishment of startup plan.

### **13.14. Introduction to Programming**

This course serves as an introduction to programming through C programming language, laying the foundation for other specialized subjects in this curriculum. A firm grasp of this course is crucial for development of reasoning and programming skills necessary in problem solving in theory as well as in practice.

### **13.15. Object-Oriented Programming**

This course helps students approach object-oriented programming, learning how to analyze, design, and execute a program via such approach. They will be introduced to Unified Modeling Language (UML) and Java programming language.

### **13.16. Data Structures and Algorithms**

This course helps students understand the importance of algorithm and data organization, the two essential features of any program. Students will be provided with organizing methods and basic operations with data structures, thus developing the right algorithms appropriate for specific types of computer programs. The tool to be used in this course is C programming language.

### **13.17. Computer Architecture**

This course focuses on the analysis and organization of a computer system, which includes: digital circuitry in computer design, ALU, CPU, communication among CPU, memory, and peripheral; architecture of personal computer (PC); programming concepts pertaining to microprocessing.

### **13.18. Operating Systems**

This course provides basic knowledge on the mechanism of operating systems and discusses issues concerning the functions of such systems: process management, memory management, folder and file management, peripheral management, etc.

### **13.19. Introduction to Databases**

This course provides basic concepts regarding databases, data independence, database architecture, from which students can organize physical data, optimize the problems encountered, ensure data security and integrity, evaluate databases, and learn their utilities: algebraic language, structured query language (SQL), data constraints and optimization.

### **13.20. Computer Networks**

This course ensures students will firmly grasp how to build a computer network to organize an information system, program network interaction, or build a secured information network.

### **13.21. Artificial Intelligence**

This course provides a basic understanding of artificial intelligence. The main focus will be on problem solving approaches and their applications, with an emphasis on the heuristic approach. Methods of knowledge representation and processing will also be instructed. Students will be introduced to approximate reasoning, machine learning, description logic, and search strategy using Minimax and  $\alpha$ - $\beta$  pruning, along with new research approaches. Students will be familiarized with problems of optimizing search strategies and representing knowledge using basic methods.

### **13.22. Machine Learning**

After an introduction to machine learning and design schemata, students will learn key concepts pertaining to machine learning methods. In addition to basic algorithms, this course also focuses on learning system design, learning system quality assessment, news on machine learning. Upon attaining specific techniques and algorithms, students will learn how to utilize them, to research specialized topic, and other practical implications.

### **13.23. Big Data**

This course provides students with fundamental knowledge and broad strokes about big data, serving as the basis for data science and technology. Students will familiarize

themselves with the mental processes behind building an application and other practical problems concerning big data. They will also be introduced to big data processors such as Hadoop or Spark.

#### **13.24. Cloud Computing**

This course provides basic knowledge on cloud computing, including its components and relevant technologies. Other topics about the basis of cloud computing are also discussed: big data centers, virtualization, cloud service management and control protocols, cloud storage and database, confidentiality and security in using cloud, quality assurance, and service agreements. Students will learn how to develop and execute cloud services with knowledge about web services, cloud development environment, architecture and design of a cloud service.

#### **13.25. Research Methods**

Students will be equipped with fundamental knowledge on research methodology, research methods, and the proper steps to conduct research. They will understand the significance of scientific research in professional development and get familiarized with the research process in practice.

#### **13.26. Mobile Device Programming**

This course provides students with a fundamental understanding of application design and development for mobile devices, including general concepts and knowledge, app interface design, relevant tools, event processing, toolkits, application development, testing, and deployment. Students will learn Native application development on Android platform, component programming for Android apps such as: Activity, Service, Content provider, Broadcast receiver, Intent.

#### **13.27. Python Programming**

This course provides students with basic to advanced knowledge on Python programming.

#### **13.28. Computer Vision**

This course focuses on key topics such as computer vision, visual information query for images and video images at content and semantic levels. Upon completion, students will be able to write computer vision applications and retrieve visual information including digital images and videos, as well as biometric features.

### **13.29. Robotics**

This course provides basic knowledge on robot and relevant methods for computing, simulating, pathway design, and robot control.

### **13.30. Natural Language Processing**

This course provides fundamental knowledge on methods of computer natural language processing: morphological, part-of-speech, syntactic, semantic analyses. They are the foundation on which students can build practical applications such as text checker, text comprehension and summary, text categorization, information retrieval, machine translation, text generation, converting texts to structured data, etc.

### **13.31. Deep Learning**

This course provides students with fundamental and specialized knowledge on artificial neural networks, common deep learning models and their implications in solving practical AI problems.

### **13.32. AI Project**

The AI Project is an opportunity for students to apply what they have learned in Artificial Intelligence to practice, serving as the basis for Graduation Thesis and other research.

### **13.33. Embedded Systems Programming**

This course provides knowledge on general concepts of embedded system models, embedded applications, embedded system design, embedded software programming tools and principles, as well as different embedded systems categorized by micro-processor generations.

### **13.34. Audio and Speech Processing**

This course introduces multimedia technologies and relevant research approaches. Students will be introduced to the concepts, roles, and applications of such technologies, as well as audio and audio processing tools, image and video processing tools. To attend this course, basic knowledge on data encryption, image processing, and fluency in one programming language are required.

### **13.35. Data Analysis and Visualization with Python**

Students will be equipped with basic knowledge on data visualization and analytics, knowledge discovery via data mining approach, insight attainment via visual analytics,

data visualization systems that convert a data set to visual presentation for ease of access and knowledge mining.

#### **13.36. Data Mining**

This course provides students with proper knowledge and techniques of data mining for attainment of useful insights. The significance of mined insight with respect to decision and policy making will be discussed along with practical implications.

#### **13.37. Computer Linguistics**

This course provides students with specialized knowledge on natural language processing specific to machine translation. Students will be familiarized with the models and algorithms used in machine translation.

#### **13.38. Advanced Computer Vision**

This course focuses on key topics such as computer vision, visual information query for images and video images at content and semantic levels. Upon completion, students will be able to write computer vision applications and retrieve visual information including digital images and videos, as well as biometric features.

#### **13.39. Recommender Systems**

This course provides students with fundamental knowledge on recommender systems such as: their significance, practical implications, key concepts and recommender algorithms (content filter and collaborative filtering), recommender system evaluation (online, offline), programming libraries, tools to build a recommender system. Students will also be introduced to new approaches and trends concerning recommender systems.

#### **13.40. Knowledge-Based Systems**

This course covers: introduction to knowledge-based systems (their architecture, development, distinctions with traditional computing systems); knowledge collection and management; inference engine; system interface; reasoning module; fuzzy-logic or ontological system development.

#### **13.41. Advanced Python Programming**

Students will be equipped with advanced knowledge on Python programming: object-oriented programming, network and interface programming, database connection, and other topics for specialized research such as data visualization, computer vision, machine learning, etc.

#### **13.42. Blockchain**

Students will be equipped with basic knowledge on blockchain technologies and their applications for employment in conducting scientific research.

#### **13.43. Deep Learning in TensorFlow**

Students will be equipped with specialized knowledge on deep neural networks; different types of neural networks; collaborative filtering with RBM. They will also gain practical experience with TensorFlow projects.

#### **13.44. Distributed Database**

This course provides students with basic knowledge on distributed database and relevant problems. Specifically, the course focuses on: methods of data fragmentation, conditions for verification; approaches to distributed database design and relevant algorithms; conversion of heuristic query into fragmented query and optimization of distributed data; principles for transaction management, semantic data control, and concurrency control. Students will be familiarized with problems concerning data fragmentation, analyzing and developing a distributed database to be installed on management systems such as: SQL Server, Oracle, DB2, PostgreSQL. A project involving 2-3 students working on a practical problem concludes this subject.

#### **13.45. Software Engineering**

This course provides an understanding of software engineering processes and basic methods of software development. Students will learn about the specific criteria for each of the software development stages.

#### **13.46. Object-Oriented Software Development**

This course provides students with fundamental knowledge on the analysis of structured and object-oriented information system designs; basic concepts regarding object orientation; Unified Modeling Language (UML); Rational Rose; the steps in object-oriented analysis and design. Students will be able to analyze specific problems with an object-oriented programming approach.

#### **13.47. Software Architecture**

This is among the optional obligatory courses for all specializations and usually opens at the 7<sup>th</sup> semester for Information Technology students. They will be equipped with basic knowledge, concepts, and skills necessary for any software development project. Students will take a deep dive into software architecture and relevant issues.

### **13.48. Software Deployment, Maintenance and Operations**

This course provides students with fundamental knowledge on software engineering, with a focus on the last two stages of software production: deployment, operation, and maintenance. Students will learn about the activities pertaining to software development and operation, as well as processes, techniques, and tools involved in software maintenance to be able to address any issue encountered during software maintenance or change, ensuring effective execution and management of software upgrade.

### **13.49. Software Engineering Project**

This course is only available to students who have completed other courses in their major. Students are required to carry out a project relevant to their specialization, to research and find a solution to a theoretical or practical problem, and to compose a final project report.

### **13.50. Modern Issues in Software Engineering**

This is among the optional obligatory courses for all specializations and usually opens at the 7<sup>th</sup> semester for Information Technology students. They will be equipped with basic knowledge, concepts, and skills necessary for any software development project. This course introduces basic problems concerning RUP software development, CMMI standards. Upon completion, students with a firm grasp of the tasks pertaining to the software development process may participate in practical projects.

### **13.51. Open-Source Software Development**

Open-source softwares are becoming more commonplace, playing a larger part in the software industry. This course provides students with knowledge on open-source softwares and their relevant copyrights, development, utilization, and community; open-source enterprise, combination of open-source and proprietary softwares to facilitate effective entrepreneurial environment, encouraging community feedbacks and contributions. There are seven chapters to be covered: Chapter 1 introduces the history of open-source softwares and their pros and cons; Chapter 2 presents different types of open-source enterprises; Chapter 3 focuses on open-source copyrights; Chapter 4 discusses the development of open-source community; Chapter 5 concerns the development of an open-source software; Chapter 6 instructs the steps to create an open-source project; Chapter 7 focuses on building a specific open-source software.



### **13.52. Introduction to Game Programming**

This course presents basic issues concerning game softwares, including game development, basic game components, design models, artificial intelligence building. Students will be introduced to various object-oriented tools and environments to develop a simple game.

### **13.53. Information Technology Project Management**

This course focuses on information technology management issues such as project planning and supervision. Students will also understand the significance of planning and the roles of different participants.

### **13.54. Software Testing**

This course provides students with knowledge on software testing, relevant processes, and simple techniques in designing and setting up a test. Students will gain the ability to design, test, and evaluate a specific software in practice. They will also get familiarized with some error management tools and automated testing tools.

### **13.55. Advanced Computer Networks**

Students will get familiarized with: configurations of routing protocols such as RIP, OSPF, EIGRP on Cisco devices; VLAN, STP, VTP, ACL, NAT, PPP, Frame Relay configurations on Cisco devices. Students will be able to manage cybersecurity and be skilled at configuring VLAN, STP, VTP on Cisco devices.

### **13.56. Network Management**

This course allows students to: build a management system, use management software, grasp the network structure they are managing and problems concerning cybersecurity, protection of input/output with regards to network requirements; execute frequent monitoring of network anomalies, abnormal logins/logouts; establish a defense to nullify any potential invaders; perform safe upgrade on request; and gather new knowledge.

### **13.57. Information Security**

This course provides fundamental knowledge on information protection in general (common models, data security mechanisms, cryptography, etc.).

### **13.58. Computer Networking Security Analysis and Evaluation**

Students will be equipped with: techniques to detect risks in a network system by employing approaches and methods similar to hackers; discover and check internal and external network protection; methods of risk mitigation for businesses.

### **13.59. Cybersecurity and the Internet of Things**

Students will be equipped with basic knowledge on Internet of Things (IoT). IoT is the connection among various technologies including wireless sensor networks, Pervasive (Ubiquitous) systems, AmI (ambient intelligence, distributed and contextualized systems). The focus is on hardware and software platforms applicable in IoT, M2M protocols (such as Zigbee, Bluetooth, IEEE 802.15.4, IEEE 802.15.6, IEEE 802.15.11), and procedures for data and information processing.

### **13.60. Wireless Network**

This course introduces basic knowledge on wireless networks, with which students can understand the basic components and structure of a wireless network, wireless transmission technologies, and transmission control protocols pertaining to wireless networks.

### **13.61. Linux Operating Systems**

This course allows students to: build Linux servers that meet clients' requirements such as Mail Server, Web Server, Database, etc.; operate Linux system in business settings (installation, configuration, connection with printers, fluency in network management tools, kernel configuration, DFS, planning for data storage and recovery, TCP/IP, DHCP, device configuration).

### **13.62. Computer Networks Design**

Students will be equipped with basic and advanced knowledge on network design by looking into the network devices currently in use, theoretical issues concerning network features and operations. Upon completion, students will have a firm grasp of: IP address classification; Domain system; DNS; Active Directory Domain Forest and Domain; Site and Active Directory; Operation Master.

### **13.63. Graduation Internship**

Students will get the opportunity to experience and learn more about the IT working environment in practice in preparation for their post-graduation career.

### **13.64. Graduation Thesis**

Graduation Thesis helps students improve their skills and apply what they have learned to build an application or conduct an intensive research into artificial

intelligence.

### **13.65. Physical Education**

Students will be equipped with knowledge on Physical Education and trained on exercises, track and field (middle distance), keeping fit, therefore understanding PE's significance.

### **13.66. National Defense and Security Education**

Students will gain a basic understanding of Communist Party's military policies, the practice of national defense and security, general military training and organization.

Note: Please attach the outlines of all courses listed in this curriculum.

***CHANCELLOR***

***DEAN***  
***School of Computer Science & Engineering***

***Assoc. Prof. Dr. Tran Cong Hung***