HO CHI MINH CITY UNIVERSITY

OF FOREIGN LANGUAGES - INFORMATION TECHNOLOGY

Faculty of Information Technology

PROGRAMME SPECIFICATION

(Decision No 437/QĐ-ĐNT, 30/11/2021

By the President of Ho Chi Minh City University of Foreign Languages - Information Technology)

1. Programme title: B.S. Programme of Information Technology

2. Name of the final award: Bachelor of Science in Information Technology

3. Programme code: 7480201

4. Awarding institution: *Ho Chi Minh City University of Foreign Languages - Information Technology*

5. Teaching institution: *Ho Chi Minh City University of Foreign Languages - Information Technology*

6. Entry requirements: Graduate from the High School program or equivalences.

7. Delivery mode: Full time

8. Instruction languages: Vietnamese

9. Number of concentrations: 4 majors

- **Network Security**
- **Software Engineering**
- **Information System**
- **Data Science**

10. Mission, Vision, Objective and Core Values:

MISSION

HUFLIT define its central purpose as educating eager learners to become citizens who can adapt to continuous requirements of the labor market, are aware of self-development, are

knowledgeable, and possess necessary professional skills, especially foreign languages and information technology skills through hands-on experience.

VISION

By 2030, HUFLIT will become one of Viet Nam's leading universities in training various majors using two strategic tools – foreign languages and information technology – to enhance students' professional knowledge and skills.

OBJECTIVE

To develop HUFLIT into a multi-major university which meets demand of educating high quality human resource who are competent to integrate in regional and international workforce.

CORE VALUES

SOLIDARITY – COOPERATION – DISCIPLINE – QUALITY – GROWTH

11. Mission and vision of the faculty:

Mission:

Faculty of Information Technology focuses on training IT engineers who have a good attitude, firm knowledge, awareness of self-development, strong professional skills and high abilities of joining to the global IT workforce.

Vision:

By 2030, Faculty of Information Technology – HUFLIT will become one of leading institution in training high-quality IT engineers in Vietnam.

12. Program Objectives (PO):

Training IT engineers with the following POs:

- PO1: Having a right political attitude, disciplined and professional ethics.
- PO2: Having abilities to organize tasks, to effect communicate, to present IT issues by English.
- PO3: Having a firm background, global IT skills, proficiently practicing and adaptability with the continuously changing labor market.
- PO4: Having abilities of self-learning and further post-graduate studying.

13. Program Learning Outcome (PLO):

Graduate IT engineers will have abilities of:

LO 1. Able to apply fundamental knowledge of science and information technology.

LO 2. Able to apply knowledge of law, professional ethics and social responsibility.

LO 3. Able to communicate and present IT solutions.

LO 4. Able to apply group-working skills, planning and writing technical reports.

LO 5. Able to practice self and lifelong learning.

LO 6. Able to communicate about IT issues by English.

And other 5 LOs from one of the following majors:

Major in Network Security:

LO 7a. Analyze requirements design and build computer networks for companies.

LO 8a. Evaluate a computer network of a company.

LO 9a. Administrate and maintain computer networks at organizations.

LO 10a. Assure information security for information systems and computer networks at organizations.

LO 11a. Consult solutions about computer networks and information security for organi-zations.

Major in Software Engineering:

LO 7b. Collect domain knowledge and analyze requirements of software.

LO 8b. Design systems, modules and features of software.

LO 9b. Develop software based on the design.

LO 10b. Deploy developed software.

LO 11b. Consult software solutions for organizations.

Major in Information System:

LO 7c. Collect domain knowledge and analyze requirements of an information system.

LO 8c. Design systems, modules and features of an information system.

LO 9c. Deploy the designed information system.

LO 10c. Administrate and refine an information system.

LO 11c. Consult solutions of information systems for organizations.

Major in Data Science:

LO 7d. Collect domain knowledge and analyze requirements of a data analysis system.

LO 8d. Design systems, modules and features of a data analysis system.

LO 9d. Deploy the designed data analysis system.

LO 10d. Administrate and refine a data analysis system.

LO 11d. Consult solutions of data analysis systems for organizations.

14. Teaching strategies:

14.1. Direct teaching strategy

Face-to-face teaching is the strategy, in which, lecturers teach a lesson and students listen. This strategy is often used in traditional classes and achieves high performance when teaching fundamental knowledge or explaining a new concept or skill.

Used methodologies in this strategy are Explicit Teaching, Lecture and Guest Lecture.

1. Explicit Teaching: In this methodology, lecturers introduce and explain a new basic concept to students.

2. Lecture: Lecturers teach and explain a composed lesson. Students are provided a lecture note in advance, listen to the lesson, and take notes about the learned knowledge. This methodology is suitable for introducing new concepts, models, methods or technology.

3. Guest lecture: Guest lecturers, invited from industry, give students talks about practical experiences or inspired stories. This method can help students gain general knowledge about the program.

14.2. Indirect teaching

Indirect teaching creates a learning environment, in which, students study without the fully control of lecturers. This strategy facilitates the student-center studying, in which, students are encouraged to actively join the learning process and apply the rational thinking in problem solving. There are three indirect-teaching methods as Inquiry, Problem Solving and Case Study.

4. Inquiry: In the class, lecturers use open questions to help students understand a problem and then find a solution by themselves. Students can also join group discussion to find a solution for a problem.

5. **Problem Solving:** during the learning process, lecturers give a practical problem and students learn knowledge by solving the given problem. Through the solving process, students collect knowledge and skills up to the requirement of the course. There are three levels of achievement: Level 1 – Technology applicable (self-solving), Level 2 – Situation solving (requiring of group working) and Level 3 – Problem solving (requiring of analysis and solving complex practical problems.

6. Case Study: This is a student-centered teaching strategy to help students achieve rational thinking and communication skills. In this strategy, lecturers give a situation or a practical challenge, and require students solve the given problem. During the solving process, students gain skills in problem solving, decision making and research ability.

14.3. Experiential Learning

Experiential Learning is a learning strategy, in which, learners receive knowledge and skill through living experience on practicing, observation and perceiving. In this type of learning, there are several teaching strategies: Experiment, Model, Field Trip and Teaching Research Team.

7. Experiment: Lecturers give a detailed lab instruction, students follow the instruction step-by-step in the laboratory under the guideline of lecturers, observe the results and self-perceive the experiment. Through the labs, students learn how to apply knowledge on problem solving in the basic scale.

8. Model: Lecturers give an IT system, in the form of models, for students to observe and analyze in order to learn knowledge and skill.

9. Field Trip: By visiting and joining to activities at IT companies, students know about the real working environment of IT engineers, modern technologies currently used in industry, working skills and culture. This teaching methodology also helps students know about future jobs and enhance the chance to get a job in industry after graduation.

10. Teaching Research Team: Students are encouraged to join to research projects or research groups of lecturers to gain research ability and creative skills. Therefore, this teaching method also gets more chance to study a Master or PhD degree after graduation.

14.4. Interactive teaching

In this teaching-learning strategy, lecturers combine several activities in class as raising an open question and requiring students to discuss about the problem. Lecturers guide students step-by-step solve the problem. Through the solving process, students gain the taught knowledge and skill. Students can learn from other students or lecturers to develop social skill, critical thinking, interaction, negotiation in making decision.

There are three methods in this strategy as Debate, Discussions and Peer Learning.

11. Debate: Lecturers raise an issue, related to the content of a lesson, for students with diversified opinions discuss the issue by analyzing, reasoning, convincing other students support their own idea. Through this teaching method, students learn skills as critical thinking, negotiation, making decision or public speaking.

12. Discussion: Students are organized into groups to discuss about an issue given by lecturers. Different with Debate, in Discussion, students have a similar view about the issue and contribute their own ideas to refine the solution of the issue.

13. Peer Learning: Students are organized into small groups to solve a problem and present the group result in the forms of reports or presentation in the classroom. This teaching strategy emphasize on group working to solve a course project during the semester. Each student plays a different role and contributes to the course project.

14.5. Self-Learning

Self-learning means that all learning activities of students are carried out by themselves without, or a very small part of, the training of lecturers. This is a process in which students perform their own learning activities based on their experience. Students have their own autonomy to schedule learning through doing exercises, home works and projects given by lecturers.

There are two main methodologies as Work assignment and Course project.

14. **Work Assignment:** Students are assigned home works by lectures. Through accomplishing given home works, students acquire their self-learning ability as well as expected knowledge and skill.

15. **Course project:** A group of 2-3 students is assigned a project which is accomplished during the course. By doing the course project, students perform the process of analysis, design and construct an Information System to satisfy the requirement of lecturers. The technologies used in the course project are the main knowledge and skills taught in the course. The group of students works together on the given project and submits progressive versions due to the milestones set by lecturers. For each submission, lecturers mark the result of the group, give comment on correction and propose potential improvements. At the end of the semester, the group submits the final paper-work report. Depending on the types of the project, lecturers can directly grade on the report or require a presentation in front of a committee including 2 or 3 lecturers. By this teaching strategy, students creatively apply learned knowledge to solve a practical problem. This teaching strategy requires students self-work on the course project under the supervision, guiding and evaluation of lecturers.

15. Assessment strategies:

Assessment the studying results of students is the process of noticing and recording information about the progress of learners during the teaching and learning process. The assessment has to be fair, exact and non-bias. The assessment principles have to be

continuously and periodically updated. The evaluation criteria are designed by the Faculty and published to related stakeholders, such as teachers, students, social agents and administrators.

The faculty of Information Technology has applied a number of diversified assessment methods. Depending on the teaching strategy and the learning outcomes of a course, lecturers select appropriate assessment methods to ensure the right evaluation of the students' progress as well as the performance of the teaching process.

There are two group of assessment methods used in the faculty are On-going/Formative Assessment and Summative Assessment.

15.1. On-going/Formative Assessment

The purpose of this assessment type is to provide in-time feedbacks for lecturers and students about the learning progress and needed adjustment in the teaching process. There three methods in this assessment type as: Attendance Check, Work Assignment and Oral Presentation.

1. Attendance Check

The attendance and in-class activities of students show their learning attitudes to a course. Attendance Check can be done as in Rubric 1 or 2, depending on a theoretical course or a project.

2. Work Assignment

Students are required to accomplish some in- or out-class activities. The assignment can be done by a student or a group, and assessed by Rubric 3.

3. Oral Presentation

In some courses, group working is required to solve a problem or a situation, and present the results in front of the whole class. This type of activities help students acquire professional knowledge as well as train essential skills, including communication, negotiation and group working. To assess this type of activities, lecturers can use assessment criteria listed in Rubric 4.

15.2. Summative Assessment

The objectives of this assessment are to provide observation and evaluation of the achievements on education objectives, learning outcomes and student progress at the checking timelines, as mid-term evaluation, examination at the end of a semester or the graduation evaluation at the end of the program.

There three methods in this assessment type as: Written Exam, Multiple-choice Exam, Oral Exam, Written Report, Oral Presentation, Teamwork Assessment and Peer Assessment.

4. Written Exam

In this assessment method, students are required to answer questions, perform exercises or give their opinions on the requirements of learning outcomes of the course. The student's answers are assessed based on a prepared solution. Rating of this method is evaluated on the 10-mark scale. The number of questions in the assessment is designed based on the content of the course.

5. Multiple-choice examination

This assessment method is similar to the written assessment; students are required to answer questions based on a prepared solution. The difference of this method is the answer of students is only selected on a limited set of recommended answers, which is designed and printed on the examination.

6. Oral Exam

In this assessment method, students are assessed by interviewing or a question-and-answer section.

7. Written Report

In this assessment method, students are assessed on the submitted reports, including the content, format, drawing and figures in the report.

8. Oral Presentation

This assessment method is similar to the Oral Presentation in On-going/Formative Assessment, assessment criteria are listed in Rubric 4.

9. Peer Assessment

This assessment method is used to assesse group-working activities, assessment criteria are listed in Rubric 7.

16. Career opportunities:

Graduated engineers can work in organizations, companies related to the IT field as:

- Software companies: develop software (desktop applications, web systems, smart phone application, software testing etc.), outsourcing.
- Banks, companies, governmental organizations, schools… (as database administrator, network engineers, IT staffs to manage network security etc.)
- Companies to consult IT solutions.
- Companies to sell and maintain computing devices.
- Universities, colleges, research institutions in the IT field.

17. Programme structure / Curriculum map:

17.1. Program structure:

Table 2.1. Knowledge blocks and the corresponding credits

Knowledge blocks	No. of credits	Percentage (%)	Notes
General Education	**58**	**41.43**	
Social Science	13	9.29	
Languages	18	12.86	
Mathematics, probability, natural science	25	17.86	
Skills	2	1.43	
Physical training: 165 teaching hours			
Military training: 165 teaching hours			
Professional Education	**82**	**58.57**	
Fundamentals	28	20.00	
Professional training	45	32.14	
+ Compulsory	19	13.57	
+ Elective	25	17.86	
Internship and Graduation Thesis	9	6.43	

Sum ≥ 140

17.2. Lists of modules

I. General Education **58 credits**

Social Science **13 credits**

Course code	Course name	Credits	Prerequisite
1010443	Marxist-Leninist Philosophy	3	
1010452	Marxist-Leninist Political Economy	2	
1010462	Science Socialism	2	
1010472	History of the Communist Party of Vietnam	2	
1010092	Ho Chi Minh Thought	2	
1010122	Introduction to Laws	2	

Language **18 credits**

Course code	Course name	Credits	Prerequisite
1010484	General English 1	4	
1010494	General English 2	4	
1010504	General English 3	4	
1250013	Technical Engish 1	3	
1250023	Technical Engish 2	3	Technical Engish 1

Mathematics, probability, natural science **25 credits**

Course code	Course name	Credits	Prerequisite
1250033	Calculus	3 (3+0)	
1250043	Linear Algebra	3 (3+0)	

1221163	Discrete Mathematics	3 (3+0)	
1210113	Probability and Statistics	3 (2+1)	
1250052	Introduction to Information Technology	2 (2+0)	
1250064	Introduction to Programming	4 (3+1)	
1250074	Programming Techniques	4 (3+1)	Introduction to Programming
1221123	Graph Theory	3 (2+1)	Data Structures and Algorithms

Skill **2 credits**

Course code	Course name	Credits	Prerequisite
1230172	Soft Skills	2 (2+0)	

Physical Training: 165 teaching hours

Course code	Course name	Credits	Prerequisite
1010042	Physical Training1	75 tiết	
1010182	Physical Training2	90 tiết	Physical Training1

Military Training: 165 teaching hours

Course code	Course name	Credits	Prerequisite
1010034	Military Training	165 tiết	

II. Professional Education **85 credits**

II.1. Fundamentals **28 credits**

Course code	Course name	Credits	Prerequisite
1221024	Introduction to Database	4 (3+1)	
1221014	Data Structures and Algorithms	4 (3+1)	Programming Techniques
1221084	Operation System	4 (3+1)	Programming Techniques
1230214	Web Programming	4 (3+1)	Programming Techniques
1221134	Computer Network	4 (3+1)	Operation System
1250084	Software Analysis and Design	4 (3+1)	Web Programming
1230444	Mobile Application Programming	4 (3+1)	Programming Techniques

II.2. Profession Training **47 credits**

Major in Network Security

Course code	Course name	Credits	Prerequisite
Compulsory		**19**	
1250094	Network Programming	4 (3+1)	**Computer Network**
1223014	Networking Operating Systems	4 (3+1)	**Computer Network**
1230274	Network Administration	4 (3+1)	**Computer Network**
1250204	Network Design	4 (3+1)	**Computer Network**
1230913	Network Project	3 (0+3)	**Computer Network**

Elective		**26**	
1250214	Network Infrastructure	4 (3+1)	**Computer Network**
1230294	Network service installing and Management	4 (3+1)	**Computer Network**
1230374	Network Security	4 (3+1)	**Computer Network**
1250104	Programming Security	4 (3+1)	**Computer Network**
1250114	Computer Hacking Forensic Investigator	4 (3+1)	Network Security
1250124	Encryption	4 (3+1)	Network Security
1250254	Penetration testing	4 (3+1)	Network Security
1250234	Cloud Computing	4 (3+1)	Network Programming
1223024	System Programming	4 (3+1)	**Computer Network**
1250264	Network Defense Management	4 (3+1)	**Computer Network**
1250274	End-User Secure	4 (3+1)	Network Security
1230504	Information System Security	4 (3+1)	**Computer Network**
1250224	Advance Network Programming	4 (3+1)	Network Programming
1250244	Wireless Networking	4 (3+1)	Network Programming
1210112	Entrepreneurship	2 (2+0)	
	Intellectual Property Law	2 (2+0)	

Major in Software Engineering

Course code	Course name	Credits	Prerequisite
Compulsory		**19**	
1221064	Software Engineering	4 (3+1)	Software Analysis and Design
1222024	Advanced Database Systems	4 (3+1)	Cơ sở dữ liệu Introduction to Database
1250134	User Interface Design	4 (3+1)	Software Analysis and Design
1230114	Software Testing	4 (3+1)	Software Engineering
1230713	Software Project	3 (2+1)	
Elective		**26**	
1224024	Advanced Software Engineering	4 (3+1)	Software Engineering
1224034	Software Project Management	4 (3+1)	Software Engineering
1230344	Advanced Web Programming	4 (3+1)	Web Programming
1250524	Advanced Mobile Application Programming	4 (3+1)	Mobile Application Programming
1250284	Java Programming	4 (3+1)	Programming Techniques
1250364	Electronic Commerce	4 (3+1)	Web Programming
1230474	Design Pattern	4 (3+1)	Programming Techniques
1224034	Software Project Management	4 (3+1)	Software Engineering
1230534	Advanced Software Testing	4 (3+1)	Software Testing
1230484	Accounting Information Systems	4 (3+1)	Introduction to Database
1222014	Database Management Systems	4 (3+1)	Introduction to Database
1230314	Management Information System	4 (3+1)	Introduction to Database
1230544	Internet of Things	4 (3+1)	Programming Techniques
1210112	Entrepreneurship	2 (2+0)	

	Intellectual Property Law	2 (2+0)	

Major in Information System

Course code	Course name	Credits	Prerequisite
Compulsory		**19**	
1221064	Software Engineering	4 (3+1)	Software Analysis and Design
1222024	Advanced Database Systems	4 (3+1)	Introduction to Database
1250134	User Interface Design	4 (3+1)	Software Analysis and Design
1230314	Management Information System	4 (3+1)	Introduction to Database
1230723	Software Project	3 (2+1)	
Elective		**26**	
1230484	Accounting Information Systems	4 (3+1)	Introduction to Database
1230504	Information System Security	4 (3+1)	Introduction to Database
1230344	Advanced Web Programming	4 (3+1)	Web Programming
1230524	Advanced Mobile Application Programming	4 (3+1)	Mobile Application Programming
1250174	Data Mining	4 (3+1)	Introduction to Database
1230474	Design Pattern	4 (3+1)	Programming Techniques
1222014	Database Management Systems	4 (3+1)	Introduction to Database
1250364	Electronic Commerce	4 (3+1)	Web Programming
1222034	Distributed Database	4 (3+1)	Introduction to Database
1224034	Software Project Management	4 (3+1)	Software Engineering
1210112	Entrepreneurship	2 (2+0)	
	Intellectual Property Law	2 (2+0)	

Major in Data Science

Course code	Course name	Credits	Prerequisite
Compulsory		**19**	
1221064	Software Engineering	4 (3+1)	Software Analysis and Design
1222024	Advanced Database Systems	4 (3+1)	Introduction to Database
1230184	Machine Learning	4 (3+1)	Data Structures and Algorithms
1230404	Artificial Intelligence	4 (3+1)	Data Structures and Algorithms
1230723	Software Project	3 (2+1)	
Elective		**26**	
1250174	Data Mining	4 (3+1)	Introduction to Database
1250304	Big Data	4 (3+1)	Introduction to Database
1230554	Natural Language Processing	4 (3+1)	Artificial Intelligence
1230564	Computer Vision	4 (3+1)	Artificial Intelligence
1230574	Recommender System	4 (3+1)	Artificial Intelligence
1230584	Fuzzy Logics and Applications	4 (4+0)	Artificial Intelligence
1230594	Bio-informatics	4 (3+1)	Artificial Intelligence
1230604	Deep learning	4 (3+1)	Machine Learning
1230624	Information Retrieval	4 (3+1)	Artificial Intelligence

1230544	Management Information System	4 (3+1)	Introduction to Database
1230544	Internet of Things	4 (3+1)	Programming Techniques
1210112	Entrepreneurship	2 (2+0)	
	Intellectual Property Law	2 (2+0)	

Internship and Graduation Thesis

Course code	Course name	Credits	Prerequisite
1230443	Internship	3	
1230466	Graduation Thesis	6	
Or	Two professional elective of the same major, instead of graduation thesis	6-8	

18. Tentative programme schedule:

Year	Semester		Course	Credits	Theory	Lab	Sum
I	1	1	Introduction to Information Technology	2	30		19
		2	Introduction to Programming	4 (3+1)	45	30	
		3	Discrete Mathematics	3	30		
		4	Marxist-Leninist Philosophy	3	45		
		5	General English 1	4	60		
		6	Calculus	3	30		
	2	7	Programming Techniques	4 (3+1)	45	30	17
		8	Introduction to Database	4 (3+1)	45	30	
		9	General English 2	4	60		
		10	Linear Algebra	3	45		
		11	Marxist-Leninist Political Economy	2	30		
	Summer	12	Military Training				
II	3	13	Data Structures and Algorithms	4 (3+1)	45	30	20
		14	Operation System	4 (3+1)	45	30	
		15	Soft Skills	2	30		
		16	Web Programming	4 (3+1)	45	30	
		17	General English 3	4	60		
		18	Science Socialism	2	30		
		19	Physical Training1				
	4	20	Computer Network	4 (3+1)	45	30	18
		21	Software Analysis and Design	4 (3+1)	45	30	
		22	Graph theory	3 (2+1)	30	30	
		23	Technical Engish 1	3	30		
		24	History of the Communist Party of Vietnam	2	45		
		25	Introduction to Laws	2	30		
		26	Physical Training 2				

	5	**Software Engineering**	29	Software Engineering	4 (3+1)	45	30	21
			30	Probability and Statistics	3 (2+1)	30	30	
			31	Advanced Database Systems	4 (3+1)	45	30	
			32	User Interface Design	4 (3+1)	45	30	
			33	Ho Chi Minh Thought	2	30		
			34	Mobile Application Programming	4 (3+1)	45	30	
		Information System	35	Software Engineering	4 (3+1)	45	30	
			36	Probability and Statistics	3 (2+1)	30	30	
			37	Advanced Database Systems	4 (3+1)	45	30	
			38	User Interface Design	4 (3+1)	45	30	
			39	Ho Chi Minh Thought	2	30		
			40	Mobile Application Programming	4 (3+1)	45	30	
		Data Science	41	Software Engineering	4 (3+1)	45	30	
			42	Probability and Statistics	3 (2+1)	30	30	
			43	Artificial Intelligence	4 (3+1)	45	30	
			44	Advanced Database Systems	4 (3+1)	45	30	
			45	Ho Chi Minh Thought	2	30		
			46	Mobile Application Programming	4 (3+1)	45	30	
		Network Security	47	Probability and Statistics	3 (2+1)	30	30	
			48	Network Design	4 (3+1)	45	30	
			49	Network Programming	4 (3+1)	45	30	
			50	Networking Operating Systems	4 (3+1)	45	30	
			51	Ho Chi Minh Thought	2	30		
			52	Mobile Application Programming	4 (3+1)	45	30	
	6	**Software Engineering**	53	Software Testing	4 (3+1)	45	30	19
			54	Elective Course for Software Engineering	4 (3+1)	45	30	
			55	Elective Course for Software Engineering	4 (3+1)	45	30	
			56	Elective Course for Software Engineering	4 (3+1)	45	30	
			57	Software Project	3 (2+1)		90	
		Information System	58	Management Information System	4 (3+1)	45	30	
			59	Elective Course for Information System	4 (3+1)	45	30	
			60	Elective Course for Information System	4 (3+1)	45	30	
			61	Elective Course for Information System	4 (3+1)	45	30	
			62	Software Project	3 (2+1)		90	
		Data Science	63	Machine Learning	4 (3+1)	45	30	
			64	Elective Course for Data Science	4 (3+1)	45	30	
			65	Elective Course for Data Science	4 (3+1)	45	30	
			66	Elective Course for Data Science	4 (3+1)	45	30	

			67	Software Project	3 (2+1)		90	
		Network Security	68	Network Administration	4 (3+1)	45	30	
			69	Elective Course for Network Security	4 (3+1)	45	30	
			70	Elective Course for Network Security	4 (3+1)	45	30	
			71	Elective Course for Network Security	4 (3+1)	45	30	
			72	Network Project	3 (0+3)		90	
	7	**Software Engineering**	73	Elective Course for Software Engineering	4 (3+1)	45	30	19
			74	Elective Course for Software Engineering	4 (3+1)	45	30	
			75	Elective Course for Software Engineering	4 (3+1)	45	30	
			76	Elective Course for Software Engineering	4 (3+1)	45	30	
			77	Technical Engish 2	3	30		
		Information System	78	Elective Course for Information System	4 (3+1)	45	30	
			79	Elective Course for Information System	4 (3+1)	45	30	
			80	Elective Course for Information System	4 (3+1)	45	30	
			81	Elective Course for Information System	4 (3+1)	45	30	
			82	Technical Engish 2	3	30		
		Data Science	83	Elective Course for Data Science	4 (3+1)	45	30	
			84	Elective Course for Data Science	4 (3+1)	45	30	
			85	Elective Course for Data Science	4 (3+1)	45	30	
			86	Elective Course for Data Science	4 (3+1)	45	30	
			87	Technical Engish 2	3	30		
		Network Security	88	Elective Course for Network Security	4 (3+1)	45	30	
			89	Elective Course for Network Security	4 (3+1)	45	30	
			90	Elective Course for Network Security	4 (3+1)	45	30	
			91	Elective Course for Network Security	4 (3+1)	45	30	
			92	Technical Engish 2	3	30		
	8		93	Graduation Thesis (6)	6			6
			94	Two Major Electives if not select Graduation Thesis	8			
	9		95	Internship	3			3

19. Course description:

No.	Course title	Description
I. General Education		
1.	**General English 1**	Provide students with knowledge and practice English language skills (Listening-Speaking-Reading-Writing) in the

		context of social communication, science, culture, education, achieving proficiency and ability to communicate in English. English at the elementary level (equivalent to the standard level 1/6 of the national foreign language competency framework as prescribed by the Ministry of Education and Training) in society, learning and working environment.
2.	**General English 2**	Provide knowledge and practice English language skills (Listening-Speaking-Reading-Writing) for students in the context of social communication, science, culture, education to reach the level and ability to communicate in English pre-intermediate level (equivalent to standard level 2/6 of the national foreign language competency scale as prescribed by the Ministry of Education and Training) in society, learning and working environment.
3.	**General English 3**	Provide students with knowledge and practice English language skills (Listening-Speaking-Reading-Writing) in the context of social communication, science, culture, education, achieving proficiency and ability to communicate in English. English at an intermediate level (equivalent to the standard level 3/6 of the national foreign language competency framework as prescribed by the Ministry of Education and Training) in society, learning and working environment.
4.	**Technical Engish 1**	Course ID: 1250013 Provide students with English knowledge for information technology majors and practice English skills (Listening-Speaking-Reading-Writing) for students in the context of social communication, science related to information technology. English communication skills and ability to specialize in information technology at intermediate level (equivalent to the standard level 3/6 of the national foreign language competency framework as prescribed by the Ministry of Education and Training) in society, learning and working environment related to the field of information technology.
5.	**Technical Engish 2**	Course ID: 1250023 Provide students with English knowledge for information technology majors and practice English skills (Listening-Speaking-Reading-Writing) for students in the context of social communication, science related to information technology. English communication skills and ability to specialize in information technology at intermediate level (equivalent to the standard level 3/6 of the national foreign language competency framework as prescribed by the Ministry of Education and Training) in society, learning and working environment related to the field of information technology.
6.	**Calculus**	Course ID: 1250033 Students have basic knowledge and skills about one variable's functions and many real variables functions. Students can apply their knowledge and skills to solve some real-life problems.
7.	**Linear Algebra**	Course ID: 1250043 Provide students with knowledge about solving multivariable

		linear systems, understanding of multidimensional real spaces and linear transformations on square matrices, understanding the concept of eigenvalues and eigenvectors.
8.	**Discrete Mathematics**	Course ID: 1221163 Students have basic knowledge and skills in counting, relations, algorithms, and Boolean algebra. Students can apply knowledge and skills, rules of logical reasoning in life and in computer engineering.
9.	**Probability and Statistics**	Course ID: 1210113 Good knowledge of probability, random variables, probability distribution laws, numerical characteristics of random variables. Understand and perform descriptive statistics. Understand and perform statistical hypothesis testing. Apply knowledge of the subject to calculate probability, draw graphs, analyze data in economics, engineering and information technology.
10.	**Introduction to Information Technology**	Course ID: 1250054 This introductory course introduces fundamental concepts and technologies in Information Technogoly. This course introduces to students knowledge about history of IT, main modules in a computing system, data presentation, operating systems, computer network, information systems and so on. The course also trains students about learning method in universities, team-working in IT, presentation skills
11.	**Introduction to Programming**	Course ID: 1250064 The course is designed for freshmen, who are just get started learning to code. This course introduces the fundamental concepts of programming and three programming structures: sequences, selections, and loops. By the course, students learn about built-in data types available in the C# programming language, single dimensional array, and how to organize the program into functions. In addition, students also have the ability to write, execute, test, and debug for a simple computer program.
12.	**Programming Techniques**	Course ID: 1250074 The course "Programming techniques" will introduce some knowledge and skills used in the process of solving a basic computational problem such as data representation, loop control techniques, processing techniques for each type of data, how to organize programs according to object-oriented programming principles. After completing this course, students will be equipped with a solid foundation in programming, from which students can learn more advanced programming techniques on their own, as well as create a basis for students to be able to learn other subjects.
13.	**Graph Theory**	Course ID: 1221123 The Graph Theory course provides student the fundamental concepts for graphs: vertices and edges of a graph, vertex, path, cycle, … Student will also learn some basic theorems in graph theory. Base on the concepts. Student will embark on learning the algorithms to solve problems on graph: find the path between two vertices, shortest path between two vertices,

		find the minimum spanning tree,… Furtheremore, Graph Theory is a module that provides students with a mathematical models to model the objects in real world (by the vertices of a graph), understand the relationship between objects with the concepts of edges in graph. Eventually, student will able to solve real life applications with the algorithms accumulated through out the Graph Theory unit
14.	**Soft Skills**	Course ID: 1230172 This course trains students knowledge and skills in technical communication, time management, self-controlling, creative thinking and group working. After learning this course, students are able to make a personal presentation, manage or join a group to tackle social issues, apply critical thinking to solve a practical problem.
II. Fundamental Knoledge		
15.	**Introduction to Database**	Course ID: 1221024 This course aims to provide foundational knowledge of databases, database organization, data processing and data querying. Through this course, students have an overview when approaching building management software systems and this is the foundation subject for students to continue studying in majors related to management organization, and query data. In terms of content: students are equipped with basic knowledge of data design theory, concepts in the Entity Relationship model at a basic level. the concepts of the relational model and how to convert from the Entity Relationship model to the relational model; Appling Data Definition Languages and Data Manipulation Languages to organize and manage databases; how to arrange Relational Algebra operations to map to Structured Query Language SQL; types of integrity constraints on the Relational Model.
16.	**Data Structures and Algorithms**	Course ID: 1221014 The course helps students understand the importance of algorithms and data organization. In this module, students are provided with the knowledge of understanding, analyzing, and evaluating algorithms on some basic data structures. In addition, students can analyze, build and exploit new data structures and apply them appropriately to the requirements of each specific application.
17.	**Artificial Intelligence**	Course ID: 1221054 This course introduces concepts and methods in Artificial Intelligence (AI) including problem solving by state space search, knowledge representation, supervised and unsupervised learning. The course also introduces basic models and methods in Data Mining, Machine Learning and Deep Learning. Students are trained with methods to analyze practical problems, design and develop AI systems, and evaluate the performance of constructed AI systems.
18.	**Operation System**	Course ID: 1221084 This course provides fundamental knowledge about management systems of computer resources. By this course, students have knowledge about working principles of an

		operating system. Beside that, students learn about management of computer resources, such as file/directory system, I/O devices, CPU, process, thread, etc. In addition, students also have basic knowlegde about system security, basic attack methods, attack prevention and system protection.
19.	**Web programming**	Course ID: 1224054 This course introduces concepts about the web. It is also provided the knowledge about static and dynamic web. This course is teaching the students a piece of general knowledge about Web design, web programming based on ASP.NET. After finishing this course, students can design and develop a personal website or a website for a company, or an organization.
20.	**Computer Network**	Course ID: 1221134 This course introduces basic computer network concepts. By the course, students learn basic knowledges of the communication and computer network, able to apply knowledges and skills to manage computer systems. Student can manage and maintainance medium and small LANs.
21.	**Software Analysis and Design**	Course ID: 1250084 This course introduces concepts and method to analyse and design a software or an information management system. By the course, students learn concepts, processes, methods to collect and analyse software requirements. The course focuses on the object anlysis and design method by using the UML (United Modelling Language) diagrams. The course also introduces common software architectures
22.	**Mobile Application Programming**	Course ID: 1224054 The course is for designing and building mobile applications using Android™ open-source platform. By the course, students can presentation of the knowledge needed to develop mobile app, understand the structure of the Android operating system, APIs for application programming, apply the process of designing and building components mobile app, fluency in programming techniques to build applications for mobile devices
III. Professional Training		
1. Major in Network Security		
23.	**Network Programming**	Course ID: 1250094 Networking is a module designed to provide essential knowledge in the design and development stages enterprise network applications. Through the module, students will have the opportunity to review concepts related to software, software development processes, basic techniques in object oriented programming. More importantly, the module will focus on methods of transmitting data over the network, the process of designing and building network applications in the direction of synchronization and asynchronous. The course will introduce common software architectures as well as introduce a number of methods to ensure software flexibility and scalability in the future
24.	**Networking**	Course ID: 1223014

	Operating Systems	This course helps students consolidate their knowledge of the principles of the operating system, and at the same time expand on how to use a second operating system outside of a familiar Windows system. The course helps students interact with the command-line interface and script programming on the operating system to facilitate system administration. In the field of information security, this course not only helps students to know how to install and administer but also how to configure the security of basic network services on Linux platform.
25.	**Network Administration**	Course ID: 1230274 Network administration is a module designed to provide an overview of computer network administration, Introduction of basic principles such as: sharing resources, granting access to shared resources to end users, focusing on technologies and solutions that have been widely used to ensure stability , safe and highly efficient for internal network systems. Provides knowledge of the underlying network infrastructure building, deployment models, and hardware standards. Through the module, students will have the opportunity to review concepts related to computer networks, databases and system security.
26.	**Network Design**	Course ID: 1250204 This cource provides knowledge for students to understand and apply the optimal network design process as required. Get the most out of Microsoft Windows, Linux support for deployment. Students explain the process of constructing a LAN project
27.	**Network Project**	Course ID: 1230913 In this course, from the given topic in the network major, students will conduct surveys, research and come up with a detailed plan to solve technical problems including steps: analysis, specification, implementation, testing, evaluation. and deploy. In the process of working in groups, the skills of exchanging and dividing work also play an important role, the documents recorded at each group meeting or meeting with the instructor will also be recorded for follow-up. At the end, the groups will complete the report and protect the network project.
2. Major in Software Engineering		
28.	**Software Engineering**	Course ID: 1221064 This course: - Help students understand and know how to build software in a systematic and methodical manner. During the course students will be introduced to various methods to get an overview of the methods: - Provides an understanding of software engineering processes and basic methods in building a software, understanding of software quality criteria for each stage in the software development process. - Guide methods for receiving requirements, making a list of requirements, analyzing requirements, designing requirements and building specific software skills.

		- Help students understand the importance of each step in the software engineering process. - Help students have the ability to make a complete specific software on their own.
29.	**Advanced Database Systems**	Course ID: 1222024 This course helps students in mastering in-depth knowledge about relational database: method of database design that preserves functional dependencies and dependency Property. Understand the database design stages from the extended Entity Relationship model, conceptual design, to calculate performace in order to consider in organizing the physical design to achieve good results. Apply database programming language to write stored procedures and triggers that execute server-side processes. In addition, students are also provided with knowledge of semi-structured and unstructured databases in new database systems.
30.	**User Interface Design**	Course ID: 1250134 After completing the course requirements, students can evaluate and observe user's habits when they use applications, set up manipulations, features, and operations of applications, and understand the development process and the UX/UI design for applications. Students will master the knowledge of designing mobile and website interfaces, layouts, colors, design rules. Besides, students also have the ability to think and plan the process from receiving customers' requirements to completing products. Students can sketch solutions to optimize user experiences using grid systems and font styles to draw wireframes and workflows on papers. Then they use design software to make application interfaces.
31.	**Software Testing**	Course ID: 1230114 Understand the importance of quality assurance in the software development industry Understand the role and function of the software quality assurance team, the interaction with stakeholders in ensuring the output quality of the software product. Understand software requirements, environmental requirements impact and factors affecting software quality Use knowledge and tools to support the software testing process
32.	**Software Project**	Course ID: 1230713 In this subject, from the given topic, students will conduct surveys, research and come up with a detailed plan to solve technical problems including steps: analysis, specification, implementation, testing, evaluation. and deploy. In the process of working in groups, the skills of exchanging and dividing work also play an important role, the documents recorded at each group meeting or meeting with the instructor will also be recorded for follow-up. At the end, the groups will complete the report and protect the software project.
3. Major in Information System		
33.	**Software Engineering**	Course ID: 1221064 This course:

		- Help students understand and know how to build software in a systematic and methodical manner. During the course students will be introduced to various methods to get an overview of the methods: - Provides an understanding of software engineering processes and basic methods in building a software, understanding of software quality criteria for each stage in the software development process. - Guide methods for receiving requirements, making a list of requirements, analyzing requirements, designing requirements and building specific software skills. - Help students understand the importance of each step in the software engineering process. - Help students have the ability to make a complete specific software on their own.
34.	**Advanced Database Systems**	Course ID: 1222024 This course helps students in mastering in-depth knowledge about relational database: method of database design that preserves functional dependencies and dependency Property. Understand the database design stages from the extended Entity Relationship model, conceptual design, to calculate performace in order to consider in organizing the physical design to achieve good results. Apply database programming language to write stored procedures and triggers that execute server-side processes. In addition, students are also provided with knowledge of semi-structured and unstructured databases in new database systems.
35.	**User Interface Design**	Course ID: 1250134 After completing the requirements in the module, students can evaluate and study the user's application usage habits, set up operations, features and operation of the application, development process. and UI/UX design for the app. Master the knowledge of design for mobile and website, layout, color, design principles. Think design process from receiving requirements to finishing products. Use grid systems, fonts to draw wireframes, workflows, solutions to help users use the product. Use software to design application interfaces.
36.	**Management Information System**	Course ID: 1222063 - The course equips students with knowledge about information, knowledge, information systems, and their role in the business environment. Then, helping students realize the role of information systems based on information technology for the competitive advantage of enterprises. - The contents mentioned in the course also include types of information systems in enterprises and competitive advantages; the process of creating and developing information systems; information system project management; strategy and management of information systems. Besides, this course provides a foundation to improve the working capacity of students in the corporate environment.
37.	**Software Project**	Course ID: 1230713 In this subject, from the given topic, students will conduct

		surveys, research and come up with a detailed plan to solve technical problems including steps: analysis, specification, implementation, testing, evaluation. and deploy. In the process of working in groups, the skills of exchanging and dividing work also play an important role, the documents recorded at each group meeting or meeting with the instructor will also be recorded for follow-up. At the end, the groups will complete the report and protect the software project.
4. Major in Data Science		
38.	**Software Engineering**	Course ID: 1221064 This course: - Help students understand and know how to build software in a systematic and methodical manner. During the course students will be introduced to various methods to get an overview of the methods: - Provides an understanding of software engineering processes and basic methods in building a software, understanding of software quality criteria for each stage in the software development process. - Guide methods for receiving requirements, making a list of requirements, analyzing requirements, designing requirements and building specific software skills. - Help students understand the importance of each step in the software engineering process. - Help students have the ability to make a complete specific software on their own.
39.	**Advanced Database Systems**	Course ID: 1222024 This course helps students in mastering in-depth knowledge about relational database: method of database design that preserves functional dependencies and dependency Property. Understand the database design stages from the extended Entity Relationship model, conceptual design, to calculate performace in order to consider in organizing the physical design to achieve good results. Apply database programming language to write stored procedures and triggers that execute server-side processes. In addition, students are also provided with knowledge of semi-structured and unstructured databases in new database systems.
40.	**Machine Learning**	Course ID: 1230184 The Machine learning module provides students with knowledge and skills about the process of building a machine learning system. The course will introduce some typical problems in machine learning (regression, classification, clustering) and some classic machine learning algorithms (linear regression, k-Nearest Neighbors, decision trees, Support Vectors) Machines, K-Means, ...) as well as modern (Gradient Descent optimization method, artificial neural network) to solve those problems. Through the course, students will have the skills to build, refine, experiment, and evaluate machine learning systems.
41.	**Artificial Intelligence**	Course ID: 1230404 This course students with fundamental concepts of Artifical

		Inteligence and its practical applications. This course teaches students about problem solving by Heuristic strategy, such as scheduling, game... Beside that, this course also teaches students about knowledge representation, fundatmental machine learning, deep learning...
42.	**Software Project**	Course ID: 1230723 In this subject, students will receive different topics from teachers in the Faculty and work in groups. From the content of the topic, students will conduct surveys, research and come up with a detailed plan to solve technical problems including steps: analysis, specification, implementation, testing, evaluation. and deploy. In the process of working in groups, the skills of exchanging and dividing work also play an important role, the documents recorded at each group meeting or meeting with the instructor will also be recorded for follow-up. At the end, the groups will complete the report and protect the software project.
IV. Internship and Graduation Thesis		
43.	**Internship**	**Course ID: 1230443**
44.	**Graduation Thesis**	Course ID: 1230466 Graduation thesis is considered a scientific research work only for students who achieve good academic results during nearly 4 years of study. The graduation thesis provides students with conditions and opportunities to improve the knowledge and skills that have been equipped at the school and promote their forte in scientific research. By completing the thesis, students will be able to: Systematize the knowledge and skills and apply them to the graduation thesis topic in a scientific and creative way. Train and improve the ability to think, ask questions and solve problems independently and creatively. Train students to be self-motivated, independent in research and promote their forte in scientific research.
V. Electives		
1. Major in Network Security		
45.	**Network Infrastructure**	Course ID: 1250214 Network Infrastructure provides knowledges of network infrastructure. - The fundamental knowledges of enterprise network infrastructure - How to config network services on Switch and Router Cisco - How to config network system security on Switch andRouter Cisco
46.	**Network service installing and Management**	Course ID: 1230294 This subject provides fundamental knowledges, related to network infrastructure and network services deploying skills. This network services are common network services or high-end network servces as DNS, Web, FPT, Mail….. This subject also deal with basic knowledges about Cisco network infrastructure
47.	**Network Security**	Course ID: 1230374 Cybersecurity is a module designed to provide an overview of

		network security, introduce to the basic principles of network safety and security, focusing on standard technologies and protocols. Widely used to ensure the safety of data transmitted over the network. Provide knowledge about attack, exploit vulnerabilities and security on each type of attack. Through the module, students will have the opportunity to review concepts related to computer networks, databases and system security. More importantly, the module will focus on information gathering, error scanning, attack and error correction across categories of intranet, internet, website, virus, operating system, data, personal information. , the method of transmitting data over the network ...
48.	**Programming Security**	Course ID: 1250104 This course introduces an overview of the attacks in the application software. The knowledge of attack, exploit and security programmatically. This course focuses on common attacks and exploitation, programmers can prevent basic errors and secure code to avoid security errors.
49.	**Computer Hacking Forensic Investigator**	Course ID: 1250114 Attack investigation is a module designed to provide an overview of network security, introducing the basic principles of network security and security, focusing on providing an overview of data collection and analysis. Provide knowledge about attack, exploit vulnerabilities and security on each type of attack. Through the module, students will have the opportunity to review concepts related to computer networking, database and system security, network security. More importantly, the module will focus on information gathering, investigation in accordance with a process with high technology, multi-platform such as windows, linux, mobile, ... for investigation skills on evidences from the attack.
50.	**Cryptography**	Course ID: 1250124 This course introduces basic knowledges of cryptography. By the cource, students understand features, meaning and uses of main algorithm groups in cryptography. Students are able to analyze information security requirements in software system, design solutions, protocols, processes to protect information in software system, Students have skills to analyze, evaluate strengths and weaknesses of information security solutions, protocols, processes in software system
51.	**Penetration testing**	Course ID: 1250254 This subject is built to provide knowledges related to Penetration Testing techniques: - The fundamental knowledges of Penetration Testing - Penetration testing processes - Penetration test on operating system - Penetration test on website - Penetration test on web server - Penetration test on LAN - Penetration test on mobile - Penetration test on application source code

		- Tools and penetration testing environment
52.	**Cloud Computing**	Course ID: 1250234 This course provides to students with practical knowledge and practical skills on basic topics related to cloud computing, while helping students understand and operate the features of cloud computing based on 4 different cloud service models: IaaS, PaaS, SaaS and BPaaS.
53.	**System programming**	Course ID: 1230193 System programming is a module designed to provide basic knowledge of the components of a system such as file import / export system, file management system, process and continuous communication. process, flow, ... Through the module, students learn the mechanism and how these components work to understand how systems in practice work. More importantly, the module will focus on providing students with the process as well as how to use the C programming language, the system call, the programming library to be able to represent the components of a program. real system.
54.	**Network Defense Management**	Course ID: 1250264 This course provides to students with knowledge related to administration, operation and design of security systems; general knowledge of system security and intranet resources, physical security. Students can understand the dangers surrounding end-users, able to attack or intrusion on computer systems, grasp information security and safety measures.
55.	**End-User Security**	Course ID: 1250274 End User Security is a module designed to provide an overview of network security, introducing the basic principles of network safety and security, focusing on standard technologies and protocols. It has been used extensively to ensure the safety of data transmitted over the network. Providing knowledge about attack, exploit vulnerabilities and security on each type of attack. Through this module, students will have the opportunity to review conceptions related to computer networks, databases and system security. More importantly, the module will focus on knowledge related to end-user security: general knowledge and resources of end-user that need to protect, the dangers of attending network, the dangers from virus threats, software threats, operating system threats, encryption and recovery, privacy policy.
56.	**Information System Security**	Course ID: 1230504 Information system security is a course designed to provide an overview of information security, introducing the basic principles of information safety and security, with a focus on technologies and information security. Techniques have been widely used to ensure the security of database systems. Provides knowledge about attacks, exploits and security on each type of attack. Through the module, students will have the opportunity to review concepts related to computer networks, databases and network security. More importantly, the module will focus on knowledge related to database system

		security: general knowledge and resources to protect, dangers from the internet, dangers from malware, software hazards, operating system hazards, encryption and recovery, security policy.
57.	**Advanced Network Programming**	Course ID: 1250224 Advanced Networking is a module designed to provide advanced knowledge for the design and development stages.enterprise network applications. Through the module, students will have the opportunity to review concepts related to software, software development processes, basic techniques in object oriented programming. More importantly, the module will focus on methods of transmitting data over the network, the process of designing and building network applications in the direction of synchronization and asynchronous. The course will introduce common software architectures as well as introduce a number of methods to ensure software flexibility and scalability in the future
58.	**Wireless Networking**	Course ID: 1250244 This course introduces an overview of wireless network technologies included 802.11x, ZigBee, Bluetooth, WiMAX. The knowledge of wireless system architecture and frame structure. This course not only focuses on wireless network design, configuration, operation but also provides knowledge in security
2. Major in Software Engineering		
59.	**Advanced Software Engineering**	Course ID: 1224024 This course introduces: Systematic approach for developing software Methods and techniques to develop and maintain quality software to solve problems. Study of the principles and methodologies for developing and maintaining software systems
60.	**Software Project Management**	Course ID: 1224034 This course introduces concepts and method to manage a software project. The course focuses on the process areas such as the scope management, cost management, time management, human resourse management, etc ... The course also introduces some common software project management tools.
61.	**Advanced Web Programming**	Course ID: 1230344 The course is built to provide knowledge related to developing a website based on the Angular framework and using a database, thereby helping students to design simple SPA web applications.
62.	**Advanced Mobile Application Programming**	Course ID: 1224054 The course is for designing and building mobile applications using Android™ open-source platform. By the course, students can presentation of the knowledge needed to develop mobile app, understand the structure of the Android operating system, demonstrate components and advanced features in android, use the services provided by Google to apply in real applications,

		master the design and build process of integrating services into mobile applications to build applications for mobile devices
63.	**Java Programming**	Course ID: 1250284 Java Programming is a course designed to provide the core knowledge for the extended stages of programming skills. Through the module, students will have the opportunity to review concepts related to programming techniques, basic techniques in requirements and object-oriented programming methods. More importantly, the module will focus on adaptive techniques and expressing programming techniques in the language. The course will introduce the basic architecture of J2EE, a popular platform as well as extending the direction of mobile software programming on Android devices.
64.	**Electronic Commerce**	Course ID: 1250364 This course introduces concepts about Electronic Commerce (E-Commerce). The business strategies for E-commerce, it is also introducing to E-Commerce types, the environment of e-commerce, the development and growth of electronic commerce. This subject gives the processes of developing an e-commerce system. By the course, students can present all the processes and how to design, develop and deploy an e-commerce application or a website.
65.	**Design Pattern**	Course ID: 1230474 This course is designed to provide knowledge related to object-oriented software development, software development processes, and object-oriented method features. In addition, it helps students approach step by step to the use of design pattern in the object-oriented software development process: structural group, object creation group, behavioral group
66.	**Software Project Management**	Course ID: 1224034 Courses provide students: - Presenting the characteristics, principles and application scope of software project sizing and estimating methods; - Present the characteristics, principles and application scope of the methods of planning and optimizing the works. - Present the characteristics, principles and application scope of risk prevention methods in software project management. - Present the characteristics, principles and application scope of methods of data collection, analysis and quality management in software project management; - Present the characteristics, principles and application scope of methods of managing resources (human, material, financial ...) in software project management Software Quality Assurance
67.	**Advanced Software Testing**	Course ID: 1230534 The course helps students to have knowledge and skills to participate in building, monitoring and detecting errors in all software development activities at the project or in the

		enterprise, especially the activities to ensure the correctness of the software. process, in accordance with the principles, in accordance with the prescribed standards, in accordance with the methods with the motto of minimizing software errors that affect the output quality of the product while preventing both time and cost risks, of project. In addition, the module also provides knowledge and skills to use tools and software to support static and dynamic testing; Manual testing and automation testing in software development phases from unit testing to system testing.
68.	**Accounting Information Systems**	Course ID: 1230483 Students understand the basic issues: Concepts, functions and roles of accounting information systems. How to organize data in accounting information systems. Control in the accounting information system. Concept of business cycle and business cycles in the enterprise. The process of organizing the accounting information system in the conditions of computerization. Process and methods of evaluating, selecting and deploying accounting software in enterprises.
69.	**Database Management Systems**	Course ID: 1222014 This course provides students with knowledge of Database Management Systems (DBMS): Roles, functions, and components of a DBMS; features in transaction management and concurrency control problems, concurrency management, data security, and recovery from instance failure. Each presentation is illustrated on commercial Oracle or SQL Server DBMS to implement specific solutions; however, in this module, using Oracle DBMS to help students who can approach the most secure, famous and largest DBMS available today
70.	**Management Information System**	Course ID: 1222063 - The course equips students with knowledge about information, knowledge, information systems, and their role in the business environment. Then, helping students realize the role of information systems based on information technology for the competitive advantage of enterprises. - The contents mentioned in the course also include types of information systems in enterprises and competitive advantages; the process of creating and developing information systems; information system project management; strategy and management of information systems. Besides, this course provides a foundation to improve the working capacity of students in the corporate environment.
3. Major in Information System		
71.	**Accounting Information Systems**	Course ID: 1230483 Students understand the basic issues: Concepts, functions and roles of accounting information systems. How to organize data in accounting information systems. Control in the accounting information system. Concept of business cycle and business cycles in the enterprise. The process of organizing the accounting information system in the conditions of computerization. Process and methods of evaluating, selecting

		and deploying accounting software in enterprises.
72.	**Advanced Web Programming**	Course ID: 1230344 The course is built to provide knowledge related to developing a website based on the Angular framework and using a database, thereby helping students to design simple SPA web applications.
73.	**Advanced Mobile Application Programming**	Course ID: 1224054 The course is for designing and building mobile applications using Android™ open-source platform. By the course, students can presentation of the knowledge needed to develop mobile app, understand the structure of the Android operating system, demonstrate components and advanced features in android, use the services provided by Google to apply in real applications, master the design and build process of integrating services into mobile applications to build applications for mobile devices
74.	**Data Mining**	Course ID: 1230403 - This course provides students with basic knowledge of Data Mining and its applications in other sciences. - This course covers general contents related to the process of discovering knowledge from data and in-depth contents related to common techniques in data mining such as mining frequent sets and association rules, classify, cluster, represent and evaluate knowledge.
75.	**Design Pattern**	Course ID: 1230474 This course is designed to provide knowledge related to object-oriented software development, software development processes, and object-oriented method features. In addition, it helps students approach step by step to the use of design pattern in the object-oriented software development process: structural group, object creation group, behavioral group
76.	**Database Management Systems**	Course ID: 1222014 This course provides students with knowledge of Database Management Systems (DBMS): Roles, functions, and components of a DBMS; features in transaction management and concurrency control problems, concurrency management, data security, and recovery from instance failure. Each presentation is illustrated on commercial Oracle or SQL Server DBMS to implement specific solutions; however, in this module, using Oracle DBMS to help students who can approach the most secure, famous and largest DBMS available today.
77.	**Electronic Commerce**	Course ID: 1224054 This course introduces concepts about Electronic Commerce (E-Commerce). The business strategies for E-commerce, it is also introducing to E-Commerce types, the environment of e-commerce, the development and growth of electronic commerce. This subject gives the processes of developing an e-commerce system. By the course, students can present all the processes and how to design, develop and deploy an e-commerce application or a website
78.	**Distributed Database**	Course ID: 1222034 This course introduces concepts and method to analyze and

		design a distributed database system, fundamentals of fragmentation, concurrency control and performance of distributed processing. By the course, students learn concepts, methods of fragmentation, correctness of fragmentation; distributed database design approaches; transaction processing; concurrency control; and optimization query in distributed database. Knowledge of this course is applied in students' course project to design and set up a distributed database on a specific database system such as: SQL Server, Oracle, DB2, PostgreSQL, etc.
79.	**Software Project Management**	Courses provide students: - Presenting the characteristics, principles and application scope of software project sizing and estimating methods; - Present the characteristics, principles and application scope of the methods of planning and optimizing the works. - Present the characteristics, principles and application scope of risk prevention methods in software project management. - Present the characteristics, principles and application scope of methods of data collection, analysis and quality management in software project management; - Present the characteristics, principles and application scope of methods of managing resources (human, material, financial ...) in software project management
4. Major in Data Science		
80.	**Data Mining**	Course ID: 1230403 - This course provides students with basic knowledge of Data Mining and its applications in other sciences. - This course covers general contents related to the process of discovering knowledge from data and in-depth contents related to common techniques in data mining such as mining frequent sets and association rules, classify, cluster, represent and evaluate knowledge.
81.	**Big Data**	Course ID: 1230493 - The course introduces the definition and basics of big data in the first three chapters. The tools then provide different functionalities for big data management, big data connectivity, application development and programming, and deployment of big data applications in a variety of environments introduced in chapter 4. - Chapter 5 introduces in-depth topics on big data analysis, providing appropriate suggestions for students to develop and conduct research projects on big data.
82.	**Natural Language Processing**	Course ID: 1230554 The main objective of this course is to provide a comprehensive description of the theory and techniques used in the field of natural language processing (NLP). The course does not go into specific approaches to complex/ adhoc issues, but focuses on defining the basic concepts of this field. The course aims to provide knowledge for undergraduate and

		graduate students majoring in Computer Science, Data Science. For those with programming knowledge can absorb the important ideas of the subject. This course can help learners develop some natural language understanding systems.
83.	**Computer Vision**	Course ID: 1230564 The Computer Vision course provides student a concrete knowledge along with skills for image representation, image operations, image processing algorithms. From which students can build a system capable of understanding images. This course will introduce some techniques of image processing, image analysis, motion analysis, image segmentation, and feature extraction on images.
84.	**Recommender System**	Course ID: 1230574: The course will cover fundamental and practical aspects of a Recommender System (RS), focusing on theory as well as on the practical use and applications of Recommender systems. Recommender systems are used in multiple domains such as e-commerce, content and media distribution, social media and so on. The course content consists of content-based and collaborative algorithms for recommendation, programming of recommender systems, and evaluation and metrics for recommender systems.
85.	**Fuzzy Logics and Applications**	Course ID: 1230584 Upon completion of the course, students will achieve the following goals: - Understand and apply some basic knowledge about fuzzy set theory and fuzzy logic such as: fuzzy set concept, fuzzy relationship, linguistic variables, fuzzy logic and fuzzy inference mechanism. - Understand and implement some applications of fuzzy logic in fuzzy inference.
86.	**Bio-informatics**	Course ID: 1230594 Upon completion of the course, students will achieve the following goals: Understand and apply some basic knowledge of Bioinformatics such as: querying biological databases, comparing DNA sequences, analyzing protein structure. Understand and implement some applications of Bioinformatics in practice
87.	**Deep learning**	Course ID: 1230604 Deep Learning course provides student a concrete knowledge along with skills for neuron networks, method to train a deep learning model, as well as how to build a Deep Learning system. The unit will introduce some popular neuron network architectures such as: Convolutional Neural Networks (CNNs), RecurrentNeural Networks(RNNs), Long Short Term Memory(LSTM), following with the variences of these architectures. Throughout the course, student will accumulate knowledge and skills to build a model, tune the parameters and evaluate the deep learning system.
88.	**Information**	Course ID: 1230624

	Retrieval	This course introduces fundamentals of an Information Retrieval (IR) system, including IR models, evaluation of an IR system, improving IR systems with Natural Language Processing, IR systems on Web data and related fields.
89.	**Management Information System**	Course ID: 1222063 - The course equips students with knowledge about information, knowledge, information systems, and their role in the business environment. Then, helping students realize the role of information systems based on information technology for the competitive advantage of enterprises. - The contents mentioned in the course also include types of information systems in enterprises and competitive advantages; the process of creating and developing information systems; information system project management; strategy and management of information systems. Besides, this course provides a foundation to improve the working capacity of students in the corporate environment.
90.	**Entrepreneurship**	Course ID: 1210112 The module provides knowledge to help students know how to prepare the necessary and sufficient conditions to successfully create and run a new business. The course also gives students with skills so that they can develop an action plan for a business idea, implement the plan and adjust to changes in the business environment. In addition, the course also aims to raise awareness of the responsibility of an entrepreneur for the economic development of the country, for the customers the business serves and the entire population in the area where it operates. This is a subject that uses general knowledge from many subjects such as Executive Management, Financial Management, Marketing Management... Therefore, to be able to learn this subject easier, students should learn management subjects first.
91.	**Management Information System**	Course ID: 1222063 - The course equips students with knowledge about information, knowledge, information systems, and their role in the business environment. Then, helping students realize the role of information systems based on information technology for the competitive advantage of enterprises. - The contents mentioned in the course also include types of information systems in enterprises and competitive advantages; the process of creating and developing information systems; information system project management; strategy and management of information systems. Besides, this course provides a foundation to improve the working capacity of students in the corporate environment.
92.	**Internet of Things**	Course ID: 1230544 The course equips students with knowledge about information, knowledge, information systems, and their role in the business environment. Then, helping students realize the role of information systems based on information technology for the competitive advantage of enterprises. The contents mentioned in the course also include types of

		information systems in enterprises and competitive advantages; the process of creating and developing information systems; information system project management; strategy and management of information systems. Besides, this course provides a foundation to improve the working capacity of students in the corporate environment.