

**MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF
TECHNOLOGY & EDUCATION**



UNDERGRADUATE PROGRAM
Major of
INFORMATION TECHNOLOGY

Ho Chi Minh City, 04-2025

UNDERGRADUATE PROGRAM

Education Program: INFORMATION TECHNOLOGY

Level: Undergraduate

Major: INFORMATION TECHNOLOGY

Type of Program: Full Time

(Decision No.....date....on.....)

1. Duration of Study: 4 years

2. Student Enrollment: High-school Graduation

3. Grading Scale, Curriculum and Graduation Requirements

Grading Scale: 10

Curriculum: Based on regulations of Decision No 43/2007/BGDDT

Graduation Requirements:

General condition: Based on regulations of Decision No 43/2007/BGDDT

Condition of specialty: None

4. The objectives and Expected Learning Outcomes

Program Goals

After completing this training course, the students should be able to have basic scientific knowledge, fundamental knowledge, specialized knowledge of Information Technology major, analysis capability, solve problem skills and solutions assessment, ability contribution, design, operation of automobile systems, communication skill teamwork, professional attitudes, meet the development requirements of major and society. After graduation, the graduates can work in companies, factories, industrial manufactories or operation of automotive systems, ensure national defense, security and international integration.

Program Objectives

PO1. Applying foundational knowledge of social sciences, natural sciences, and information technology.

PO2. Exploring knowledge, problem-solving, system thinking, creative thinking, and professional skills in the field of Information Technology.

PO3. Teamwork and Effective communication.

PO4. Ability to generate ideas, design, implement, and operate IT systems, along with knowledge of leadership and business in engineering.

Program outcomes

No.	Output Standards	Competency Level
1	Ability to apply mathematical principles, algorithms, and scientific knowledge to determine solutions for IT problems.	3
2	Ability to recognize professional responsibilities and make informed judgments in IT solutions based on legal and ethical foundations	4
3	Ability to acquire and apply new knowledge, using appropriate learning strategies	3
4	Ability to work effectively in a team where members jointly lead, creating a cooperative and inclusive environment, setting goals, planning tasks, and meeting objectives.	3
5	Ability to communicate effectively with various audiences, and communicate in English	4
6	Ability to design, install, and evaluate solutions to meet specific requirements in the IT field.	6
7	Ability to apply suitable technologies to create IT solutions	6

Competency level scale

Competency level		Short description
$0.0 \leq \text{level} \leq 1.0$	Basic	Remember: Students remember/recognize/recall knowledge by actions such as defining, repeating, listing, identifying. . .
$1.0 < \text{level} \leq 2.0$	Meets requirements	Understanding: Students construct their own knowledge from documents and knowledge through actions such as explaining, classifying, illustrating, inferring...
$2.0 < \text{level} \leq 3.0$		Application: Students perform/apply knowledge to create products such as models, real objects, simulation products, reports, ...
$3.0 < \text{level} \leq 4.0$	Proficient	Analysis: Students analyze documents/knowledge into details/parts and point out their overall relationship by actions such as analysis, classification, comparison, synthesis...

4.0 < level ≤ 5.0		Evaluation: Students can make judgments and predictions about knowledge/information according to the standards, criteria and measurement indicators that have been determined by actions such as comments, criticism, suggestions,
5.0 < level ≤ 6.0	Excellent	Creativity: Students create/arrange/organize/design/generalize details/parts in different/new ways to create new structures/models/products.

5. Total program credits: 158 credits

(Excluding Physical, National Defense, and IT Enterprise education)

6. Allocation of credits

Name	Credits		
	Total	Compulsory	Elective
General science (I)	57	53	4
Political theory + Laws	14	14	0
Social sciences and humanities	4	0	4
English Language	8	8	0
Mathematics & Natural sciences	21	21	0
Introduction to Information Technology	10	10	0
Professional knowledge	101	83	18
Broad major foundation (group of related majors)	53	53	0
Program foundations	12	0	12
Specialized courses	24	18	6
Information Technology Enterprise	0	0	0
Internship	2	2	0
Capstone projects	10	10	0
Total	158	136	22
Physical and National Defense Education	Non-accumulation		
<i>National Defence Education 1</i>	1		
<i>National Defence Education 2</i>	1		
<i>National Defence Education 3</i>	1		
<i>National Defence Education 4</i>	1		
<i>Physical Education 1</i>	1		
<i>Physical Education 2,3</i>	2		

7. Content of the program

A. Compulsory courses

A.1. General science courses (45 credits)

No.	Course ID	Course name	Credits	Notes
1	LLCT130105E	Philosophy of Marxism and Leninism	3	Political science
2	LLCT120205E	Political Economics of Marxism and Leninism	2	
3	LLCT220514E	History of Vietnamese Communist Party	2	
4	LLCT120314E	Ho Chi Minh's Ideology	2	
5	LLCT120405E	Scientific Socialism	2	
4	GELA236939E	General Law	3	
7	MATH133101E	Mathematical Statistics for Engineers	3	Math & Natural Science
8	MATH132401E	Calculus 1	3	
9	MATH132501E	Calculus 2	3	
10	MATH143001E	Linear Algebra and Algebraic Structure	4	
11	PHYS130902E	Physics 1	3	
12	PHYS111202E	Physics 1 - Laboratory	1	
13	EEEN231780E	Basic Electronics	3	
14	PRBE214262E	Practice Basic Electronics	1	
15	INIT130185E	Introduction to Information Technology	3 (2+1)	Information Technology
16	INPR140285E	Introduction to programming	4 (3+1)	
17	PRTE230385E	Programming techniques	3 (2+1)	
18	ACEN340535E	Academic English 1	4	
19	ACEN340635E	Academic English 2	4	
20	COEN140135E	Communicative English 1	4	Không tích lũy
21	COEN140235E	Communicative English 2	4	
22	PHED110130	Giáo dục thể chất 1 (<i>Physical Education 1</i>)	1	Non-accumulation
23 24	Giáo dục thể chất 2,3 (<i>Physical Education 2,3</i>)		2	Choose 2
	FOOT112330	Bóng đá (<i>Football</i>)	1	Non-accumulation
	VOLL112330	Bóng chuyền (<i>Volleyball</i>)	1	Non-accumulation
	BASK112330	Bóng rổ (<i>Basketball</i>)	1	Non-accumulation
	BADM112330	Cầu lông (<i>Badminton</i>)	1	Non-accumulation
	TENN112330	Quần vợt (<i>Tennis</i>)	1	Non-accumulation
	KARA112330	Không thủ đạo (<i>Karate</i>)	1	Non-accumulation

	CHES112330	Cờ vua (<i>Chess</i>)	1	Non-accumulation
	CHIN112330	Cờ tướng (<i>Chinese Chess</i>)	1	Non-accumulation
	YOGA112330	Yoga (<i>Yoga</i>)	1	Non-accumulation
	PICK112330	Pickle ball	1	Non-accumulation
	National Defense Education		(4)	
25	GDQP110131	Giáo dục quốc phòng 1 (<i>National Defence Education 1</i>)	1	Non-accumulation
26	GDQP110231	Giáo dục quốc phòng 2 (<i>National Defence Education 2</i>)	1	Non-accumulation
27	GDQP110331	Giáo dục quốc phòng (<i>National Defence Education 3</i>)	1	Non-accumulation
28	GDQP110431	Giáo dục quốc phòng 4 (<i>National Defence Education 4</i>)	1	Non-accumulation
		Total	45	

A.2. Information Technology Courses

A.2.1. Broad major foundation courses (53 credits)

No	Course ID	Course name	Credits	Prerequisites
1	DIGR240485E	Discrete Mathematics and Graph Theory	4(3+1)	INPR140285E
2	DASA230179E	Data Structures and Algorithms	3(2+1)	PRTE230385E
3	OOPR230279E	Object-Oriented Programming	3(2+1)	PRTE230385E
4	WIPR230579E	Windows Programming	3(2+1)	OOPR230279E
5	INSE330380E	Information Security	3(2+1)	INPR130285E, NEES330380E
6	WEPR330479E	Web Programming	3(2+1)	DASA230179E DBSY240184E, OOPR230279E
7	SOEN330679E	Software Engineering	3(2+1)	DBSY240184E, OOPR230279E
8	CAAL230180E	Computer Architecture and Assembly Language	3(2+1)	EEEN234162E
9	OPSY330280E	Operating Systems	3(2+1)	CAAL230180E, PRTE230385E
10	NEES330380E	Networking Essentials	3(2+1)	
11	DBSY240184E	Database Systems	4(3+1)	DASA230179E
12	DBMS330284E	Database Management Systems	3(2+1)	DBSY230184E, WIPR230579E
13	ARIN330585E	Artificial Intelligence	3(2+1)	DIGR130485E, DASA230179E
14	AIPR233280E	AI Programming with Python	3(2+1)	ARIN330585E
15	INOT431780E	Internet of Things	3(2+1)	
16	MALE431984E	Machine Learning	3(2+1)	AIPY233277E
17	MOPR331279E	Mobile Programming	3(2+1)	
		Total	53	

A.2.2. Specialized courses (*Students choose one among the following areas of concentration*)

No	Course ID	Course name	Credits	Prerequisites
Software Engineering (SE)				
1	WESE331479E	Web Security	3(2+1)	INSE330380E, WEPR330479E
2	OOSD330879E	Object-Oriented Software Design	3(2+1)	OOPR230279E
3	SOTE431079E	Software Testing	3(2+1)	SOEN33067E, DBSY230184E
4	MTSE431179E	Modern Technologies in Software Engineering	3(2+1)	WEPR330479E, SOEN330679E
5	POSE461479E	Project on Software Engineering	6	INSE330380E, WEPR330479E
Computer network (CN)				
1	NPRO430980E	Network Programming	3(2+1)	MATH143001E, AIPY233277E
2	ADNT330580E	Advanced Networking Technology	3(2+1)	NEES330380E
3	CNDE430780E	Computer Networks Design	3(2+1)	ADNT330580E
4	NSEC430880E	Networks Security	3(2+1)	NEES330380E
5	POCN461280E	Project on Computer Network & Network Security	6	
Information system (IS)				
1	ISAD330384E	Information Systems Analysis and Design	3(2+1)	DBMS330284E
2	DAMI330484E	Data Mining	3(2+1)	DBSY240184E
3	BDES333877E	Big Data Essentials	3(2+1)	DBSY240184E
4	DBSE431284E	Database security	3(2+1)	DBSY240184E
5	POIS461184E	Project on Information System	6	
Artificial Intelligence (AI)				
1	MAAI330985E	Mathematics for Artificial Intelligence	3(2+1)	
2	INDS331085E	Introduction to Data Science	3(2+1)	
4	BDPR431385E	Big Data Processing	3(2+1)	
5	DLEA432085E	Deep Learning	3(2+1)	
6	POAI461485E	Project on Artificial Intelligence	6	
	Total per each concentration		18	

A.2.3. Internship & Graduation (11 credits)

No	Course ID	Course name	Credits
1	SEMI310026E	Information Technology Enterprise	0
2	ITIN421085E	Internship	2
3	GRPR401979E	Capstone project	10

B – Elective courses:

B.1. General Knowledge Courses (4 credits)

No.	Course ID	Course Title	Credits	Note
1	GEEC220105E	General Economics	2	Choose 2 courses
2	IQMA220305E	Introduction to Quality Management	2	
3	INMA220305E	Introduction to Management	2	
4	INLO220405E	Introduction to Logics	2	
5	LESK120190E	Learning Skills	2	
6	SYTH220491E	Systematic Thinking	2	
7	PLSK120290E	Planning Skill	2	
8	IVNC320905E	Introduction to the Vietnamese Culture	2	
9	INSO321005E	Introduction to Sociology	2	
10	ENPS220591E	Engineering Psychology	2	
11	WOPS120390E	Workplace Skills	2	
12	REME320690E	Research Methodology	2	

B.2. Program foundation Courses (12 credits)

No.	Course ID	Course Title	Credits	Prerequisites
1	DIPR430685E	Digital Image Processing	3(2+1)	DASA230179E
2	ESYS431080E	Embedded Systems	3(2+1)	OPSY330280E MATH132501E , MATH132901E NEES330380E DBSY240184E, OOPR230279E
3	FOIT331380E	Information Theory	3(2+1)	
4	ECOM430984E	Electronic Commerce	3(2+1)	
5	CLCO332779E	Cloud Computing	3(2+1)	
6	SPPR330885E	Speech Processing	3(2+1)	

B.3. Specialized Courses (6 credits)

No.	Course ID	Course Title	Credits
Software Engineering (SE)			
1.	TOEN430979E	Tools and Environments for Software Development	3(2+1)
2.	SOPM431679E	Software Project Management	3(2+1)
3.	ADMP431879E	Advanced Programming for Mobile Devices	3(2+1)
4.	ADPL331379E	Advanced Programming Language	3(2+1)
Computer network (CN)			
1.	DIFO432180E	Digital Forensics	3(2+1)
2.	WISE432380E	Wireless and Mobile Security	3(2+1)

3.	BCAP433280E	Blockchain and Applications	3(2+1)	NEES330380E
4.	CLAD432480E	Cloud Computing Administration	3(2+1)	NEES330380E
Information system (IS)				
1.	ADDB331784E	Advanced Database	3(2+1)	DBSY240184
2.	DAWH430784E	Data Warehouse	3(2+1)	DBMS330284
3.	INRE431084E	Information Research	3(2+1)	DBSY240184
4.	DAAN436277E	Data analytics	3(2+1)	
Artificial Intelligence (AI)				
1.	AIOT331185	Artificial Intelligence for IOT	3(2+1)	
2.	PCOM331285	Parallel Computing	3(2+1)	
3.	NLPR431585	Natural Language Processing	3(2+1)	
4.	RELE431685	Reinforced Learning	3(2+1)	

C. Interdisciplinary courses

No.	Course ID	Course Title	Credits	Prerequisites
1.	DIGI330163E	Digital Systems	3(2+1)	
2.	DSIC330563E	Digital Systems Design with HDLs	3(2+1)	
3.	BIIM331863E	Bio-Signal and Image Processing	3(2+1)	
4.	BIME331965E	Computer Aided Design	3(2+1)	
5.	DSPR431264E	Digital Signal Processing	3(2+1)	

D. Massive Open Online Courses

Aimed to leverage the students' competency to quickly adapt themselves to higher education in advanced countries, the following courses may be taken in place of aforementioned courses.

#	Course ID	Course name	Credits	Equivalent MOOC	Equivalent percentage
1.	DIPR330685E	Digital Image Processing	3	Fundamentals of Digital Image and Video Processing https://www.coursera.org/learn/digital	50
2.	MALE431984E	Machine Learning	3	https://www.coursera.org/learn/machine-learning	50
3.	OOSD330879	Object-Oriented Software Design	3	https://www.coursera.org/learn/software-re-design-development-life-cycle	50
4.	SOTE431079E	Software Testing	3	https://www.coursera.org/learn/introduction-software-testing	50

E. Supplementary courses (8 credits)

No.	Course's ID	Course Name	Credits	Notes
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1	ACEN340535E	Academic English 1	4	
2	ACEN340635E	Academic English 2	4	
3	COEN140135E	Communicative English 1	4	Không tích lũy
4	COEN140235E	Communicative English 2	4	

F. Plan

Courses not included in the teaching plan will be offered in semesters for students to plan their own study schedule

No.	Course's ID	Course Name	Credits	Prerequisites
1.	GELA236939E	General law	3	Term 2, Semester 01
2.	LLCT130105E	Philosophy of Marxism and Leninism	3	Bố trí HK1
3.	LCT120205E	Political Economics of Marxism and Leninism	2	Học trước: LLCT130105E
4.	LLCT120405E	Scientific socialism	2	Học trước: LLCT130105E
5.	LLCT120314 E	Hồ Chí Minh' ideology	2	Học trước: LLCT130105E
6.	LLCT220514 E	History of Vietnamese Communist Party	2	Học trước: LLCT130105E, LLCT120205E, LLCT120405E, LLCT120314E
7.	PHED110613	Giáo dục thể chất 2	1	
8.	PHED130715	Giáo dục thể chất 3	3	

1st Semester

No.	Course ID	Course Title	Credits	Pre-req	Term
1	GELA236939E	General law	3		1
2	MATH132401E	Calculus 1	3		2
3	ACEN340535E	Academic English 1	4		1
4	ACEN340635E	Academic English 2	4		1
5	INIT130185E	Introduction to Information Technology	3		1
6	INPR140285E	Introduction to Programming	4		2
7	PHED110130E	Physical Education 1	0(1)		
Total			21		

2nd Semester

No.	Course ID	Course Title	Credits	Pre-req	Term
1	LLCT130105E	Philosophy of Marxism and Leninism	3		1
2	MATH132501E	Calculus 2	3		2

3	MATH143001E	Linear Algebra and Algebraic Structure	4		2
4	LLCT120205E	Kinh tế chính trị of Marxism-Leninism	2		2
5		Social Sciences and Humanities Elective 1	2		2
6	PRTE230385E	Programming techniques	3		1
7	PHYS130902E	Physics 1	3		1
8		Physical Education 2	0(1)		
Total			20		

3rd Semester

No .	Course ID	Course Title	Credits	Prerequisites	Term
1	LLCT120405E	Scientific socialism	2		1
2	DIGR240485E	Discrete Mathematics & Graphs Theory	4		1
3	DASA230179E	Data Structure and Algorithm	4		2
4	OOPR230279E	Object-Oriented Programming	3		1
5	EEEN231780E	Basic Electronics	3		1
6	DBSY240184E	Database System	4		2
7	PHYS111202E	Physics 1 - Laboratory	1		2
8		Social Sciences and Humanities Elective 2	2		2
9		Physical Education 3	0(3)		
Total			22		

4th Semester

No .	Course ID	Course Title	Credits	Prerequisites	Term
1	DBMS330284E	Database Management System	3		2
2	WIPR230579E	Windows Programming	3		1
3	OPSY330280E	Operating System	3		1
4	CAAL230180E	Computer Architecture and Assembly Language	3		1
5	NEES330380E	Networking Essentials	3		2
6	PRBE214262E	Practice Basic Electronics	1		2

7	MATH132901E	Mathematical Statistics for Engineers	3		2
8	LLCT220514E	History of Vietnamese Communist Party	2		1
9	LLCT120314E	Ho Chi Minh's Ideology	2		2
Total			23		

5th Semester

No .	Course ID	Course Title	Credits	Prerequisites	Term
1	INOT431780E	Internet of Things	3		1
2	WEPR330479E	Web Programming	3		1
3	ARIN330585E	Artificial Intelligence	3		2
4	INSE330380E	Information Security	3		2
5	AIPR233280E	AI Programming with Python	3		1
6	SOEN330679E	Software Engineering	3		2
7		IT Core elective 1	3		1
8		IT Core elective 2	3		2
Total			24		

6th Semester

No .	Course ID	Course Title	Credits	Prerequisite	
1		IT Core Elective 3	3		1
2		IT Core Elective 4	3		2
3	MALE431984E	Machine Learning	3		2
4	MOPR331279E	Mobile Programming	3	DBSY230184E	1
Software Engineering Concentration					
6	OOSD330879E	Object-Oriented Software Design	3		1
7	NTSE431179E	New Technologies in Software Engineering	3		2
8	SOTE431079E	Software Testing	3		2
Networking and Network Security Concentration					
6	NPRO430980E	Network Programming	3	INSE330380E DASA230179E	1
7	ADNT330580E	Advanced Networking Technology	3	NEES330380E	1
8	CNDE430780E	Network Design	3	NEES330380E, INSE330380E	2

	Information System Concentration				
6	ISAD330384E	Information System Analysis and Design	3		1
7	BDES333877E	Big Data Essentials	3		2
8	DAMI330484E	Data Mining	3		2
	Artificial Intelligence Concentration				
6	MAAI330985E	Mathematics for Artificial Intelligence	3		1
7	INDS331085E	Introduction to Data Science	3		2
8	BDPR431385E	Big Data Processing	3		2
Total			21		

7th Semester

N o.	Course ID	Course Title	Credits	Prerequisite	
1	SEMI310026E	Information Technology Enterprise	0		1,2
2	ITIN421085E	Internship	2		1,2
3		Specialized elective course 1 (choose from B.3)	3		1
4		Specialized elective course 2 (choose from B.3)	3		1
	Software Engineering Concentration				
5	POSE431479E	Project on Software Engineering	6		1(15w)
	Networking and Network Security Concentration				
5	POCN431280E	Project on Networking & Network Security	6		1(15w)
	Information System Concentration				
5	POIS431184E	Project on Information System	6		1(15w)
	Artificial Intelligence Concentration				
5	POAI451485E	Project on Artificial Intelligence	6		1(15w)
Total			14		

8th Semester

No .	Course ID	Course Title	Credits	Prerequisite	
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	Software Engineering Concentration				
1	WESE331479E	Web security	3		1
	Networking and Network Security Concentration				
1	NSEC430880E	Network Security	3		1
	Information System Concentration				
1	DBSE431284E	Database Security	3		1
	Artificial Intelligence Concentration				
1	DLEA432085E	Deep Learning	3		1
2	GRPR401979E	Capstone Project	10		1(15T)
Total			13		

E. Massive Open Online Courses

Aimed to leverage the students' competency to quickly adapt themselves to higher education in advanced countries, the following courses may be taken in place of courses.

#	Course ID	Course name	Credits	Equivalent MOOC	Equivalent percentage
1.	DIPR330685	Digital Image Processing	3	Fundamentals of Digital Image and Video Processing https://www.coursera.org/learn/digital	100
2.	MALE431984	Machine Learning	3	https://www.coursera.org/learn/machine-learning	50
3.	BDES233877	Big Data Essentials	3	https://www.coursera.org/learn/big-data-essentials	100

9. Course descriptions and credits

MATHS, PHYSICS AND CHEMISTRY COURSES

1. Calculus 1

Credits: 3 (3/0/6)

Course description :

This course provides the basic principles of limits, continuity, differential calculus and integral calculus of single variable algebraic and transcendental functions and applications of the derivative, differentials, indefinite integrals, definite integrals.

2. Calculus 2

Credits: 3 (3/0/6)

Prerequisite courses: Calculus 1

Course description:

Calculus 2 provides the basic knowledge of the integration of functions of a variable, of infinite series, of power series, and of vectors in the plane and in space.

3. Mathematical Statistics for Engineers

Credits: 3 (3/0/6)

Prerequisite courses: Calculus 2 or Mathematical Economics I

Course description:

This course is designed to cover topics from mathematical statistics that are of interest to students from engineering and/or the sciences. Topics should include descriptive statistics, elementary probability, random variables and distributions, mean variance, parameter estimation, hypothesis testing and time permitting- correlation, regression and analysis of variance.

4. Linear algebra and Algebraic structures

Credits: 4 (4/0/8)

Course description:

The purpose of the course is to develop a basic understanding of linear algebra, some basic algebraic structures and their relationship with cryptology. In this course, the students will learn how to work with vector spaces, manipulate matrices, solve systems of linear equations, encode and decode messages. In particular, the students should learn to recognize vector spaces, and compute their bases, express a linear transformation as a matrix, perform basic matrix manipulations, compute the determinant of a matrix, use the Gram-Schmidt process, compute eigenvalues and eigenvectors and diagonalize (orthogonally) a (symmetric) matrix, classify quadratic forms, use some algebraic crypto-systems to encode and decode messages, ...

5. Physics 1

Credits: 3(3/0/6)

Prerequisites: None

Course Description:

This course provides students with fundamental physics including classical mechanics, fluid mechanics, mechanical oscillations and waves, and thermodynamics. Besides that, the course will also help students to understand how to build mathematical models based on experimental results and know how to analyze, to write, to present as well as to develop a specific model based on the recorded data. The content of the course consists of chapters from 1 to 22 in the book “Physics for Scientists and Engineers with Modern Physics”, 9th edition of R.A. Serway and J.W. Jewett.

6. Physics - Laboratory 1

Credits: 1(0/1/6)

Prerequisite: Physics 1

Course Description:

This course provides students with 9 physical experiments related to kinetics, dynamics,

rotational motion and thermodynamics as a basic knowledge for approaching major college subjects of science, engineering and technology. The course helps students verify the laws of physics, gain a deeper understanding of what they learned in Physics 1. The module also trains students skills to observe, conducting experiments, measure, analyze, and process the collected data.

GENERAL KNOWLEDGE ELECTIVES COURSES

01. Engineering Psychology

Credits: 2(2/0/4)

Prerequisites: None

Course Description:

In order to create the interaction between technology and people, students of technology majors need to understand the basic psychological characteristics of humans. This course will provide students with knowledge of human psychology and the application of this knowledge into the design of engineering systems that are suitable for humans.

Textbook:

02. System Thinking

Credits: 2(2/0/4)

Prerequisites: None

Course Description:

This course provides students with basic knowledge about systems, systematic methodologies, and creative thinking methods while forming in students the ability to reason and solve problems systematically, logically, and creatively.

Textbook:

03. Planning Skills

Credits: 2(2/0/4)

Prerequisites: None

Course Description:

This course provides learners with basic knowledge about planning methods and develops students' thinking skills and the ability to find solutions suitable to conditions and circumstances. This enables learners to develop their study skills, short-term and long-term personal and professional plans and teaches them how to be effective. In addition, students will learn time management skills and effective work arrangements.

Textbook:

04. Workplace Skills

Credits: 2(2/0/4)

Prerequisites: None

Course Description:

This course aims to provide students with basic working skills in a technical environment, especially those needed for working in a multicultural, modern environment with rapid technological change.

Textbook:

05. Research Methods

Credits: 2(2/0/4)

Prerequisites: None

Course Description:

This course covers the content of concepts, processes, and structures regarding research methods. The students will go through the selection of research topics, prepare an outline and apply it, collect and process information while conducting scientific research. By the end of the course, students will be able to sign up for research projects at the university level, as well as to conduct graduate these or graduation projects scientifically and successfully.

ACADEMIC ENGLISH COURSES

01. Academic English 1

Prerequisites — Classes or Knowledge required for this Course:

Students' English level must be Low-B2 (CEFR)

Course Description:

This course is designed for full-time students. It is a 45-class contact hour course focusing on Reading and Writing skills which is expected to bring students from Low-B2 to Mid-B2 (CEFR). It is the first of the four courses of Academic English for the students who are studying academic programs in English medium.

Textbooks:

Brook-hart, G. & Jakeman, V. (2012). *Complete IELTS, bands 4-5. Student's book*. Cambridge University Express.

Carter, S. (2012) *IELTS Introduction Study Skills*, Macmillan. Macmillan Education.

02. Academic English 2

Prerequisites — Classes or Knowledge required for this Course:

Students' English level must be Low-B2 (CEFR)

Course Description:

This course is designed for full-time students. It is a 45-class contact hour course focusing on Listening and Speaking skills which is expected to bring students from Low-B2 to Mid-B2 (CEFR). It is the second of the four courses of Academic English for the students who are studying academic programs in English medium.

Textbooks:

Brook-hart, G. & Jakeman, V. (2012). *Complete IELTS, bands 4-5. Student's book*. Cambridge University Express.

Carter, S. (2012) *IELTS Introduction Study Skills*, Macmillan. Macmillan Education.

03. Academic English 3

Prerequisites — Classes or Knowledge required for this Course:

Students' English level must be Mid-B2 (CEFR)

Course Description:

This course is designed for full-time students of the Faculty of High-Quality Training. It is a 45-class contact hour course focusing on four macro skills which is expected to bring students from Mid-B2 to High-B2 (CEFR). It is the third of the four courses of Academic English for the students who are studying academic programs in English medium.

Textbooks:

Brook-hart, G. & Jakeman, V. (2013). *Complete IELTS, bands 5-6.5 (Student's book)*. Cambridge University Express.

Brook-hart, G. & Jakeman, V. (2013). *Complete IELTS, bands 5-6.5 (Workbook)*. Cambridge University Express.

04. Academic English 4

Prerequisites — Classes or Knowledge required for this Course:

Students' English level must be Low-C1 (CEFR)

Course Description:

This course is designed for full-time students. It is a 45-class contact hour course focusing on four macro skills which is expected to bring students from High-B2 to Low-C1 (CEFR). It is the last of the four courses of Academic English for the students who are studying academic programs in English medium. The course lasts 15 weeks.

Textbooks:

Brook-hart, G. & Jakeman, V. (2013). *Complete IELTS, bands 6.5-7 (Student's book)*. Cambridge University Express.

Brook-hart, G. & Jakeman, V. (2013). *Complete IELTS, bands 6.5-7 (Workbook)*. Cambridge University Express.

Introduction to Information Technology

Credits: 3

Prerequisites: None

Course Description:

This course provides students with a broad range of introductory IT concepts; General knowledge of contemporary information technology and job skills required to enter the IT market, especially soft skills. An introduction Computational Thinking and AI Python for Beginners are also included.

Textbooks:

This course has no textbook.

References:

- 1) Dawson, Michael. *Python Programming for the Absolute Beginner*. 3rd ed., Course Technology, 2010.
- 2) ITL ESL. *Introduction to Information Technology*. Pearson Education India, 2013.
- 3) <http://www.cs4fn.org/computationalthinking/>
- 4) <https://deeplearning.ai>

INFORMATION TECHNOLOGY COURSES

Introduction to Programming

Credits: 4

Prerequisites: None

Course Description:

This course provides students with basic programming concepts using C/C++ programming language, knowledge of data presentation in computing, numeric systems, and methods to solve a programming problem. Moreover, this course presents computational thinking, programming styles, approaches to problem-solving and instructions to create console applications using the standard I/O routines in C/C++ with MS Visual Studio.

Textbooks:

- 1) Kernighan, Brian W., and Dennis M. Ritchie. *The C Programming Language*. Prentice Hall International Editions, 1997.
- 2) King, K. N. *C Programming: A Modern Approach*. 2nd ed., W.W. Norton, 2008.

References:

- 1) Prinz, Peter, and Ulla Kirch-Prinz. *A Complete Guide to Programming in C++*. Jones and Bartlett Publishers, 2002.
- 2) Raman, Rajar. *Fundamentals of Computers*. Prentice Hall, 2002.
- 3) Shaw, Zed A. *Learn C The Hard Way*. Addison-Wesley, 2016.

Programming Techniques

Credits: 3

Prerequisites: None

Course Description:

This is an intermediate course with an emphasis on specialized knowledge in the design and analysis of efficient algorithms. Students are exposed to various algorithm design paradigms. The module serves two purposes: to improve students' ability to design algorithms in different areas and to prepare students for the study of more advanced algorithms. The module covers lower and upper bounds, recurrences, basic algorithm paradigms such as prune-and-search, dynamic programming, recursion, big-numbers, divide and conquer, greedy algorithms and some selected advanced topics.

Textbooks:

- 1) Knuth, Donald E. *The Art of Computer Programming – Vol. 2*. 3rd ed., Addison Wesley, 1997.

References:

- 1) Cormen, Thomas H., et al. *Introduction to Algorithms*. 3rd ed., MIT Press, 2009.
- 2) Kernighan, Brian W., and Dennis M. Ritchie. *The C Programming Language*. Prentice Hall International Editions, 1997.
- 3) Lê Minh Hoàng. *Algorithms and Programming*. University of Pedagogy, Hanoi, 2006.
- 4) Skiena, Steven S., and Miguel A. Revilla. *Programming Challenges*. Springer, 2003.

Discrete Mathematics and Graph Theory

Credits: 4

Prerequisites: None

Course Description:

The discrete mathematics part of the course provides students with basic knowledge of sets, propositional logic, predicates and quantifiers, rules of inference, equivalence relations, partial orderings, Boolean functions, representing Boolean functions, logic gates, and minimization of circuits. *The graph theory* part of the course provides students with basic knowledge of graphs and graph models, graph terminologies, representing graphs, graph isomorphism, connectivity, Euler and Hamilton paths, shortest-path problems, introduction to trees, tree traversal, spanning trees and minimum spanning trees.

Textbooks:

- 1) Rosen, Kenneth H. *Discrete Mathematics and Its Applications*. 7th ed., McGraw-Hill Companies, Inc, 2012.

References:

- 1) Dang Truong Son, et al. *Discrete Mathematics and Graph Theory*. Vietnam National University, Ho Chi Minh City Publishing Company, 2016.
- 2) Nguyen Huu Anh. *Discrete Mathematics*. Vietnam National University, Ho Chi Minh City Publishing Company, 2003.
- 3) Seymour L., and Marc L. *Discrete Mathematics*. McGraw-Hill Companies, Inc, 2007
- 4) Tran Ngoc Danh. *Advanced Discrete Mathematics*. Vietnam National University, Ho Chi Minh City Publishing Company, 2004.

Artificial Intelligence

Credits: 3

Prerequisites: None

Course Description:

This course aims to provide students with knowledge of AI applications; knowledge on search methods for solving problems (blind, experience, optimization, competition); knowledge of representation and argument, semantic network, expert system, machine learning; knowledge and skills relating to developing smart applications.

References:

<http://library.thinkquest.org/2705/>

Data Structures and Algorithms

Credits: 3

Prerequisites: Introduction to programming, Programming Techniques

Course Description:

This course provides students with specialized knowledge in data structures and algorithms used for developing computer programs. Students are able to analyse and describe algorithms using pseudocodes as well as develop the algorithms on a computer using C/C++ programming language. Furthermore, this course also provides students with the ability to apply data structures and algorithms to solve real-world problems. Besides, students can work in groups and develop their presentation skills through seminars.

Textbooks:

- 1) Kruse, R. L. *Data structures and Program Design in C++*. Prentice-Hall Inc., 1999.

References:

- 1) Lê Văn Vinh. *Giáo Trình Cấu Trúc Dữ Liệu Và Giải Thuật*. NXB Đại Học Quốc Gia TP. Hồ Chí Minh, 2013.
- 2) Nguyễn Hồng Chương. *Cấu Trúc Dữ Liệu – Ứng Dụng Và Cài Đặt Bằng C*. NXB TP HCM, 2005.
- 3) Trần Hạnh Nhi. *Nhập Môn Cấu Trúc Dữ Liệu Và Giải Thuật*. Đại Học Khoa Học Tự Nhiên TP. HCM, 2000.

Object-Oriented Programming

Credits: 3

Prerequisites: Introduction to programming

Course Description:

Object-oriented programming (OOP) is a programming paradigm based on the concept of "objects", which may contain data, in the form of fields, often known as attributes; and code, in the form of procedures, often known as methods. A feature of objects is that an object's procedures can access and often modify the data fields of the object with which they are associated (objects have a notion of "this" or "self"). In OOP, computer programs are designed by making them out of objects that interact with one another.

This course provides students with specialized knowledge in OOP used for developing application programs. Students are able to write and run programs using C++/C#/Java/Python programming language or JavaScript. Furthermore, this course also provides students with the ability to apply OOP to solve real-world problems. Besides, students can develop their teamwork and presentation skills through seminars.

Textbook:

- 1) Harwani, B. M. *Learning Object-Oriented Programming in C# 5.0*. Cengage Learning PTR, 2015.

References:

- 1) Chiarelli, Andrea. *Mastering JavaScript Object-Oriented Programming*. 2nd ed., Packt Publishing Limited, 2016.
- 2) Lafore, Robert. *Object-Oriented Programming in C++*. 4th ed., SAMS Publishing, 2002.
- 3) Phillips, Dusty. *Python 3 Object-Oriented Programming*. 1st ed., Packt Publishing Limited, 2015.
- 4) Skrien, Dale. *Object-Oriented Design Using Java*. 1st ed., McGraw-Hill Companies Inc., 2009.

Information Security

Credits: 3

Prerequisites: None

Course Description:

This course provides students with consideration of security problems in computing. Topics include: (1) Foundations: security mindset, essential concepts (Policy, CIA, etc.); (2) Software and OS security: vulnerabilities and protections, malware analysis; (3) Practical cryptography: encryption, authentication, hashing, symmetric and asymmetric crypto; (4) Networks: protocols, attacks and countermeasures.

Main textbook:

- 1) William Stallings and Lawrie Brown (2014), *Computer Security, Principles and Practice*, Third Edition ISBN-10: 0-133-77392-2
- 2) Wenliang Du (2017), *Computer security a hands-on approach*, ISBN-10: 154836794X

References:

- 1) Mark Stamp (2011), *Information Security, Principle and Practices*, 2nd Edition, Wiley Inc. Publication
- 2) W. Stallings (2011), *Cryptography and Network Security - Principles and Practices*, 5th Edition, Pearson.
- 3) Matt Bishop (2004), *Introduction to Computer Security*, Prentice Hall, ISBN 0-321247442

Web Programming

Credits: 3

Prerequisites: Introduction to programming

Course Description:

This course provides students with fundamental knowledge used to develop web applications based on Servlet and JSP technology. The main contents include (1) Servlet; (2) JSP and JSTL (JSP Standard Tag Library - a collection of useful JSP tags that encapsulate core functionality common to many JSP applications); (3) JDBC; (4) some front-end technologies such as JavaScript and JQuery.

Textbooks:

1) Hall, Marty, and Larry Brown. *Core Servlets & JSP*. 2nd ed., Prentice Hall, 2003.

References:

1) Basham, Bryan, Kathy Sierra, and Bert Bates. *Headfirst Servlets and JSP*. 2nd ed., O'Reilly Media, 2008.

2) Murach, Joel, and Michael Urban. *Murach's Java Servlets and JSP*. 3rd ed., Murach, 2014.

Windows Programming

Credits: 3

Prerequisites: Introduction to programming, OOP, DBMS

Course Description:

This course provides students with specialized knowledge and methods in programming on Windows systems. Students are also provided with the fundamentals of ADO.NET to work with different database management systems. Furthermore, students are able to develop different applications using .NET technologies, including windows form controls, graphics controls, LINQ to SQL, Entity framework, Microsoft report. This course also provides students with the ability to apply .NET technologies to solve real-world problems. Besides, students can work in groups and develop their presentation skills through seminars.

Textbooks:

1) Brown, Erik. *Windows Form Programming with C Sharp*. Manning, 2002.

2) Sells, Chris. *Windows Form Programming in C Sharp*. Addison-Wesley Professional, 2003.

3) Troelsen, Andrew. *C# 5.0 and the .NET 4.5 Framework*. Apress, 2012.

AI programming with python Credits: 3

Prerequisites: Introduction to programming, OOP

Course Description:

This course teaches foundational AI programming with Python, covering model structures, key math concepts, and image classification models. The curriculum includes Python, NumPy, Pandas, Matplotlib, linear algebra, calculus, transformer networks with PyTorch, LLM inference, AI agents, and MCP.

Textbooks:

1) *Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow 2*, Packt Publishing; 3rd edition (December 12, 2019), ISBN-13:978-1789955750.

2) *Building LLMs for Production: Enhancing LLM Abilities and Reliability with Prompting, Fine-Tuning, and RAG*, independently published (May 21, 2024), ISBN-13: 979-8324731472

Software Engineering

Credits: 3

Prerequisites:

Course Description:

This course aims to provide knowledge and skills related to software engineering, such as

receiving requests, modelling the requirement, analysing the requirements, designing the requirements, building software and testing software.

Textbooks:

- 1) Roger S. Pressman. *Software Engineering*. Education Publisher, 2001.

References:

- 1) Brooks, Frederick P. *The Mythical Man-Month: Essays on Software Engineering*. 20th Anniversary Edition, Addison-Wesley, 1995.
- 2) Dương Anh Đức. *Object-Oriented Analysis and Design with UML*. Statistical Publisher, 2002.
- 3) Larman, Craig. *Applying UML and Pattern*. Prentice Hall, 1998.
- 4) Nguyễn Minh Đạo. Education Publisher. FIT - HCMUTE, 2004.
- 5) Pressman, Roger S. *Software Engineering: A Practitioner's Approach*. 4th ed., McGraw-Hill, 1997.
- 6) Sommerville, Ian. *Software Engineering*. 9th ed., Addison-Wesley, 2011.

Object-Oriented Software Design

Credits: 3

Prerequisites: OOP

Course Description:

This course provides students with fundamental knowledge about software analysis and design using object-oriented techniques, Unified Modelling Language (UML) and UML tools, as well as design patterns and their applications in software development. By the end of the course, students will be equipped with analysis and design skills, such as the ability to use UML tools to create software design components and the ability to apply appropriate design patterns in various situations to improve software resilience and extensibility. Moreover, soft skills such as teamwork and public presentation are also developed during the course.

Textbooks:

- 1) Gamma, E., et al. *Design Patterns - Elements of Reusable Object-Oriented Software*. Addison-Wesley, 2005.
- 2) Hamilton, Kim, and Russell Miles. *Learning UML 2.0*. O'Reilly, 2006.

References:

- 1) Cooper, James W. *The Design Patterns Java Companion*. Addison-Wesley, 1998.
- 2) Horstmann, Cay. *Object-Oriented Design & Patterns*. 2nd ed., John Wiley & Sons, 2006.
- 3) Larman, Craig. *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*. Pearson, 2008.
- 4) <http://www.omg.org/spec/UML/2.3/>

Software Testing

Credits: 3

Prerequisites: Software Engineering

Course Description:

This course provides students with specialized knowledge in software development life cycles, software development models, software testing, software testing processes, fundamental designing and implementing testing techniques. After finishing the course, students will be able to understand terms, definitions, and concepts in software testing and they will be able to apply knowledge to design, execute, analyse and evaluate software quality. Besides that, students will have the opportunity to do practical work using bug management tools and automation testing tools.

Textbooks:

- 1) Ammann, Paul, and Jeff Offutt. *Introduction to Software Testing*. Cambridge University Press, 2008.

References:

- 1) Dustin, Elfriede. *Effective Software Testing: 50 Specific Ways to Improve Your Testing*. Wiley Publishing, 2002.
- 2) Myers, Glenford J. *The Art of Software Testing*. John Wiley & Sons, 2004.
- 3) Nguyen, Hung Q. *Testing Application on the Web: Testing Planning for Mobile and Internet-Based System*. Wiley Publishing, 2003.

Modern Technologies on Software Engineering

Credits: 3

Prerequisites: Web programming

Course Description:

This course provides students with the ability to build an application using the MEAN stack by writing as little code as possible and taking a high-level view of the key components along the way. The students will use as many abstractions and templates as possible.

MEAN is an acronym for the four main technologies (1) MongoDB: A non-relational database; (2) ExpressJS: A node framework that has powerful middleware features; (3) AngularJS: A frontend JavaScript library created and maintained by Google that is used to create single-page applications; (4) Node.JS: A server-side JavaScript environment based on V8.

Textbook:

- 1) Holmes, Simon. *Getting MEAN with Mongo, Express, Angular, and Node*. Manning Publications Co., 2016.

References:

- 1) Haviv, Amos Q. *MEAN Web Development*. Packt Publishing, 2014.

Programming for Mobile Devices

Credits: 3

Prerequisites: Web programming

Course Description:

This course provides students with fundamentals used to develop Android Applications. The main contents include Java concepts, Android Platform concepts, Android Application Structures, Android Libraries, and Android User Interface Design. After finishing this course, students will be able to analyse, design and choose appropriate libraries for developing full-stack Android Applications.

Textbooks:

- 1) Darwin, Ian F. *Android Cookbook*. O'Reilly Media, 2012.
- 2) Lee, Wei-Meng. *Beginning Android Development*. Wrox, 2012.

References:

- 1) Lee, Wei-Meng. *Beginning Android Development*. Wrox, 2012.

Web Security

Credits: 3

Prerequisites: Information security, Web programming

Course Description:

This course provides students with knowledge about the major risks and basic popular attacking types into Web applications. This course also presents some defending methods against such types of attacks. The course also equips students with the knowledge and the ability to identify threats and use appropriate tools and techniques to build a safe web application and protect it

from attacks.

Textbooks:

- 1) Bryan, S., and Vincent, L. *Web Application Security – A Beginner’s Guide*. McGraw Hill, 2012.
- 2) Ryan, B. *Web Application Defender’s Cookbook*. Wiley Publishing, Inc., 2013.

References:

- 1) Stuttard, Dafydd, and Marcus Pinto. *The Web Application Hacker’s Handbook*. Wiley, 2011.
- 2) OWASP Top 10 - 2013.

Software Project Management

Credits: 3

Prerequisites: none

Course Description:

This course provides students with basic terminology in information technology project management, especially software project management. The course focuses on major knowledge areas involved in the software management process, including project planning, scope management, requirement and change management, time and cost management, risk and human resource management. In this course, students are also equipped with basic skills in project planning and various project management activities.

Textbooks:

- 1) Project Management Institute. *A Guide to Project Management Body of Knowledge* 5th ed., PMI, 2013.

References:

- 1) Chemuturi, Murali K., and Thomas M. Cagley Jr. *Software Project Management: Best Practices, Tools, and Techniques*. J. Ross Publishing, 2010.
- 2) Hughes, Bob, and Mile Cotterell. *Software Project Management*. 5th ed., McGraw-Hill, 2009.
- 3) Jalote, Pankaj. *Software Project Management in Practice*. Addison-Wesley, 2002.

Advanced Programming for Mobile Devices

Credits: 3

Prerequisites: Mobile programming

Course Description:

Ionic teaches web developers how to build cross-platform mobile apps for phones and tablets on iOS and Android. Students will learn how to extend their web development skills to build applications that are indistinguishable from native iOS or Android projects.

Textbooks:

- 1) Ravulavaru, Arvind. *Learning Ionic*. Packt Publishing, 2015.

References:

- 1) Bohner, Michael. *Building Mobile Apps with Ionic Framework*. Michael Bohner, 2015.
- 2) Wilken, Jeremy. *Ionic in Action*. Manning Publications Co, 2016.

Database Systems

Credits: 4

Prerequisites: Database

Course Description:

This course covers the fundamentals of database architectures and database systems, focusing on basics such as the data model, relational algebra, SQL and query optimization. The course also features database design and relational design principles based on dependencies and normal forms. It is designed for undergraduate students; no prior database experience is assumed.

Textbook:

- 1) Elmasri, Ramez, and Shamkant Navathe. *Fundamentals of Database System*. 7th ed., Texas, Addison-Wesley, 2015.

References:

- 1) Garcia-Molina, H., J. D. Ullman, and J. Widom. *Database Systems - The Complete Book*. 2nd ed., New Jersey, Pearson Prentice Hall, 2008.
- 2) Silberschatz, A., H. Korth, and S. Sudarshan. *Database System Concepts*. 6th ed., New York, McGraw-Hill, 2010.

Database Management Systems

Credits: 3

Prerequisites: Database

Course Description:

This course covers the fundamentals of database management systems, database programming, and principles of database administration. This course emphasizes database concepts, developments, use and management in two main sections: database concepts and practice. The relational database management system is the main focus of the course alongside the practical design of databases and developing database applications.

Textbooks:

- 1) Ramakrishnan, Raghu, and Johannes Gehrke. *Database Management Systems*. 3rd ed., McGraw Hill, 2003.
- 2) Tutorials Point, Database Management System, www.tutorialspoint.com, 2015.
- 3) <https://docs.microsoft.com/en-us/sql/t-sql/statements/statements>

References:

- 1) Elmasri, Ramez, and Shamkant Navathe. *Fundamentals of Database System*. 7th ed., Texas, Addison-Wesley, 2015.
- 2) Garcia-Molina, H., J. D. Ullman, and J. Widom. *Database Systems - The Complete Book*. 2nd ed., New Jersey, Pearson Prentice Hall, 2008.
- 3) Silberschatz, A., H. Korth, and S. Sudarshan. *Database System Concepts*. 6th ed., New York, McGraw-Hill, 2010.

Data Warehouse

Credits: 3

Prerequisites: Database systems

Course Description:

This course provides students with basic knowledge of the data warehouse. In this course, the learners will learn the basic concepts of data warehouse, data warehouse architecture, and multidimensional models. They will gain hands-on experience in data warehouse design and use open-source products for manipulating pivot tables and creating data integration workflows. Besides, students will also learn how to use analytical elements of SQL supported by relational database management systems for answering business intelligence questions.

Textbooks:

- 1) Jensen, Christian S., et al. *Multidimensional Databases and Data Warehousing*. Morgan & Claypool, 2010.
- 2) Lane, Paul, et al. *Oracle Database Data Warehousing Guide*. 12c Release 1 (12.1), Oracle, 2014.

References:

- 1) Casters, Matt, et al. *Pentaho Kettle Solutions: Building Open Source ETL Solutions with Pentaho Data Integration*. Wiley, 2010.
- 2) Elmasri, Ramez, and Shamkant Navathe. *Fundamentals of Database Systems*. 6th ed.,

Addison-Wesley, 2011.

- 3) Kimball, Ralph, and Margy Ross. *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modelling*. 3rd ed., Wiley, 2013.
- 4) Microsoft. *SQL Server 2012 Tutorials: Analysis Services - Multidimensional Modelling*. SQL Server 2012 Books Online, 2012.

Data Mining

Credits: 3

Prerequisites: None

Course Description:

The course will cover various issues such as fundamental data mining concepts, algorithms, and computational paradigms. These algorithms and computational paradigms allow computers to find patterns and regularities in databases and generally improve their performance through interactions with data. Data mining is currently regarded as the key element of a more general process called *knowledge discovery* that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures.

Textbook:

- 1) Han, Jiawei. *Data Mining: Concepts and Techniques*. 3rd ed., Morgan Kaufmann, 2011.

References:

- 1) Kantardzic, Mehmed. *Data Mining: Concepts, Models, Methods, and Algorithms*. John Wiley & Sons, 2003.
- 2) Larose, Daniel T. *Data Mining Methods and Models*. John Wiley & Sons, 2006.
- 3) Wu, X., et al. "Top 10 Algorithms in Data Mining". *Knowl Inf Syst* **14**, 1–37, 2008.

Information Systems Analysis and Design

Credits: 3

Prerequisites: None

Course Description:

System analysis and design deals with planning the development of information systems through understanding and specifying in detail what a system should do and how the components of the system should be implemented and work together. This course provides the concepts, skills, methodologies, techniques, tools, and perspectives essential for systems analysts. It emphasizes the development of information systems based on object-oriented analysis and design methods. Students are required to go through the steps of the systems analysis and design process to solve real-life problems.

Textbook:

- 1) Solms, Fritz. *Object-Oriented Analysis and Design using UML*. Solms Training, Consulting and Development (STCD), 2012.

References:

- 1) Bennett, S., S. McRobb, and R. Farmer. *Object-Oriented Systems Analysis and Design Using UML*. 4th ed., McGraw Hill, 2010.
- 2) Booch, G., I. Jacobson, and J. Rumbaugh. *The Unified Modelling Language for Object-Oriented Development*. Documentation set, version 1.0, Rational Software Corporation, 1997.
- 3) Dennis, A., B. H. Wixom, and D. Tegarden. *Systems Analysis and Design with UML Version 2.0*. John Wiley & Sons, 2005.

Database Security

Credits: 3

Prerequisites: Database system, Information Security

Course Description:

This course provides fundamental knowledge about data and database security. It also presents models as well as basic approaches and methods to implement database security: data encryption, access control, etc. By the end of this course, students will be able to implement security mechanisms in database management systems. Moreover, the course offers students the opportunity to develop soft skills such as teamwork and public presentation.

Textbooks:

- 1) Ben-Natan, Ron. *Implementing Database Security, and Auditing*. Elsevier, 2005.
- 2) Bishop, Matt. *Computer Security: Art and Science*. Addison-Wesley, 2002.

References:

- 1) Afyouni, Sam. *Database Security and Auditing: Protecting Data Integrity and Accessibility*. Boston, Course Technology Press, 2005.
- 2) Ben-Natan, Ron. *How To Secure and Audit Oracle 10g & 11g*. CRC Press, 2009.
- 3) Bertino, Elisa, Gabriel Ghinita, and Ashish Kamra. *Access Control for Databases: Concepts and Systems*. Now Publishers, 2011.
- 4) Clarke, Justin. *SQL Injection Attacks, and Defense*. Syngress, 2012.
- 5) Gertz, Michael, and Sushil Jajodia. *Handbook of Database Security: Applications and Trends*. Springer, 2009.
- 6) Walters, R., and G. Fritchey. *Beginning SQL Server 2012 Administration*. Apress, 2012.

Computer Architecture and Assembly Languages

Credits: 3

Prerequisites: None

Course Description:

This course provides students with basic knowledge in computer architecture and those attributes that have a direct impact on the logical execution of a program, the operational units and their interconnection that realize the architectural specifications. The students also get to know x86 processor organization, instruction set, memory segmentation, addressing modes, how to assemble a program with assembly language and debug low-level language program.

Textbooks:

- 1) Stallings, William. *Computer Organization and Architecture*. 9th ed., Pearson Education, Prentice-Hall, 2013.

References:

- 1) Nguyễn Đăng Quang. *Computer Organization and Architecture lecture notes*. 2015.
- 2) Đinh Công Đoàn. *Bài Giảng Cấu Trúc Máy Tính Và Hợp Ngữ*. Khoa CNTT Trường, ĐH. SPKT Tp. HCM, 2008.

Operating Systems

Credits: 3

Prerequisites: Computer Architecture and Assembly language

Course Description:

This course provides students with basic knowledge of the operating system, including the general model, structure, functions, basic components of the operating system, and basic principles for building operating systems. The students also get to know the structure and application of basic principles in specific operating systems, as well as research and simulate OS device drivers through system programming.

Textbook:

- 1) Silberschatz, Abraham, Peter Baer Galvin, and Greg Gagne. *Operating System Concepts*. 6th ed., Wiley, 2001.

References:

- 1) Stallings, William. *Operating Systems: Internals and Design Principles*. 8th ed., Pearson, 2014.

Networking Essentials

Credits: 3

Prerequisites: None

Course Description:

This course provides students with knowledge of basic network fundamentals, network topologies, networking operating systems, and common network protocols. This course also provides knowledge and skills related to network administration for popular network operating systems such as Windows OS and Linux OS.

References:

- 1) Bresnahan, Christin, and Richard Blum. *LPIC-2 Linux Professional Institute Certification Study Guide*. 2nd ed., Sybex, 2016.
- 2) Odom, Wendell. *CCENT/CCNA ICND1 – Official Cert Guide*. Cisco Press, 2016.
- 3) Odom, Wendell. *CCNA Routing and Switching – Official Cert Guide*. Cisco Press, 2016.
- 4) Smith, Roderick W. *LPIC-1 Linux Professional Institute Certification Study Guide*. 3rd ed., Sybex, 2013.
- 5) Thomas, Orin. *Training Guide: Administering Windows Server 2012 R2*. Microsoft Press, 2014.
- 6) Tulloch, Mitch. *Training Guide: Installing and Configuring Windows Server 2012 R2*. Microsoft Press, 2014.

Advanced Networking Technology

Credits: 3

Prerequisites: Networking Essentials

Course Description:

This course provides students with knowledge in the routing technologies, characteristics of routing protocols, VLANs, VTP, STP, Inter-VLAN routing, ACL, NAT, WAN. Moreover, this course provides students with an understanding of the core issues and awareness of proposed solutions so they can actively follow and participate in the development of network technologies. This course also offers students the opportunity to develop soft skills such as teamwork and public presentation.

References:

- 1) Odom, Wendell. *CCENT/CCNA ICND1 – Official Cert Guide*. Cisco Press, 2016.
- 2) Odom, Wendell. *CCNA Routing and Switching – Official Cert Guide*. Cisco Press, 2016.

Unix Operating System

Credits: 3

Prerequisites: Networking essentials

Course Description:

This course is designed to give experienced Unix/Linux users the skills and knowledge needed to be qualified system administrators. The students are introduced to specialized knowledge of the structure, operations of the Unix/Linux file system, Shell programming skills, Unix/Linux system, and network services administration. The students will deal with and solve real-life problems in setting up, writing scripts and administrating system/ network services on Unix/Linux operation system. The students will discuss the various aspects of the problem, various possible solutions, and try them all.

Textbooks:

- 1) Nguyen Thi Thanh Van. *Unix Network Operation System*. 2008.

References:

- 1) Glass, Graham, and King Ables. *Linux for Programmers and Users*. Prentice Hall, 2006.
- 2) Nemeth, Evi, et al. *UNIX and Linux System Administration Handbook*. 4th ed., Pearson Education Inc., 2010.
- 3) Smith, Roderick W. *LPIC-1: Linux Professional Institute Certification Study Guide*. 3rd ed., SYBEX Inc., 2013.

Computer Networks Design

Credits: 3

Prerequisites: Networking Essentials, Advanced Networking Technology

Course Description:

This course provides students with knowledge in network design processes and phases; designing networks with 3 class models; designing Local Area Network (LAN), Wireless LAN (WLAN), Wide Area Network (WAN); designing with High availability and Load balancing.

References:

- 1) Bruno, Anthony. *CCDA Official Cert Guide*. Cisco Press, 2016.
- 2) Wilkins, Sean. *Designing for Cisco Internetwork Solutions (DESIGN)*. Cisco Press, 2011.

Networks Security

Credits: 3

Prerequisites: Networking Essentials, Information Security

Course Description:

This course provides students with knowledge in network security technologies, network security analysis tools, Firewall, Intrusion Detection System/Intrusion Prevention System (IDS/IPS), Security Information and Event Management (SIEM).

References:

- 1) Chapman, Chris. *Network Performance and Security*. SynGress, 2016.
- 2) Gibson, Darryl. *CompTIA Security+: Get Certified Get Ahead*. CompTIA, 2014.
- 3) Maiwald, Eric. *Fundamentals of Network Security*. McGraw Hill, 2010.
- 4) McNab, Chris. *Network Security Assessment*. 3rd ed., O'Reilly Media, 2016.
- 5) Stallings, William. *Network Security Essentials*. 4th ed., Prentice Hall, 2011.

Networks Programming

Credits: 3

Prerequisites: Networking Essentials, Introduction to programming

Course Description:

This course is designed to provide knowledge and skills in the analysis and design of computer networks by focusing on network programming. Through this course, students are equipped with basic knowledge about the Socket API library on Windows, object classes in System.NET or java.net. Students can build data transmission applications at the Network layer with UDP, TCP, ICMP protocols and distributed applications using RMI. They can also apply knowledge of the course to program network management applications.

Textbooks:

- 1) Blum, Richard. *C# Network Programming*. SYBEX, 2003.
- 2) Harold, Elliotte Rusty. *Java Network Programming*. 4th ed., O'Reilly Media Inc., 2014.

Embedded Systems

Credits: 3

Prerequisites: Computer Architecture

Course Description:

This course provides students with basic knowledge of embedded systems, including the basic concepts of embedded systems, the properties of embedded applications; basic components of an embedded system; embedded system design process; ARM microcontroller; ARM instruction

set; C programming language for embedded systems; and embedded programming for arm microcontroller.

Textbooks:

- 1) Crowley, Patrick, and Peter Barry. *Modern Embedded Computing – Designing Connected, Pervasive, Media-Rich Systems*. Morgan Kaufmann Publishers, Inc., 2012.
- 2) Lee, Edward A., and Sanjit A. Seshia. *Introduction to Embedded Systems – A Cyber-Physical Systems Approach*. MIT Press, 2014.

References:

- 1) Vahid, Frank, and Tony Givargis. *Embedded System Design: A Unified Hardware/Software Approach*. John Wiley & Sons Inc., 2002.
- 2) Valvano, Jonathan W. *Embedded Systems: Introduction to Arm®. Cortex (TM)-M Microcontrollers (Volume 1)*. 5th ed., CreateSpace Independent Publishing Platform, 2012.
- 3) Valvano, Jonathan W. *Embedded Systems: Real-Time Interfacing to Arm®. Cortex™-M Microcontroller*. 2nd ed., CreateSpace Independent Publishing Platform, 2012.
- 4) Yiu, Joseph. *The Definitive Guide to the ARM Cortex-M3*. Elsevier Newnes, 2007.

Network Monitoring Systems

Credits: 3

Prerequisites: Networking Essentials, Advanced Networking

Course Description:

This course provides students with knowledge of the components of a network monitoring system; knowledge of implementing a network monitoring system, network monitoring protocols, network monitoring tools, and alert systems.

References:

- 1) Bejtlich, Richard. *The Practice of Network Security Monitoring*. No Starch Press, 2013.
- 2) Kundu, Dinangkur, and S. M. Ibrahim Lavlu. *Cacti 0.8 Network Monitoring*. Packt Publishing, 2009.
- 3) Olups, Rihards. *Zabbix Network Monitoring*. 2nd ed., Packt Publishing, 2016.
- 4) Ryder, Tom. *Nagios Core Administration Cookbook*. 2nd ed., Packt Publishing, 2016.

Wireless Networks

Credits: 3

Prerequisites: Networking Essentials

Course Description:

This course provides students with basic knowledge in wireless and mobile networks, including applications, history of the wireless networks, future wireless network applications, features of wireless environment and signal modulation techniques, multi-access methods, cell phone networks, and wireless LAN.

Textbooks:

- 1) Schiller, Jochen H. *Mobile Communication*. 3rd ed., Prentice Hall, 2007.

References:

- 1) Rappaport, Theodore S. *Wireless communications: Principle and practice*. 2nd ed., Prentice Hall.
- 2) Stallings, William. *Wireless Communications and Networks*. Prentice Hall, 2005.

Speech Processing

Credits: 3

Course Description:

This course provides students with the knowledge and skills to write basic speech processing

programs. Based on this foundation, students will be able to solve fundamental problems in speech processing, specifically speech recognition and synthesis with a small vocabulary.

Digital Image Processing

Credits: 3

Course Description:

This course provides students with the knowledge and skills to write basic digital image processing programs. Based on this foundation, students will be able to solve problems such as enhancing image quality, describing characteristic information of objects in images, and recognizing objects in images.

Mathematics for Artificial Intelligence

Credits: 3

Course Description:

This course provides students with two parts:

Part 1: Basic mathematical knowledge such as linear algebra, vector calculus, analytical geometry, matrix analysis, probability, distribution, and optimization.

Part 2: Application of mathematical concepts from Part 1 to solve fundamental problems in artificial intelligence, such as regression, dimensionality reduction, density estimation, and classification. Based on this foundation, students can apply the knowledge from this course to study subsequent subjects in artificial intelligence, such as machine learning and deep learning.

Introduction to Data Science

Credits: 3

Course Description:

This course equips learners with fundamental knowledge about the concepts, algorithms, and applications of data science. Learners will also experience libraries and open-source tools to implement and test algorithms for data analysis. The topics covered in this course include: basic concepts and applications of data science, issues related to the data preprocessing process, classification algorithms, regression (linear and logistic regression, k-NN, decision tree, random forest, neural network), clustering algorithms (k-means clustering, mixture models, hierarchical agglomerative clustering AGNES, density-based clustering DBSCAN), dimensionality reduction methods (PCA, LDA, Autoencoder), and metrics and methods for evaluating algorithms.

Artificial Intelligence for IOT

Credits: 3

Course Description:

This course provides students with a foundation of knowledge and methods for applying AI in IoT. Students will gain the ability to build IoT applications and make them more intelligent by incorporating knowledge of artificial intelligence, machine learning, and deep learning. Students will also learn how to use tools like TensorFlow and Keras.

Parallel Computing

Credits: 3

Course Description:

This course provides fundamental knowledge about parallel application design and development techniques. In addition, students will be equipped with skills in building applications using MPI (Message Passing Interface), OpenMP, and parallel programming on GPUs (Graphics Processing

Units) using the CUDA library

Big Data Processing

Credits: 3

Course Description:

This course equips learners with fundamental knowledge about concepts and techniques for processing big data. The topics covered in the course include basic concepts, issues related to processing, storage, querying, and analysis of big data. Learners can experience libraries and open-source tools such as Hadoop, Hive, Pig, and Spark.

Deep Learning

Credits: 3

Course Description:

This course provides foundational knowledge and helps build skills in using deep learning techniques to solve machine learning problems. The main topics include basics of neural networks, implementing ANNs using TensorFlow APIs, data preprocessing, training deep ANNs, convolutional neural networks (CNNs), and recurrent neural networks (RNNs).

Natural Language Processing

Credits: 3

Course Description:

This course equips learners with fundamental knowledge about the concepts and techniques of natural language processing (NLP). Students can experience libraries and open-source tools for natural language processing. The topics covered in this course include applications and challenges of natural language processing, problems and models in NLP such as sentiment classification, text retrieval, text representation, machine translation, and other related topics.

Reinforce Learning

Credits: 3

Course Description:

This course provides foundational knowledge and helps build skills in using reinforcement learning techniques to solve artificial intelligence problems. The main topics include basics of reinforcement learning, OpenAI Gym and Pytorch libraries, Cross-Entropy methods, Deep Q-learning, Policy gradients, REINFORCE, and Actor-Critic.

11. Program Implementation Guidelines

a. The training program is implemented in accordance with the current regulations for full-time university-level credit-based training, as stipulated by the Ministry of Education and Training and Ho Chi Minh City University of Technology and Education.

The specified hours are calculated as follows:

- **1 credit** = 15 hours of theoretical lectures or in-class discussions
- **1 credit** = 30 hours of laboratory work or practical exercises
- **1 credit** = 45 hours of self-study
- **1 credit** = 45 - 90 hours of on-site internship
- **1 credit** = 45 - 60 hours for project work or graduation thesis

The total hours for a course must be a multiple of 15.

b. Foreign language output standards are determined by the university's Academic Council at the beginning of each admission intake. During their studies, the university will monitor students' foreign language proficiency development each academic year to decide the number of course credits students are allowed to register for per semester. Students may self-study or enroll in the foreign language competency development program according to the university's plan.

Ho Chi Minh City, Date of Review: 16th Jun, 2025

RECTOR

DEAN

Assoc. Prof. Dr. Le Hieu Giang

Assoc. Prof. Dr. Truong Dinh Nhon