THAI NGUYEN UNIVERSITY
UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY

No: 566/QĐ-ĐHCNTT&TT

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

Thai Nguyen, 30/08/2021

DECISION

Regarding the issuance of the training program description; the matrix of the relevance of output standards with modules of university-level training programs according to the credit system of the ICTU

PRINCIPAL

UNIVERSITY OF INFORMATION & COMMUNICATION TECHNOLOGY

Pursuant to Decision No. 468/QĐ-TTG dated 30/03/2011, of the Prime Minister on the establishment of the university of information and communication technology, Thai Nguyen University;

Pursuant to Decision No. 799/QĐ-ĐHCNTT&TT dated 12/10/2016, of the Rector of the University of Information and Communication Technology on the promulgation of regulations on the organization and operation of the University of Information and communication technology under Thai Nguyen University;

Pursuant to Circular No. 07/2015/TT-BGD dated 16/04/2015 of the Ministry of Education and Training on regulations on the minimum amount of knowledge and competency requirements that learners can achieve after graduation profession for each training branch of higher education and the process of developing, appraising and promulgating training programs at university, master and doctoral levels;

Pursuant to decision No. 1982/QD-TTG dated 18/10/2016 of the Ministry of Education and Training on the approval of Vietnam's national qualification framework;

Pursuant to Circular No. 08/2021/TT-BGDĐT dated 18/03/2021 of the Minister of Education and Training promulgating regulations on training at the university level;

Pursuant to Circular No. 17/2021/TT-BGDĐT dated 22/6/2021 of the Ministry of Education and Training on regulations on standards of training programs; elaborating, appraising, and promulgating training programs at all levels of higher education;

Pursuant to decision No. 691/QĐ-ĐHTN dated 17/4/2018 of the director of Thai Nguyen University on promulgating regulations on the development of university-level training programs of Thai Nguyen University

Pursuant to Decision No. 1323/QĐ-ĐHTN dated 28/72021 of the Director of Thai Nguyen University, promulgating regulations on training at the university level according to the credit system of Thai Nguyen University;

Pursuant to Notice No. 110/TB-ĐHCNTT&TT dated 22/3/2021 of the Rector of the University of Information and Communication Technology on the plan to review and adjust the training program in 2021;

TABLE OF ABBREVIATIONS

CTĐT	Education program
CDIO	Conseive – Design – Implement – Operate
CTDH	Teaching program
CNTT	Information technology
TC	Credits
TĐNL	Competency level
BGD&ĐT	Ministry of Education and Training

I.GENERAL INFORMATION

1. Introduction

The curriculum of a training program is a system of subjects expressing training objectives, defining standards of knowledge, skills, ethical qualities, scope and structure of training content, methods and forms of training, methods of evaluating training results for each subject, discipline, and training level of the training level.

The Information Technology training program is designed according to the CDIO approach to training students comprehensively in professional knowledge, skills, and ethical qualities, with emphasis on practical capacity and awareness. social responsibility, ensuring students have active learning and practical experience. Graduates meet the requirements of knowledge and professional qualifications of employers and society.

The curriculum of the training program is designed on the basis of compliance with the regulations and guidelines of the Ministry of Education and Training, Thai Nguyen University, and the University of Information and Communication Technology, in accordance with the regulations of the Ministry of Education and Training. the development direction of the information technology field, human resource needs, the labor market of the locality and economic region, reference to national and international quality assurance standards; refer and compare with programs of other universities in the country and internationally.

2. General information

2.1. Name of training:

+ Vietnamese name: Information Technology

+ English name: Information Technology

2.2 Training code: 7480201

2.3 Specialization:

2.4. Type of formal training.

2.5. Diploma Name:

- Bachelor of Information Technology (4-year training system).

- Information Technology Engineer (5 years training system).

2.6. Training and degree-granting unit: University of Information and Communication Technology - Thai Nguyen University.

II. PROGRAM OBJECTIVES

The goal of the Information Technology program is built in accordance with the Vision - Mission - Educational philosophy of the University of Information and Communication

Technology; aimed at fostering people and developing applied scientific research to meet the needs of socio-economic development and international integration.

1. Vision - Mission - Educational philosophy

1.1. Vision

University of Information and Communication Technology becomes the leading digital-based, multidisciplinary, applied university in the Vietnamese higher education system.

1.2. Mission

Training human resources at university and postgraduate levels; short-term fostering; scientific research and technology transfer to meet the needs of the labor market and in line with the National Strategy on the Fourth Industrial Revolution and the National Digital Transformation Program, serving economic development - the country's culture and society

2. Program Objectives

2.1 General objectives

To train bachelors/engineers in Information Technology (IT) with political qualities, knowledge, basic scientific knowledge and specialized knowledge in IT; Capable of exploiting, researching and developing practical IT applications; Having professional ethics, good health, ability to self-study to improve qualifications to meet the development of the Industry and the requirements of society.

2.2 Specific objectives

O1. Basic scientific knowledge, foundational and advanced knowledge in the field of information technology.

O2. Skills in operating and exploiting Information Technology application software products; Apply in-depth expertise in information technology project development, implementation and management.

O3. Skills in teamwork, presentation, planning and organization, work implementation; Effective communication skills in a multicultural and multinational environment.

O4. Ability to learn and analyze the context and trends of social change; business and business context to form startup ideas.

O5. Ability to apply legal regulations to solve specialized problems; have research methods and apply modern technology to solve jobs and upgrade IT systems (target for engineers).

3. Program Learning Outcomes

PLO		Output standard (PLOs)	Level
1		**Knowledge and reasoning**	
1.1	***L1***	***Apply general knowledge in social and natural science (such as political theory, mathematics, physics) to solve problems in specialization, career, and daily life.***	***3***
1.1.1		Apply knowledge of Marxism-Leninism, Ho Chi Minh's thought and the Party's viewpoints to perceive scientific, technical and technological issues; build political bravery and develop moral values, responsibility to self, family, social community.	3
1.1.2		Apply basic knowledge of mathematics, physics, and logical thinking as the foundation for studying, researching and solving professional and professional problems.	3
1.1.3		Apply knowledge of national defense and security and physical education to realize responsibility for the cause of national defense and health training to ensure assigned tasks.	3
1.2	***L2***	***Achieve a foreign language proficiency level of 3/6 (B1) with the six-level Foreign Language Proficiency Framework for Vietnam or other equivalent international foreign language certificates.***	***4***
1.2.1		Apply basic knowledge of vocabulary and grammar to meet the acquisition of professional knowledge.	3
1.2.2		Synthesize learned knowledge and language skills to listen, speak, read and write on familiar topics in life and work.	4
1.3	***L3***	***Apply fundamental knowledge in the IT field for implementing practical applications.***	***3***
1.3.1		Apply knowledge of basic programming methods, tools, and source code in the development of software products.	3
1.3.2		Apply knowledge of mathematics to computers to solve problems in system architecture and operation.	3
1.3.3		Apply knowledge of data structures and algorithms to solve problems in the process of designing and building software products.	3
1.3.4		Apply knowledge of computer architectures, operating systems and networks to deploy information technology applications	3
1.3.5		Apply knowledge of computer networks to survey and design infrastructure to ensure the operation of information systems.	3
1.3.6		Apply knowledge and design databases for building and managing data for information systems.	3
1.3.7		Apply knowledge of system analysis and design to build, organize data storage and arrange functions of information technology products in a scientific way.	3
1.4	***L4***	***Apply knowledge of tools and methods in the IT industry and in-depth knowledge of the IT industry***	***3***

PLO		Output standard (PLOs)	Level
1.4.1		Apply the knowledge of object-oriented application development in building Information Technology applications.	3
1.4.2		Understand the principles and methods of IT project management	2
1.4.3		Apply programming languages to build practical applications	3
1.4.4		Efficiently operate information technology infrastructure systems	3
1.4.5		Synthesize modern knowledge and tools in big data analysis for knowledge mining.	4
1.4.6		Analyze the development trend of technology and have the knowledge to start a business in the field of information technology.	4
1.5	***L5***	***Synthesize specialized knowledge, career development and practice of IT (for Engineer degree)***	***4***
1.5.1		Classify research methods in scientific research activities to solve new problems in the IT field.	4
1.5.2		Outline solutions to update and upgrade information technology services to meet the development needs of society.	4
1.5.3		Applying security solutions and information security at work.	3
1.5.4		Apply knowledge of artificial intelligence in solving real-world problems.	3
2		**Skills, personal and professional qualities**	
2.1	***L6***	***Apply critical thinking and problem-solving skills in building and consulting software application solution***	***3***
2.1.1		Select modeling and problem statement in the field of information technology	3
2.1.2		Solve problems in implementing information technology application projects	3
2.1.3		Develop solutions to implement information technology application projects	3
2.2	***L7***	***Be able to research and explore knowledge***	***3***
2.2.1		Apply knowledge of theoretical foundations and tools to solve information technology application problems	3
2.2.2		Analyze assumptions to explain the points in IT application deployment	4
2.3	***L8***	***Apply systematical thinking***	***3***
2.3.1		Apply specialized knowledge to build the overall system	3

PLO		Output standard (PLOs)	Level
2.3.2		Calculating the priority of work order in problem solving	3
2.3.3		Using different elements in problem solving	3
2.4	***L9***	***Use personal skills and virtues to work independently in in implementing and deploying of IT systems***	3
2.4.1		Show honesty in implementation and handling of work	3
2.4.2		Fully implement the provisions of the law of the field of information technology in the implementation and deployment of information technology systems.	3
2.5	***L10***	***Apply IT professional ethics in implementing and deploying of IT systems***	***3***
2.5.1		Apply the ability to think creatively in the implementation and deployment of information technology systems	3
2.5.2		Responsible performance in the assigned work in the implementation of information technology systems	3
2.5.3		Apply knowledge of information security law in the implementation of information technology systems	3
2.5.4		Realize the values in the commitment in the implementation of work	3
3		**Communication and teamwork skills**	
3.1	***L11***	Use teamwork skills in group projects	***3***
3.1.1		Implement the process of forming and working group principles	3
3.1.2		Apply motivation, plan activities, monitor, adjust and evaluate the group's performance.	3
3.1.3		Apply personal and team development skills	4
3.2	***L12***	***Practice communication skills in idea explanation, representation, review, and developing communication relationships in professional life***	***3***
3.2.1		Apply communication skills, from forming coherent and logical ideas to supporting evidence, the ability to present, listen and respect others' opinions.	3
3.2.2		Build relationships with friends, colleagues and social networks	3
4		**Ability to conceptualize, design, deploy and operate application software in business and social contexts**	
4.1	***L13***	***Recognize the the enterprise, organization, and societal context***	***3***
4.1.1		Analyze the impact of IT on society and apply state regulations to the field of IT.	4

PLO		Output standard (PLOs)	Level
4.1.2		Identify social, economic and environmental problems in the field of information technology	2
4.1.3		Understand the culture of the organization and the business	2
4.1.4		Analyze goals, strategies, regulations of organizations and enterprises on information technology investment	4
4.1.5		Apply entrepreneurial skills to develop product ideas, services, business plans and form a software-assisted business	3
4.2	***L14***	***Conceive ideas for building a IT system***	***3***
4.2.1		Develop project objectives, collect requirements based on technical methods and tools to collect requirements classification.	3
4.2.2		Proven feasibility and suitability of the project.	3
4.2.3		Select the project's goals and requirements	3
4.3	***L15***	***Design IT systems***	**3**
4.3.1		Apply knowledge and skills in designing information technology solutions	3
4.3.2		Apply processes, methods and tools to develop information technology systems	3
4.3.3		Building an Information Technology system suitable for different purposes.	3
4.3.4		Building architecture and components of information technology systems	3
4.4	***L16***	***Deploy IT projects***	***3***
4.4.1		Apply methods, techniques, tools and environments to develop and deploy applications.	3
4.4.2		Apply knowledge and techniques to realize the design of information technology systems.	3
4.4.3		Apply knowledge to integrate system components and functions during deployment.	3
4.5	***L17***	***Perform the practice on testing, operating, and maintaining software systems***	***3***
4.5.1		Apply processes and methods to verify components or entire systems	3
4.5.2		Apply knowledge and skills to organize and operate systems in operating and maintaining software systems	3

4. Knowledge volume:

120 credits for bachelor and 150 credits for engineering (excluding Physical Education, Defense Education and extracurricular subjects).

5. Distribution of knowledge blocks

Name	Credits Total		
	Total	**Requirement**	**Option**
General curriculum	32	32	0
Political theory		11	11
English		12	12
Math and Natural Science		6	6
Information technology		3	3
Professional knowledge block	88	79	9
Industry group base	30	30	
Base	15	15	
Specialized	31	22	9
Graduation internship	5	3	
Graduation thesis	7	7	
Additional knowledge for engineering degrees	30		
Intensive courses	25		
Engineer Internship	5		
Physical and Defense education	NA		
Physical Education 1			
Physical Education 1			
Defense Education	NA		
Extracurricular	NA		

6. Admission Criteria

According to the general regulations of the Ministry of Education and Training, Thai Nguyen University and the University of Information and Communication Technology.

7. Training process, graduation conditions

7.1. Training method

According to the credit system (specified by the Ministry of Education and Training).

7.2. Organize classes

According to the current credit training regulations of the Ministry of Education and Training, Thai Nguyen University, University of Information and Communication Technology.

7.3. Graduation conditions

Applying university training regulations according to the credit system of the Ministry of Education and Training, Thai Nguyen University, and University of Information and Communication Technology.

8. Marking scheme

Evaluation according to the training scale according to the credit system, prescribed by the Ministry of Education and Training.

9. Career prospects

Job positions:

+ Job position of IT bachelor

- Software development specialist.
- Programmer
- Technician in Information Technology.
- Participating in teaching at high schools, information technology training schools, researchers at research institutes.

+ Job position of IT Engineer: In addition to the job positions of IT bachelors, IT engineers can work in the following positions:

- Engineers programming, analyzing and designing systems, building and integrating systems at software companies.

- Consulting engineers to build information systems, manage information systems or administer networks at agencies and enterprises.

These positions are available at companies and businesses in the fields of:

- IT support specialist
- Computer network specialist
- Software/Application developer
- Web developer

- Computer maintenance and repair staff
- Database Administrator
- High schools, colleges, universities, research institutes and vocational training centers.

10. Teaching, learning and assessment methods

Trainers participating in the training program are regularly trained to approach new teaching methods; cooperate with businesses in specialized fields to enhance the reality for lecturers and students. In it, focus on practical applicability and focus on students. The assessment method is implemented on the basis of the requirements in the output standards of the training program and of each module, according to the accreditation standards issued by the Ministry of Education and Training, towards regional and national standards like AUN-QA.

11. Program content (name and volume of required modules)

No	Course name	Number of credits	Practice credits	Semester	1	2	3	4	5	6	7	8	9	10	pre-requisite course / learn first / parallel (0)/(2)/(1)	core course (*)
					15	17	17	14	14	16	15	12	15	15		
1	English 1	3		1	3											
2	English 2	3		2		3									English 1 (1)	
3	English 3	3		3			3								English 2(2)	
4	English 4	3		4				3							English 3(2)	
5	Science socialism	2		3			2								Marxist - Lenninist political philosophy (2)	
6	Marxist-Lenninist political philosophy	2		2		2									Marxist - Lenninist Philosophy (2)	
7	History of the Vietnamese Communist Party	2		4				2							Science socialism (2)	
8	Marxist-Lenninist Philosophy	3		1	3											
9	Ho Chi Minh's Ideology	2		5					2						History of the Vietna	

															mese Communist Party (2)	
10	General informatics	3	1	1	3											
11	Physics	2		1	2											
12	Advanced Mathematics	4		1	4											
13	Discrete Mathematics	3		2		3									Advanced Mathematics (2)	
14	Statistics-Probability	3		2		3									Advanced Mathematics (2)	
15	Computer network	3	1	3			3								General informatics (2)	*
16	Computer Architecture and operating system	3		2		3									General informatics (2)	
17	System analysis and design	3		4				3							Database (2)	*
18	Database	3	0.5	3			3									
19	Introduction to software engineering	3		4				3							General informatics (2)	*
20	Programming techniques	3	1	2		3									General informatics (2)	*
21	Data structures and algorithms	3	1	3			3								General informatics (2)	*
22	Object oriented programming	3	1	3			3								General informatics (2) Programming techniques (2)	
23	Information Security	3		4				3								

24	Database management system	3	1	5					3						Database (2)	
25	Advanced computer network	3	1	5					3							
26	Artificial intelligence	3		5					3						Programming techniques (2) Data structures and algorithms (2)	
27	.Net technology	3	1	5					3							
Specialized knowledge block (Total credits: 31 credits /10 modules. Of which are compulsory: 22 credits/7 modules; electives: 10 credits/3 modules)																
28	Object-oriented software development methodology	3	1	6						3					Object oriented programming (2) Introduction to software engineering (2)	
29	IT project management	3		6						3					Introduction to software engineering (2)	
30	System management	3	1	6						3					Advanced computer network (2)	
31	Image processing	3		7							3				Advanced Mathematics (2) Programming techniques (2)	
32	Digital Transformation	3		7							3					
33	Machine Learning	3	1	7							3				Artificial intelligence (2)	
34	Cloud computing	3		7							3				Advanced computer network (2)	
35	Elective 1	4	1	6						4					Advanced computer	

															network (2)	
36	Elective 2	3	0.5	6						3					IT project management (2)	
37	Elective 3	3	1	7							3				Object-oriented software development methodology (2)	
	List of electives (10 credits)															
	Elective 1	4	1												Advanced computer network (2)	
38	.NET application development	4	1													
39	Java programming	4	1													
40	PHP Application Development	4	1													
	Elective 2	3	0.5												IT project management (2)	
41	Start-up project	3	0.5												IT project management (2)	
42	Digital Marketing	3	0.5												IT project management (2)	
	Elective 3	3	1												Object-oriented software development methodology (2)	
43	Mobile programming	3	1												Object-oriented software development methodology (2)	
44	Cross-platform application development	3	1												Object-oriented software development	

															method ology (2)	
Internship, Graduation Project (12 credits)																
45	Graduation internship	5		8								5				
46	Graduation project	7		8								7			Graduation internship (0)	
	Courses to replace graduation project (7 credits)															
47	Intensive application development	4	1	8											Graduation internship (0)	
48	Human-computer Interaction	3		8											Graduation internship (0)	
Total accumulated credits of bachelor training program		**120**														
49	Job skill	5		9									5		Graduation project (2)	
50	Research methods and modern technology application	5	2	9									5		Graduation project (2)	
51	Internship	5	5	9									5		Graduation project (2)	
52	software development project	5	2	10										5	Graduation project (2)	
53	Network infrastructure project	5	2	10										5	Graduation project (2)	
54	Knowledge technology and machine learning project	5	2	10										5	Graduation project (2)	
Total accumulated credits of engineer training program		**150**														

Note:

- TQ(0) = Prerequisite; SH(1)= Parallel; HT(2) = Learn first.

- Physical Education module 1 is ranked in semester 1, Physical Education 2 is ranked in semester 2.

- National Defense - Security Education course according to the schedule of TNU.

12. Brief description of the content and volume of the courses

No	Course code	Course name	Number of credits	Description
1. General education knowledge block				

1	ENG131	English 1	3	Equip students with basic grammar knowledge such as how to use the verb to be, singular and plural nouns, adverbs of frequency, present tense and provide vocabulary related to topics. Topics such as personal information, family, everyday objects, colors, telling the time, places in the city, leisure time, descriptive adjectives. Besides, the subject also provides students with how to use English sentence patterns in real situations.
2	ENG132	English 2	3	Equip students with basic grammar knowledge such as countable nouns, uncountable nouns, simple past tense, present continuous tense, comparative levels of adjectives and equip a related vocabulary system which related to Food, Money, Journeys and Appearance topics. Besides, the subject continues to help students gradually familiarize themselves with and approach diverse communication situations and evenly develop listening, speaking, reading and writing skills at the elementary level (A2).
3	ENG136	English 3	3	Equip students with basic grammar knowledge such as how to use near future tense, present perfect tense, should/shouldn't, have to/don't have to, can/can't, will/ won't and equipped with a vocabulary system related to the topics of Film and the Arts, Science, Tourism and the Earth. In addition, the subject continues to help students familiarize themselves with and approach a variety of communication situations and develop the skills of listening, speaking, reading and writing at the pre-intermediate level.
4	ENG13	English 4	3	Subject English 4 helps students consolidate their grammatical knowledge such as how to use too, enough, Verb (to infinitive or ing form), conditional sentences type 1, past continuous, passive sentences in the present and past simple, and how to use some modal verbs “must, should, can, had better,…”,. At the same time, this module also equips knowledge about some conjunctions and phrasal verbs with "do, make, have..." and expands and equips a vocabulary system related to topics about means of transport. , health, vacation, leisure activities or technology… Besides, the subject continues to help students familiarize themselves with and approach competently with diverse communication situations and develop skills equally. listening, speaking, reading and writing at level B1.

5	STS121	Science socialism	2	Provide students with the most basic and core knowledge about socialism, one of the three components of Marxism-Leninism. Mastering the basic principles of the law of building socialism. Applying theoretical knowledge of scientific socialism to building and developing the country according to socialist orientation.
6	POE121	Marxist-Leninist Political Economy	2	Provide students with objects, research methods and functions of Marxist-Leninist political economy. The core content of Marxist-Leninist political economy. Specifically issues such as; goods, markets and the role of market participants; Producing surplus value in a market economy; Competition and monopoly in the market economy.; Socialist-oriented market economy and economic benefit relations; Industrialization, modernization and international economic integration of Vietnam.
7	PHV121	History of the Communist Party of Vietnam	2	Researching and studying the Party's history is not to master historical events and milestones, but to understand issues in the process of leadership and struggle, in order to apply and develop in the period of comprehensive renovation. promote industrialization, modernization of the country and international integration today.
8	POL131	Marxist-Leninist philosophy	3	Providing students with the most general features of philosophy, Marxist-Leninist philosophy, the role of Marxist-Leninist philosophy in social life. At the same time, provide students with the basic content of materialism; cognitive theory of dialectical materialism.
9	HCM120	Ho Chi Minh Thought	2	To help students understand systematically the ideological values of President Ho Chi Minh on the basic issues of the Vietnamese revolution and the creative application of his ideas and theories into practice. life, thereby mobilizing students to study and follow President Ho Chi Minh's ideology and moral example.
10	GIS131	General computing	3	Equip students with the most basic knowledge in informatics. Create conditions for students to apply manipulation and proficient use of computers. Specific contents include: Windows operating system; Word editing system; Electronic spreadsheet Excel; Build Powerpoint presentations.
11	VLL121	Physics	2	Equip with basic knowledge of General Physics of electricity and magnetism; understand physical phenomena in nature, practice calculation skills and solve basic physics problems

12	MAT140	Advanced math	4	The subject provides students with basic knowledge about matrices, determinants, systems of linear equations, vector spaces; linear mapping and quadratic form; partial derivatives and full differentials; extrema of multivariable function; the theory of series of numbers, series of functions; differential equations and some applications of advanced mathematics in engineering. These are the basic knowledge of Advanced Mathematics, which serves as the foundation for students to continue studying in the basic and specialized modules.
2. Basic knowledge of major groups				
13	DEM23	Discrete math	3	The subject equips students with knowledge and skills to represent and process information in computers, with a major focus on the study of discrete objects and processing algorithms on these objects. aims to help students have the foundation knowledge to access the knowledge of other modules in the training program and develop their algorithmic and programming skills when solving real-world problems. The knowledge provided to students includes 4 main contents: Logical algebraic function theory presents basic concepts and operations on logical propositions; Combinatorial theory revolves around four basic problems: the counting problem, the existence problem, the enumeration problem, and the combinatorial optimization problem; Graph theory focuses on discrete structures synthesized from practical problems and algorithms on graphs: shortest path problem, minimum spanning tree problem, maximum flow problem in the network ; Finally, the content instructing students to install the algorithms that have been approached in the above 3 contents in order to improve programming skills for students when solving practical problems.
14	PRS221	Statistical probability	3	The subject provides basic knowledge about probability, random quantities, probability distribution rules, sample theory, estimation, statistical hypothesis testing and regression analysis.
15	CON231	Computer network	3	The subject provides content to help students familiarize themselves with the basic knowledge of computer networks, including knowledge of infrastructure, protocols, systems, and network software. Students will be equipped with the basic skills to build a basic home computer network and serve other related learning content.

16	COM331	Computer Structure and Operating System	3	The subject covers the most basic knowledge of computer architecture and understanding of the role and operation of computer components. - Students learn and practice skills in installing and configuring basic features on Windows, and at the same time exploiting available tools thoroughly to optimize and secure and maintain the operating system. . With the Linux operating system, students learn and practice basic system administration skills such as understanding the file system organization structure, user management, file and directory management, software packages and practice basic programming on the bash shell
17	ASD232	System analysis and design	3	The subject aims to provide students with the basic knowledge as a basis for the structured and object-oriented system analysis and design approach. During the learning process, students are used to do large exercises with the following contents: survey, analysis and system design. After completing this course, students will be able to apply the knowledge they have learned to analyze and design a real system.
18	BAD131	Database	3	The subject aims to provide students with basic knowledge about databases, understand the meaning and role of databases, knowledge about relational databases, relational algebra operations, Standardize databases, master the knowledge of SQL language. Using SQL Server as a tool to install, manipulate, and query data. As a premise for the next courses in database analysis, design and implementation.
19	ISE131	Software Engineering Introductory	3	The subject provides students with basic knowledge related to key subjects in the field of software engineering such as software development processes, tools and software development environments... The subject enables students to build software in a systematic and methodical manner.

20	EPT131	Programming Techniques	3	Equip students with basic knowledge of programming. Facilitate students to get acquainted and use the C programming language. Specific content includes: The concept of algorithms and the language of algorithmic representation. The concept of programming languages. The concept of data types. Overview of the C programming language, data types, control structures. How to design and use Functions and Some Data Structures in C programming language. This subject provides background knowledge, creating a premise for students to understand other subjects in the training program.
21	DAS231	Data structures and algorithms	3	Equip knowledge from general to in-depth knowledge of common data models (lists, stacks, queues, trees, graphs, sets, dictionaries, ...) as well as operations on each element of the model. At the same time, the course provides some basic algorithms such as: searching and sorting with algorithms on each of the above data models. The subject helps students to analyze and choose the representation structure and algorithm for the problem. Besides, this is also a subject that develops programming thinking and algorithmic thinking.
22	OOP231	Object Oriented Programming	3	This subject provides the foundation of object-oriented programming, the important concepts and principles of this programming method: such as data abstraction, encapsulation, inheritance, and polymorphism. In addition, students will be equipped with other knowledge such as error handling techniques (exceptions), generating and handling events, memory management and using some pre-built data structures. in programming languages to write application programs according to object-oriented programming methods.
3. Basic knowledge of the major				
23	SIF131	Information Security	3	The subject provides students with basic knowledge in the field of information security such as: the role of data, the need to protect personal data, privacy, virus issues, malicious code.Beside, the subject also introduces information technology law, information security law and cyber security law, important legal policies, necessary for Internet users and working in the digital environment. In addition, the subject also provides learners with the knowledge to self-prevent attacks on the network environment, and to be more conscious in the use of social networks and digital devices.

24	DMS231	Database management system	3	This module provides basic knowledge about MS SQL server database management system such as: presenting concepts, roles and functions; create a relational database and related objects in the relational database; query on the database; define and use Store Procedure, Function and Triger; create and manage users
25	CNA431	Advanced computer network	3	The Advanced Computer Networking module familiarizes students with more in-depth knowledge of computer networking, focusing on the application and transport layer protocols of the TCP/IP protocol suite or Application-> LLC Datalink (OSI) sublayer. Approaching the network system in an academic direction.
26	ARI231	Artificial intelligence	3	Provide students with machine learning techniques that are being widely used to develop intelligent systems today: Conceptual learning; Decision Trees, Neural Networks, Hypothesis Evaluation, Bayesian Learning, Case Based Learning, Support Vector Machines, Undirected Graph Models... Students learn skills to analyze problems using knowledge to solve, choose appropriate smart algorithms and build smart applications to solve real problems.
27	CET331	Dot NET Technology	3	This module provides basic knowledge of C# programming language, develops object-oriented programming capabilities on the foundation of .NET programming libraries to build complete applications. Most of the course time is devoted to content about object-oriented programming, manipulating databases using the ADO.NET library, and building web applications using MVC architecture. The course also introduces some advanced technologies such as WPF, LINQ, Entity Framework...
4. Block of specialized knowledge				

28	PPM231	Object-oriented software development methodology	3	This module provides students with software requirements and discusses the processes involved in requirements definition and software design, the role of software requirements analysis and software design in engineering in software and system engineering, documenting requirements so that learners understand: the concept of user requirements and system requirements, the notation of requirements representation. The difference between functional and non-functional requirements. Classification and documentation of requirementsengineering activities that primarily require inference, analysis, design, and validation as well as the relationship between these activities, requirements management, software evolution management and software design.
29	ITP331	IT project management	3	Provide students with basic knowledge of project management, information technology project management, knowledge and skills related to project planning, time estimation, cost estimation , product quality management, risk management, project personnel selection, and IT project integration management.
30	SYM431	System management	3	Network administration with windows server approach according to MCSA Windows Server or Network administration with linux server approach according to LPI.
31	IMP231	Image processing	3	Equip learners with basic knowledge of digital image processing, applications of image processing, preprocessing operations, image segmentation, feature extraction and recognition. The course provides basic techniques on image processing operations, thereby helping students understand and apply them to real-life image processing problems.
32	CDS231	Digital transformation	3	Equip students with the concept of digital transformation and the importance of digital transformation in the Industrial Revolution 4.0. Equip students with the tools and principles to integrate digital technologies into the operational areas of agencies and business organizations in order to take advantage of technologies to change the way they operate, business models and provide new value to customers.
33	MAL332	Machine learning	3	Provide students with machine learning techniques that are being widely used to develop today's intelligent systems: Conceptual learning; Decision Trees, Neural Networks, Hypothesis Evaluation, Bayesian Learning, Case Based Learning, Support Vector Machines, Undirected Graph Models...

34	CCP431	Cloud computing	3	The course provides learners with some general knowledge about cloud computing, virtualization, and private cloud implementation skills based on an overview of computer networks and network device technology. Upon completion of the course, students are able to deploy cloud computing services, install private clouds, and develop basic cloud computing applications.
35		Elective 1	4	Provides students with basic knowledge of Web application development and commonly used Web development tools in practice. Based on their ability and interests, students can choose to develop applications based on open source code or on tools such as HTML, CSS and Java.
36		Elective 2	3	Provide students with the skills and understanding of startup and business in the digital environment. Students can choose one of two directions: Specialized in serving startups such as: identifying core products, customer sets. SEO, sales... tools to support revenue calculation; breakeven point… Specialized in Digital Marketing and the importance of marketing in the digital age. Focus on analyzing marketing communication activities with new communication tools such as: marketing via search engine optimization, marketing via social networks, email marketing, mobile marketing...
37		Elective 3	3	Providing students with knowledge of application development on mobile technologies such as: IOS, Android, Windows Phone applications ..., students can also choose in the direction of developing cross-platform applications through real problems. economic. The goal is to help students think systematically about implementing a project on information system development, helping students practice basic skills from surveying, analyzing, designing to installing a software.
5. List of elective courses				
38		**Elective 1**	4	
	NET241	Dot NET application development	4	The course provides students with the necessary skills and knowledge to be able to develop a complete application using .NET technology, specifically including: problem analysis ability, system design ability. software, .NET programming skills, software deployment skills on the server

	PJA241	Java Application Programming	4	The course equips students with basic and advanced knowledge on the Java language. Specifically: Database connection programming, interface programming and event handling in standalone application programming, Servlet and JSP technology in web programming. After completing this course, learners can use java's API library used to build stand-alone applications as well as build web application projects. Through these equipping knowledge, students can self-study and apply this knowledge to build specific projects later.
	PHP241	PHP Application Development	4	The course provides students with basic and advanced knowledge of programming and web application development, including knowledge with PHP as well as the MVC pattern in web application development,... Besides, Students also practice confidence and creativity in learning and surveying, analyzing, researching and deploying web applications. At the end of the course, students can build small and medium-sized websites for individuals, organizations or businesses.
39		**Elective 2**	3	
	DKN231	Startup project	3	The subject of specialized knowledge aims to provide students with core concepts and knowledge about entrepreneurship. The course helps students to be able to design a plan of ideas, form a product and proceed to establish a start-up business. The course also provides examples of successful companies' start-up process for students' reference.
	MKT331	Digital Marketing	3	The subject of specialized knowledge aims to provide students with the core concepts and knowledge of marketing. Overview of online marketing and marketing. In which, it is necessary to have a clear understanding of strategies, customers, content characteristics, implementation plans and monitoring. This knowledge includes content that helps students to be able to build a marketing plan by themselves, to manage and optimize strategies and to complete marketing projects.
40		**Elective 3**	3	

	LTT332	Mobile device programming	3	The Mobile Programming course equips students with knowledge and skills in designing mobile applications on Android operating systems. After completing this course, learners can master the basic knowledge and skills on how to build a mobile application. The course will present the concepts and components that make up a project running on the Android operating system. How to design user interface, knowledge about lists, communication, Intent and programming services for applications. How users store data on Android. The course is designed according to each separate project, the projects are designed from simple to complex to introduce the most basic components when building a real application on the Android operating system.
	PUT231	Multi-platform application development	3	The course provides students with the necessary skills to develop applications on different platforms, to meet the needs of the participating project, and to shape the necessary platform that the developing project needs to use. In the course, students are provided with technologies for developing server-side applications such as Webservie, Cloud Computing, Edge Computing and deploying client-side application technologies such as Front End, Web, Desktop, Mobile...
6. Internship, Graduation thesis				
41	GRP451	Internship	5	They are comprehensive knowledge that closely reflects reality, helping students review all the knowledge of subjects such as CSN and CN. At the same time, it helps students apply their knowledge to real-world problems in the business context. Additionally, students can choose to participate in practical projects that are currently being implemented by companies.
42	GRA905	Graduation thesis	7	A graduation thesis is a research topic, either theoretical or practical, related to the field of information technology proposed by a lecturer or by students themselves with guidance from their instructor. The purpose of a graduation thesis is to equip students with the skills to apply the knowledge they have learned to solve a problem. The evaluation of the course's results is based on the defense of the topic.
43		**The replacement courses for the graduation thesis**		

44	UCS241	Developing specialized applications	4	Helping students understand the professional knowledge to develop specialized applications in narrow fields. For example: ICT applications in banking, ICT applications in healthcare, ICT applications in public administration with IoT technology, etc.
45	TNM333	Human-machine interaction	3	Helping students acquire in-depth skills in analyzing and designing user interaction interfaces. Helping students apply HCI principles and tools to quickly create software prototypes and optimize user interfaces, with a user-centered design approach. Through the course, students develop skills in applying principles and guidelines in user-oriented design and user interface evaluation techniques.
The total accumulated credits			120	
7. List of Engineering degree courses				
46	PRS551	Professional skills	5	The course provides professional skills in the field of technology, such as entrepreneurial thinking, professional ethics, and information technology law.
47	SRM251	Methods of research and application of modern technology	5	This course provides students with scientific research methods, skills in reading scientific literature, writing research proposals and reports, and other research skills to participate in engineering and higher-level research. It also helps students develop a knowledge system and other research skills needed for engineering and higher-level research.
48		Internship	5	It is a program designed to help students familiarize themselves with the operations of information technology systems, data mining in real-world scenarios, and in businesses. Students will work directly at various business sites and gain exposure to the applications of information technology in data processing and management. This internship program focuses on addressing more in-depth issues than the undergraduate internship program.
49	PTM342	The project to develop software	5	The content helps students to develop and implement complex software systems entirely on the enterprise network system.
50	PND251	network infrastructure project	5	The content helps students to develop and implement real-world network systems in various facilities and businesses.
51	KEM251	The project of knowledge technology and machine learning	5	The content helps students to apply machine learning methods to specific problems, solve practical issues in businesses and facilities that use artificial intelligence and machine learning technology.
Total credits			150	

13. Facilities serving for learning

13.1. The workshops, laboratories, and important experimental equipment systems

- Samsung Lab practice room
- Computer room
- Data Science lab practice room

13.2. Library, website

- Library of University of Information Technology and Communications
- List of websites (refer to the detailed syllabus)

14. Guidelines for implementing the program

14.1 The training program is implemented according to the regulations of undergraduate training in the credit-based system under the current regulations of the Ministry of Education and Training and the University of Information Technology and Communications, Thai Nguyen University.

The regulated hours are calculated as follows:

One credit = 15 teaching periods of lectures or class discussions

= 30 Laboratory or practical

= 45 Self-study hours

= 45 - 90 Internship hours at the facility

= 45 - 60 The time for doing a thesis or final project.

The number of hours for each course is a multiple of 15.

14.2 The language proficiency standard is decided by the School's Council of Science and Education at the beginning of each enrollment period. During the study period, the university will monitor the students' language proficiency development each academic year to determine the number of credits for each course in the upcoming semester. Students can self-study or enroll in the university's language proficiency development program according to the School's plan.

15. The contribution matrix of courses to PLOs

TT	**PLOs**	1																						2														3					4																
		1,1			1, 2		1,3							1,4						1.5				2,1			2, 2		2,3			2, 4		2,5				3,1			3, 2		4,1					4,2			4,3				4,4			4, 5	
	Courses (in the order of semesters)	1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7	1.4.1	1.4.2	1.4.3	1.4.4	1.4.5	1.4.6	1.5.1	1.5.2	1.5.3	1.5.4	2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.5.1	2.5.2	2.5.3	2.5.4	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2	4.1.1	4.1.2	4.1.3	4.1.4	4.1.5	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	4.3.3	4.3.4	4.4.1	4.4.2	4.4.3	4.5.1	4.5.2
	Semester 1																																																										
1	English 1				2	3																																																					
2	General informatics									2							3																								3																		
3	Advanced Maths		3						2																																																		
4	Marxist-Leninist Philosophy	3																																																									
5	Physics		2																																																								
	Semester 2																																																										
6	English 2				3	3																																																					
7	Computer Architecture and Operating system									3												2							2																														
8	Marxist-Leninist Political Economy	3																																																								
9	Programming techniques						3		3																																3																		
10	Discrete Mathematics							3																3			3																																
11	Probability and Statistics		3					3								2							2																																				
	Semester 3																																																										
12	English 3				3	3																																																					
13	Data structures and Algorithms								3							3											3	3																															
14	Science socialism	3																																																								
15	Database											3						3							2																																		

TT	PLOs	1																					
		1,1			1, 2		1,3							1,4						1.5			
	Courses (in the order of semesters)	1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7	1.4.1	1.4.2	1.4.3	1.4.4	1.4.5	1.4.6	1.5.1	1.5.2	1.5.3	1.5.4
16	Object-oriented programming						3		3					3									
17	Computer Network									3	3											2	
	Semester 4																						
18	Information Security																					3	
19	English 4				3	4																	
20	History of the Vietnamese Communist Party	3																					
21	Introduction to software engineering												3		2								
22	System analysis and design											3		3									
	Semester 5																						
23	Database Management system												3										
24	.Net Technology												3			3							
25	Advanced Computer Network										3											3	
26	Artificial Intelligence													3								3	
27	Ho Chi Minh's Ideology	3																					
	Semester 6																						
28	Object-oriented software developmen											3	3	3									

TT	PLOs	2													
		2,1			2, 2		2,3			2, 4		2,5			
	Courses (in the order of semesters)	2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.5.1	2.5.2	2.5.3	2.5.4
16	Object-oriented programming			2											
17	Computer Network						3								
	Semester 4														
18	Information Security						3								
19	English 4														
20	History of the Vietnamese Communist Party														
21	Introduction to software engineering														
22	System analysis and design	3	3												
	Semester 5														
23	Database Management system						3		2						
24	.Net Technology								3						
25	Advanced Computer Network					4	3	3							
26	Artificial Intelligence						3								
27	Ho Chi Minh's Ideology														
	Semester 6														
28	Object-oriented software developmen														

TT	PLOs	3				
		3,1			3, 2	
	Courses (in the order of semesters)	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2
16	Object-oriented programming					
17	Computer Network					
	Semester 4					
18	Information Security					
19	English 4					
20	History of the Vietnamese Communist Party					
21	Introduction to software engineering		3		3	
22	System analysis and design					
	Semester 5					
23	Database Management system					
24	.Net Technology					
25	Advanced Computer Network					
26	Artificial Intelligence					
27	Ho Chi Minh's Ideology					
	Semester 6					
28	Object-oriented software developmen					

TT	PLOs	4																
		4,1					4,2			4,3				4,4			4, 5	
	Courses (in the order of semesters)	4.1.1	4.1.2	4.1.3	4.1.4	4.1.5	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	4.3.3	4.3.4	4.4.1	4.4.2	4.4.3	4.5.1	4.5.2
16	Object-oriented programming																	
17	Computer Network											2						
	Semester 4																	
18	Information Security												2					
19	English 4																	
20	History of the Vietnamese Communist Party																	
21	Introduction to software engineering						3				3							
22	System analysis and design								2									
	Semester 5																	
23	Database Management system											2		3				
24	.Net Technology																	3
25	Advanced Computer Network												3					
26	Artificial Intelligence									3								
27	Ho Chi Minh's Ideology																	
	Semester 6																	
28	Object-oriented software developmen										3				2			

TT	PLOs	1																						2														3					4																
		1,1			1,2		1,3							1,4						1.5				2,1			2,2		2,3			2,4		2,5				3,1			3,2		4,1					4,2			4,3				4,4			4,5	
	Courses (in the order of semesters)	1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7	1.4.1	1.4.2	1.4.3	1.4.4	1.4.5	1.4.6	1.5.1	1.5.2	1.5.3	1.5.4	2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.5.1	2.5.2	2.5.3	2.5.4	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2	4.1.1	4.1.2	4.1.3	4.1.4	4.1.5	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	4.3.3	4.3.4	4.4.1	4.4.2	4.4.3	4.5.1	4.5.2
	t methodology																																																										
29	IT project management														3										3	3													3		3							3											
30	System management						3										3													2																		3						3					
31	**Elective 1**															3										3	3			3																3							3		3				
	.NET application development																																																										
	Java application development																																																										
	PHP application development																																																										
32	**Elective 2**																																3	3		3							4		3		3												
	Startup project																																																										
	Digital Marketing																																																										
	Semester 7																																																										
33	Digital Transformation																3			4																3					3		4			3													
34	Cloud computing										3						3				4					3																												3					
35	Machine learning							3	3									4					3				3							3														3					3						
36	Image Processing													3								3	3				3																														2		
37	**Elective 3**																																													4	3		3		3					3			
	Mobile programming																																																										

TT	PLOs	1																						2														3					4																
		1,1			1,2		1,3							1,4						1.5				2,1			2,2		2,3			2,4		2,5				3,1			3,2		4,1					4,2			4,3				4,4			4,5	
	Courses (in the order of semesters)	1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7	1.4.1	1.4.2	1.4.3	1.4.4	1.4.5	1.4.6	1.5.1	1.5.2	1.5.3	1.5.4	2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.5.1	2.5.2	2.5.3	2.5.4	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2	4.1.1	4.1.2	4.1.3	4.1.4	4.1.5	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	4.3.3	4.3.4	4.4.1	4.4.2	4.4.3	4.5.1	4.5.2
	Cross-platform application development																																																										
	Semester 8																																																										
38	Graduation Internship																																		2					3		3		2	3							3							
39	Graduation Thesis																																	3	3									2					3				3					3	
	Courses replacing graduation thesis																					3															3		3					2														3	
	Intensive application development																																																										
	Human-Computer Interaction																																																										
	Semester 9																																																										
40	Professional Skills																			4												3					3				3				2														
41	Research methodology and application of modern technology																		4		4							4			3	3																							3				3
42	Internship																									3							3					3				3										3							3
	Semester 10																																																										
43	Software development project														3				3	4																				4												3				3		3	
44	Network infrastructure project																			4																				4									3				3			3		3

TT	PLOs	1																						2														3					4																
		1,1			1, 2		1,3							1,4						1.5				2,1			2, 2		2,3			2, 4		2,5				3,1			3, 2		4,1					4,2			4,3				4,4			4, 5	
	Courses (in the order of semesters)	1.1.1	1.1.2	1.1.3	1.2.1	1.2.2	1.3.1	1.3.2	1.3.3	1.3.4	1.3.5	1.3.6	1.3.7	1.4.1	1.4.2	1.4.3	1.4.4	1.4.5	1.4.6	1.5.1	1.5.2	1.5.3	1.5.4	2.1.1	2.1.2	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.4.1	2.4.2	2.5.1	2.5.2	2.5.3	2.5.4	3.1.1	3.1.2	3.1.3	3.2.1	3.2.2	4.1.1	4.1.2	4.1.3	4.1.4	4.1.5	4.2.1	4.2.2	4.2.3	4.3.1	4.3.2	4.3.3	4.3.4	4.4.1	4.4.2	4.4.3	4.5.1	4.5.2
45	Knowledge technology and machine learning project																			4																		3		4							3										3		
Block of physical education and national defense education																																																											
1	Physical education 1			3																																																							
2	Physical education 2			3																																																							
3	National defense education			3																																																							

Dean

Dr. Nguyễn Hải Minh