THAI NGUYEN UNIVERSITY

UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY

PROGRAMME SPECIFICATION

OF SOFTWARE ENGINEERING EDUCATION PROGRAMME

THAI NGUYEN - 2020

MỤC LỤC

THAI NGUYEN UNIVERSITY
UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY
Faculty of Information Technology

PROGRAMME SPECIFICATION OF SOFTWARE ENGINEERING EDUCATION PROGRAMME

Decision No 99/QĐ-ĐHCNTT&TT dated on March 4th, 2020 by the Rector of TNU - University of Information and Communication Technology

I. BASIC INFORMATION ABOUT THE TRAINING PROGRAM

1. Name of training:

+ Vietnamese name: Kỹ thuật phần mềm.

+ Englist name: Software Engineering.

2. Course code: 7480103.

3. Type of trainning: Formal.

4. Diploma name:

- Software Engineering Bachelor (141 credits)
- Software Engineering Engineer (151 credits)

5. Training and degree places: University of information and communication technology - Thai Nguyen University.

II. DESCRIPTION OF TRAINING PROGRAM

1. Training Objectives

1.1. General objectives

Training bachelors/engineers in Software Engineering with solid political qualities, a sense of discipline and professional ethics; master the basic and intensive knowledge of Software Engineering, meet the social demand for research, development and application in the field of Software Engineering.

2.2. Detail objectives

By the end of the course, graduates have the knowledge, skills and qualities:

- Have basic and intensive knowledge of Software Development Process; Knowledge and skills in using programming languages and techniques for software development; Knowledge and skills in software testing and quality assurance.
- Have good health, ensure the ability to work with high intensity;
- Have full knowledge of politics, security and defense, law as required by the Ministry of Education & Training;
- Have the ability to use foreign languages for work;
- Have the necessary soft skills for the job.

2. Program learning outcomes

The output standards of the Software Engineering training program promulgated under Decision No. 99/QD-ĐHCNTT&TT are shown through the following contents (encoded: L1 ÷ L15):

Notation	PLOs of SE programme
L1	Apply knowledge of natural sciences in order to solve scientific and technical problems in Software Engineering and have the ability to study at high levels
L2	Understand general educational knowledge on Theory of Marxism-Leninism and Ho Chi Minh Thought, the revolutionary line of the Communist Party of Vietnam, the Party's policy and the State's laws, and national security.
L3	Approach foreign language ability (English), level 3/6 of Vietnam's Foreign Language Competency Framework; specialized English skills.
L4	Apply data structure models and programming techniques to build computer software
L5	Understand the fundamentals of computer operating systems, computer networks, and programming platforms for software development.
L6	Apply basic knowledge of databases and database management systems in software development
L7	Understand the knowledge related to systems design analysis methods and tools in the software development process.
L8	Apply application programming skills in developing software on windows, web applications, open source applications and mobile applications.
L9	Apply knowledge of software requirements specification, modern software architecture to provide solutions in software development.
L10	Apply knowledge of software testing and software quality assessment in system testing
L11	Apply software project management skills in the software development process
L12	Be aware of the context of businesses and organizations to deploy software applications that are suitable for practice
L13	Apply knowledge of software life cycle to predict problems arising during software operation.
L14	Apply communication skills in presenting ideas, giving presentations, giving criticism in software system implementation and deployment.
L15	Apply machine learning fundamentals and pattern design principles in intelligent application development.

3. Matching matrix between the modules with the output standards of the training program

No.	Courses	Output standards of training programs														
		L1	*L2*	*L3*	*L4*	*L5*	*L6*	*L7*	*L8*	*L9*	*L10*	*L11*	*L12*	*L13*	*L14*	*L15*
General education knowledge block																
1	English 1			x												
2	Linear algebra	x														
3	Marxist-Lenninist Philosophy 1		x													
4	Physics	x														
5	English 2			x												
6	Analytics	x														
7	Ho Chi Minh's Ideology		x													
8	Political economics of marxism and leninism		x													
9	English 3			x												
10	Statistics-Probability	x														
11	General law		x													
12	English 4			x												
13	History of Vietnamese communist party		x													
14	General Informatics					x									x	
15	Scientific socialism		x													
16	Soft skills												x		x	
Basic knowledge block																
17	Introduction to programming					x			x							
18	Advanced programming					x			x							
19	Computer network					x			x							
20	Database						x		x							

No.	Courses	Output standards of training programs														
		L 1	*L 2*	*L 3*	*L 4*	*L 5*	*L 6*	*L 7*	*L 8*	*L 9*	*L10*	*L11*	*L12*	*L13*	*L14*	*L15*
21	Object oriented programming					x			x							
22	Operating system					x									x	
23	System design analysis						x	x								
24	Discrete Mathematics				x				x							
25	Computer architecture					x										
26	Data structures and algorithms				x				x							
27	Programming methodology							x						x		
28	Algorithm application				x			x								
29	Software technology							x		x		x		x		
30	Information Safety and Security									x					x	
31	Java programming				x				x							
32	Developing object-oriented software with UML							x		x						
33	Mobile programming				x				x							
Specialized knowledge block																
	Required Courses/Modules:															
34	Requirements analysis and management							x		x						
35	Formal methods							x		x						
36	.Net technology					x			x						x	
37	Software Testing										x			x		

No.	Courses	Output standards of training programs														
		L1	*L2*	*L3*	*L4*	*L5*	*L6*	*L7*	*L8*	*L9*	*L10*	*L11*	*L12*	*L13*	*L14*	*L15*
38	Advanced Java Programming				x				x							
39	Information technology project management											x	x			
40	Software architecture and design							x			x					
41	Software Quality Assurance										x			x		
42	Software operation and maintenance												x	x		
	Elective Courses/Modules:															
43, 44	***Specialization elective courses 1, 2***															
	Open-source software development				x				x							
	XML and application							x		x						
	J2EE technology				x				x							
	Cloud computing					x								x		
	Embedded System Application Development				x				x							
45	***Specialization elective courses 3***															
	Software interface design							x		x						
	Some modern problems in software engineering							x		x						
	Multimedia systems							x		x						
	Service							x		x						

No.	Courses	Output standards of training programs														
		L 1	*L 2*	*L 3*	*L 4*	*L 5*	*L 6*	*L 7*	*L 8*	*L 9*	*L10*	*L11*	*L12*	*L13*	*L14*	*L15*
	Oriented Architecture															
46	***Specialization elective courses 4***															
	Ecommerce												**x**		**x**	
	Facebook marketting												**x**		**x**	
	Some medical informatics standards and applications												**x**		**x**	
	Internship / Graduation Project															
Mandatory module																
47	Basic internship					x	x	x								
48	Graduation internship							x	x	x	x					
49	Graduation project										x		x	x	x	
List of specialized courses in engineering																
50	Machine learning application development				**x**											**x**
51	Game development				**x**											**x**
52	Desgin software Pattern				**x**											**x**

4. Training time: 4.5 years

5. The volume of knowledge of the whole course

The amount of knowledge of the whole course: 141 credits for bachelor, 151 credits for engineer (*excluding the subjects of Physical Education, Defense - Security*).

Structure of the training program:

TT	Knowledge group	Number of credits
1	**General knowledge**	**41**
1.1	Political Course: 11	
1.2	Natural/social sciences, informatics:	

TT	Knowledge group	Number of credits
	+ Mandatory: 18 + Optional: 0	
1.3	Foreign language: 12	
2	**Basic faculty knowledge**	**47**
	+ Mandatory: 47 + Optional: 0	
3	**Specialized faculty knowledge**	**33**
	+ Mandatory: 22 + Optional: 11	
4	**Internship, Graduation Project**	**20**
	+ Mandatory: 20 + Optional: 0	
Total (bachelor)		**141**
5	List of specialized courses for engineering degrees	**10**
	+ Mandatory: 20 + Optional: 0	
Total (engineer)		**151**

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 Board of Education and Training).

7.2. Organize classes

According to the current credit training regulations of the Department 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. Scoring

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

9. Career prospects

Job positions:

- Application development programming.
- Engineer: Software production process; Software system; Software Testing; Software quality;
- Administrator: Software and IT project manager; Database systems.
- Expert: Business Analyst; Analysis and design of information systems; Data analysis and design.
- Lecturers and researchers specializing in software engineering and information technology; can continue to study intensively at the graduate level.

Job positions are available at:

- Field: Software industry; Digital content industry; Game Industry.
- Consulting companies and system building solutions.
- Companies dealing in software and IT products.
- Software and IT Services.

10. Teaching, learning and assessment methods

- Approach and orientation of the training program:
  + Taking learners as the center; Teachers are guides, providing students with references, theoretical bases and problem-solving thinking methods. Exploiting and using modern means to improve the quality of teaching and learning, vivid and intuitive teaching and learning.
  + Learning and teaching in a positive, proactive way, associated with reality, high applicability.
  + Guide students to think logically and scientifically in developing study plans and solving problems.
- Specify the blocks of knowledge that students need to master, including:
  + General knowledge of math and natural sciences: Linear algebra, analysis, statistical probability.
  + General knowledge of industry and industry fundamentals: data structures and algorithms; Internet; computer architecture; operating system;
  + Basic and in-depth knowledge of Software development process: Software engineering; Requirements analysis and management; Software architecture and design; Software operation and maintenance.
  + Basic and in-depth knowledge of Software Quality Assurance and Testing: Formal Methods; Software Testing; Information technology project management; Software quality assurance.
  + Basic and in-depth knowledge of Programming techniques and technologies: Programming methodology; Java programming; Object-oriented software

development; Programming for mobile devices; Advanced Java Programming; DotNet Technology; XML and applications.

- Linking partners, business cooperation to bring students closer to the reality of social needs; looking for many job opportunities to ensure output for students; at the same time as a basis to adjust and standardize the training program towards high quality, close to the actual needs of enterprises and society.

11. Course abstract

No.	Course code	Courses	Number of credits	Description
1. General knowledge block				
1	ENG131	English 1	3	The course consists of 7 lessons with 7 basic grammar and vocabulary topics at the beginner level. Grammar topics in this module include: verb to be, article a, an, quantifier some, pronouns, countable and uncountable nouns, singular, plural, present simple, simple past, present continuous. These contents are associated with familiar vocabulary topics in daily life to help students have basic language knowledge and necessary vocabulary. In addition, students are trained to evenly develop four skills of listening, speaking, reading and writing, especially basic communication skills. At the end of the module, students can communicate at a simple level with the vocabulary and grammar materials provided in this module.
2	FOL121	General law	2	Equip with basic and important contents about the state and law as well as mention some basic branches of law in Vietnam today.
3	GIS131	General Informatics	3	Equip students with the most basic knowledge in computer science. Instruct students in the application of manipulation and proficient use of computers. Specific contents include: Windows operating system; Word editing system; Electronic spreadsheet Excel; Build Powerpoint presentations.
4	DST131	Linear algebra	3	Provides basic knowledge of linear algebra such as: Sets, maps and complex numbers, Matrix and

No.	Course code	Courses	Number of credits	Description
				determinant, System of linear equations, Vector space, Linear mapping and quadratic form
5	PHY121	General 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.
6	MPP131	Marxist-Leninist philosophy	3	The subject aims to provide learners with an understanding of the most general principles and laws of nature, society, and thought. On the basis of that knowledge, learners can properly perceive practical problems from the worldview and methodological stance of Dialectical Materialism and Historical Materialism; Develop self-directed thinking and teamwork, critical thinking, and self-responsibility skills.
7	ENG132	English 2	3	The course consists of 7 lessons with 7 basic grammar and vocabulary topics at the beginner level. Grammar topics in this module include: present continuous, present perfect, near future, comparative level, article. These contents are associated with familiar vocabulary topics in daily life to help students have basic language knowledge and necessary vocabulary. In addition, students are trained to evenly develop the four skills of listening, speaking, reading and writing, especially basic communication skills. At the end of the module, students can communicate at a simple level with the vocabulary and grammar materials provided in this module.
8	GTT141	Analytics	4	Equip basic knowledge of analysis such as: Functions and limits of functions of one variable, Differential Calculus of functions of one variable, Calculus of integral of functions of one variable, Series of numbers and series of functions; multi variable Functions, partial derivatives, full differentials and extremes of them.
9	MPE121	Marxist-	2	Marxist-Leninist political economy is

No.	Course code	Courses	Number of credits	Description
		Leninist political economy		an economic science that equips students with basic and core knowledge of political economy in the development context of the country and the world today. On that basis, it helps students to form thinking, analytical skills, assessment and identification of the nature of economic relations in the country's socio-economic development. The subject contributes to building social responsibility for students suitable to their job position and life after graduation; thereby, forming the school, the Marxist-Leninist ideology
10	ENG136	English 3	3	The course consists of 5 lessons with 5 basic grammar and vocabulary topics at intermediate level. Grammar topics in this module include: Present simple, simple past, present continuous, present perfect, past continuous, have to, can. These contents are associated with familiar vocabulary topics in daily life to help students have basic language knowledge and necessary vocabulary. In addition, students are trained to evenly develop the four skills of listening, speaking, reading and writing, especially basic communication skills. At the end of the module, students can communicate at a simple level with the vocabulary and grammar materials provided in this module.
11	PRS221	Probability statistics	2	Equip students with knowledge about: Basic concepts of probability, Probability formulas and its applications, Random quantity and its probability distribution laws, Sample theory and the problem of parameter estimation, Statistical hypothesis testing.

No.	Course code	Courses	Number of credits	Description
12	STS121	Science socialism	2	The module provides learners with basic knowledge about the theory of scientific socialism: about the socialist regime that our Party has chosen; on the path, measures and methods of building the socialist regime; thereby, equipping students with a solid political ideology and right actions in accordance with ethical standards, strengthening confidence in the leadership of the Party and management of the State.
13	ENG135	English 4	3	The course consists of 5 lessons with 5 basic grammar and vocabulary topics at the Pre-intermediate level. Grammar topics in this module include: comparative level, will, might, may, real conditional, some, any, passive voice, present perfect tense, near future tense. These contents are associated with familiar vocabulary topics in daily life to help students have basic language knowledge and necessary vocabulary. In addition, students are trained to evenly develop the four skills of listening, speaking, reading and writing, especially basic communication skills. At the end of the module, students can communicate at a simple level with the vocabulary and grammar materials provided in this module.

No.	Course code	Courses	Number of credits	Description
14	PHV121	History of the Communist Party of Vietnam	2	Provides systematic, basic knowledge about the birth of the Communist Party of Vietnam (1920-1930), the leadership of the Communist Party of Vietnam for the Vietnamese revolution during the period of struggle for political power. authority (1930-1945), in two resistance wars against French colonialism and American imperialism (1945-1975), in the cause of national construction and defense during the country's transition to socialism, conducting the doi moi (1975-2018). Thereby, equipping with scientific thinking methods on history, skills, selection of research materials, learning subjects and the ability to apply historical awareness to practical work, criticism of misconceptions. contrary to the history of the Party. At the same time,: to build students a sense of respect for objective truth, to raise pride and belief in the Party's ideals.
15	HCM121	Ho Chi Minh Thought	2	Provide systematic insights into Ho Chi Minh's ideology, morality and cultural values; Basic knowledge of Marxism-Leninism.
16	SSK221	soft skills	2	The course aims to equip students with basic knowledge of soft skills. Train learners' communication ability, form and develop self-awareness skills, critical thinking skills, teamwork skills, presentation skills and job interviewing skills. Students can stand on their own to present clearly, effectively and accurately in technical work, in business work, in conferences, scientific seminars, etc.
2. Basic knowledge of software engineering				
17	NML352	Introduction to programming	3	Equiping students with basic knowledge of programming. Facilitate students to get acquainted and use the C programming language. Specific content includes: Introduction to programming; C programming language; Data types in C;

No.	Course code	Courses	Number of credits	Description
				Commands in C.
18	HDH121	Operating system	2	Providing students with basic knowledge of the organization and operating principles of computer operating systems. Learn how to choose Windows and Linux operating systems for experimentation. The main contents include: - Operating system organization and operating principle: General organization of operating systems; Scheduler; Manage processes; Synchronize and share system resources - Windows operating system: Use system tool applications; Account management and Remote service; Manage applications, services, folders, system libraries, and devices; Network configuration and data sharing techniques; Maintain and upgrade operating system; Data backup and recovery techniques - Linux operating system: Organize data on the system; Manage user accounts; Manage and share system data; Techniques using the bash shell.
19	COA221	Computer architecture	2	Providing students with the most basic knowledge about the architecture and functions of the basic components of a computer system, the organization of hardware and software, techniques for installing and optimizing computer operating systems. The main contents include: - Basic components of a computer system - Architecture and function of CPU internal components - Organize MainBoar - Organize memory in the computer - Technical hard disk partitioning according to FAT and NTFS standards - Maintain, fix and handle some

No.	Course code	Courses	Number of credits	Description
				common errors on computer systems.
20	ADP321	Advanced programmer	2	Equiping students with advanced programming knowledge. Facilitate students to use C programming language fluently. Specific content includes: Dynamic data and pointers in C; Structured data types in C; File Type File in C; Graphics in C.
21	BAD131	Database	3	Relational databases, relational operations, relational data normalization, and data manipulation languages. Practice on SQL
22	OOP231	Object Oriented Programming	3	Equiping students with basic knowledge of object-oriented programming. Facilitate students to use C++ programming language fluently in object-oriented programming. Specific contents include: Overview of object-oriented programming; Functions in C++; Class, constructor, destructor, derived, inheritance; File manipulation; Direct access to memory; Streams.
23	DEM231	Discrete mathematics	3	The course is equipped with mathematical methods of thinking, logical reasoning & proof; basic knowledge of algorithms, algorithms, and discrete structures & processing techniques on those structures; algorithms, algorithm design techniques; advanced counting principles and techniques.

No.	Course code	Courses	Number of credits	Description
24	DAS231	Data structures and algorithms	3	Equiping 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. On that basis, it is possible to apply the knowledge learned to programmatically solve problems using specific programming languages.
25	CON231	Computer network	3	Overview of computer network systems: network architecture, protocols, devices, technology
26	ASD232	System analysis and design	3	The module provides learners with survey, analysis, design and installation of information management systems and at the same time trains students in object-oriented analysis and design skills based on UML language and Rational Rose.
27	PRM321	Programming methodology	2	Providing basic programming principles, level program implementation methods. From there, creating a foundation for writing good programs, clarifying the basic problem posed for programming theory is "how to master the complexity of programming operations".
28	APA331	Algorithm application	3	Understand the methods of representation, manipulation, and applications of data structures. Understand and master algorithms built on data structures. Mastering analytical methods, designing algorithms to solve specific problems in practice.
29	SOE232	Software technology	3	Equiping students with an overview of software engineering: fundamentals of software specification, development, evaluation, operation and maintenance processes, project management and organization principles
30	CCS231	Information safety and security	3	The module provides the contents of information safety and security, how to solve such content with cryptography, grasp the theoretical basis of modern cryptographic algorithms being widely used today, application of cryptosystems used

No.	Course code	Courses	Number of credits	Description
31	PJA241	Java Programming	3	The course provides students with knowledges about object-oriented methods (OPP) and how to apply them to Java programming; Java language syntax and usage; creating objects and adding behaviors, working with collections, handling errors; tips for writing better code
32	UML333	Developing object-oriented software with UML	3	The course presents software requirements and discusses the processes involved in requirements definition and software design, the role of software need analysis and software design in software engineering and in the system, document the requirements so that students 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 requirements; engineering 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.
33	LTT332	Mobile Programming	3	The course will provide students basic knowledges of programming platforms on mobile devices such as: Android, iOS, Windows Phone,… The course will also focus on the Android open source mobile operating system and equip students to understand how to program and build applications on the Android operating system.
3. Specialized knowledge				
34	AMS431	Need analysis and management	2	The course provides students knowledges and skills of inference, how to organize, document, and track all requirements. Requirements management helps to verify and validate the software system, manage any changes so that the state of the system can be analyzed effectively, especially for large and complicated software systems

No.	Course code	Courses	Number of credits	Description
35	PPH222	Programming methodology	2	After studying this course, students will understand the role, meaning and importance of specification activities in software development, catch the concept of formal specification, informal specification of specific methods describe, use some of the specification languages used in the software specification
36	DOT331	Dot Net Technology	3	This course provides basic knowledge of C# programming language, develops object-oriented programming capabilities on the basis of .NET programming libraries, progresses to building complete applications. Most of the course time is devoted to content on object-oriented programming, manipulating databases with the ADO.NET library, and building web applications using MVC architecture. The course also introduces some advanced technologies such as WPF, LINQ, Entity Framework...
37	TNS431	Software testing	3	This course provides students with an overview of the software testing phase; understand the rules affecting the testing process; testing support tools; test status, test acceptance.
38	AJP331	Advanced Java programming	3	The course provides students with in-depth knowledge of Java programming such as: Graphical interface components, I/O, multithreaded programming, network programming, remote object access, basics, fundamental connectivity database, web application building, javabean
39	ITP331	IT project management	2	The course provides basic knowledges of IT project management and skills related to project planning, time estimation, cost estimation, product quality management, risk management, project personnel selection, and IT project integration management

No.	Course code	Courses	Number of credits	Description
40	KTV332	Software architect and design	3	The course provides basic knowledge about software high layer structure, data representation, algorithms, application of interaction rules, constraints in business context, system modeling
41	SQA421	Software quality assurance	2	The course provides in-depth knowledge of software quality control in the software life cycle; Current software standards apply in the software life cycle.
42	BTP325	Software operation and maintenance	2	This course provides students with an overview of software maintenance, software will change through evolution, types of maintenance, factors affecting maintenance costs
5. Selective Course/Modules:				
43,44	***Selective courses for speciality 1,2***			
	OSD331	Open source software development	3	This course will help students understand the basics of open source software. Licenses in the open source community, the benefits of using open source software in developing applications.
	JEE333	J2EE technology	3	The course provides and equips modern Java technologies to deploy large-scale enterprise applications.
	CCP431	Cloud computing	3	The course presents the basic and fundamental concepts of cloud computing (EIA) firtsly, its important technical characteristics and possible application capabilities. Then, the course presents knowledge about basic models of cloud computing, algorithms and large solutions to control virtual server systems, current cloud systems such as Azure, GAE, IBM, Amazon, etc.
	PMN333	Embedded application development	3	Understand what an embedded system is. Operating principles and methods for developing embedded systems.
	XTA331	XML and application	3	The course is intended to provide an overview of XML, XML document structure and content specification. Parsing of XML. Query XML data. Transform XML documents with

No.	Course code	Courses	Number of credits	Description
				XSLT. XML in semantic web technology.
45	***Selective courses for speciality 3***			
	IDS321	Software interface design	2	Introduce the stages in the software interface design process, the components of the UI interface, the factors to evaluate the quality of user interface design and also present some sample interfaces in practice
	SPS433	Modern problems in software engineering	2	This subject provides students with an in-depth look at Software Engineering, topics, and cutting-edge technological aspects from which students can apply to solve complex problems in real life, software research and production
	DPT231	Multimedia systems	2	This course equips students with an overview of multimedia documents, tools used to create multimedia products and skills to build a multimedia product… Through this, students can build multimedia products on demand as well as know how to apply multimedia devices and products to agencies.
	HDV222	Service oriented architecture	2	This couse provides students with the overall process of designing and implementing systems according to service architecture and providing enterprise services on cloud computing, building service infrastructure, and virtualization.
46	***Selective courses for speciality 4***			

No.	Course code	Courses	Number of credits	Description
	ELC331	E-commerce	3	This course provides students with the basics of e-commerce, e-marketplaces as well as the scope, functions and benefits of e-commerce for businesses. Besides it, the course also helps students to be able to grasp some core elements when applying e-commerce to businesses such as: infrastructure in e-commerce, business models, law e-commerce, transaction systems, payment methods and safe management of e-commerce, etc. Based on the research on opportunities and challenges in business through electronic means, students will minimize the risks encountered when working with any e-commerce system.
	ADV333	Facebook marketting	3	Equip students with basic knowledges of Digital Marketing and use Facebook to launch online marketing campaigns. At the end of the course, students have an 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.
	CTH333	Medical informatics standards and applications	3	This course is intended to provide students with knowledge of computer standards used in healthcare. After finishing the course, students understand the concepts of standards such as: document standards, international standards on the list of diseases used in information exchange and information processing in health insurance, HL7 messaging and CDA clinical documentation standards. These are standards that are commonly used in countries with advanced medicine and will also be widely used in Vietnam in the coming years. After completing the course, students have basic knowledge about standards, understand technical characteristics, features and how to apply a standard in building software in the medical field. Based on the knowledge gained, graduates can work as maintenance

No.	Course code	Courses	Number of credits	Description
				engineers for information systems currently used in hospitals.
6. Internship/Graduation Project				
47	BAP441	Internship	4	
48	PRT461	Vocational internship	6	
49	GRA905	Graduation project	10	
7. List of specialized courses for engineering degrees				
50	UHM241	Machine learning application development	4	The course provides knowledge about machine learning, including: Introduction to machine learning; Process of implementing a machine learning project; Classification problem; Model training; Support vector machines; Decision trees; Random learning and random forests; Data dimensionality reduction; Unsupervised learning techniques. The knowledge in the subject is uniformly arranged through specific projects and exercises to help students get an idea of the tasks of machine learning and practice on the tools provided by Python.
51	PTG333	Game Development	3	The course is instructed to students majoring in IT in their final year of study, in order to familiarize students with the Unity cross-platform game programming tool and understand the game making process. After completing the course, students have an overview of the Unity game application, game programming interfaces, understand the APIs in game programming, and can build 2D games.
52	MTK233	Software design	3	The course provides students with knowledge of software design

No.	Course code	Courses	Number of credits	Description
		patterns		principles, architectural patterns, and popular software design patterns today. The main content of the course focuses and delves into software design patterns, creating good, fast, efficient, scalable, and highly reusable software designs. In particular, some commonly used design patterns are highly applicable in current frameworks
Total			**151**	

12. Output standards, curriculum framework and detailed course outline:

- Output standards of the training program:

(link: …….).

- Detailed training program framework:

(link: …….).

- Detailed course outline:

(link : …….).

VICE RECTOR

Ph.D Do Dinh Cuong

HEAD OF IT FACULTY

Ph.D Nguyen Hai Minh