

**PROGRAMME LEARNING OUTCOMES (PLOs)
OF SOFTWARE ENGINEERING EDUCATION PROGRAMME**
*Decision No 415/QĐ-ĐHCNTT&TT dated on June 30th, 2021 by the Rector
of TNU - University of Information and Communication Technology*

Vietnamese name of the programme: Kỹ thuật phần mềm

English name of the programme: Software Engineering

Academic level:

- Bachelor's degree. Academic Schedule 4 years. Implement output standards: L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L16.
- Engineer's degree. Academic Schedule 5 years. Implement output standards: L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14, L15, L16.

I. TRAINING OBJECTIVES

1.1. General objectives

Training bachelors/engineers in Software Engineering with basic scientific knowledge, foundational knowledge of the field of information technology, solid professional knowledge in software engineering; Having skills in problem analysis, defining requirements, then designing, building, testing and operating a program, a software to meet the desired needs; Having communication skills, teamwork, professional attitude and working style to meet the development requirements of the domestic and international software industry.

1.2. Detail objectives

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

- O1. Have general knowledge of political theory, natural and social sciences, knowledge of foreign languages
- O2. Have background knowledge in the field of information technology such as: basic programming techniques, data structures and algorithms, system analysis and design, computer networks and operating systems, software development process.
- O3. Have the ability to analyze, design, program, test, deploy software projects, applications, websites; Have the ability to apply modern methods, techniques and tools in software development.

O4. Have professional skills in software engineering, have understanding of the external social and business context to analyze, apply, design and produce integrated software products..

O5. Have a professional attitude in work, communication and teamwork. Able to use English at work.

II. PROGRAM LEARNING OUTCOMES

Notation PLO		PLOs of SE programme	Proficiency level
1		Technical knowledge and reasoning	
<i>1.1</i>	<i>L1</i>	<i>Apply general knowledge in social and natural science (such as political theory, mathematics, physics) to solve problems in specialization, career, and daily life.</i>	<i>2.5</i>
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.	2.5
1.1.2		Apply basic knowledge of mathematics, physics, and logical thinking as the foundation for studying, researching and solving professional and professional problems.	2.5
1.1.3		Apply knowledge of national defense and security and physical education to realize the responsibility for the cause of national defense and health training to ensure the assigned tasks.	2.5
<i>1.2</i>	<i>L2</i>	<i>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.</i>	<i>4</i>
1.2.1		Apply basic knowledge of vocabulary and grammar to meet the acquisition of specialized 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
<i>1.3</i>	<i>L3</i>	<i>Apply fundamental knowledge in the IT field for implementing practical applications.</i>	<i>3</i>
1.3.1		Apply knowledge of basic programming methods, tools and source code in developing 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 during the design and construction of software products.	3
1.3.4		Apply knowledge of computer architectures, operating systems,	3

Notation PLO		PLOs of SE programme	Proficiency level
		and networks to deploy information technology applications	
1.3.5		Apply knowledge of software development processes, system analysis, and database design in software development.	3
1.4	L4	<i>Apply professional knowledge of software engineering in building, deploying and operating software</i>	3
1.4.1		Apply knowledge of object-oriented software development methods to solve software system development problems.	3
1.4.2		Apply knowledge of software requirements specification analysis to solve problems in the software development process	3
1.4.3		Apply modern software design and architecture knowledge to develop software products.	3
1.4.4		Apply knowledge of testing and software quality assurance in the software product quality assurance process.	3
1.4.5		Apply knowledge of software operation and maintenance in the deployment stages of the software lifecycle.	3
1.4.6		Apply the knowledge of software project management to organize and produce software products.	3
1.4.7		Apply knowledge of artificial intelligence and machine learning to solve problems in the process of operating and developing software products	3
1.4.8		Apply knowledge of information safety and security to solve related problems in the process of operating and developing software products.	3
1.4.9		Apply knowledge and technology to design and develop web applications.	3
1.4.10		Apply Java technologies to solve problems in the development of software products	3
1.4.11		Apply and exploit Microsoft technology proficiently to solve problems in the process of developing software products	3
1.4.12		Apply application development for mobile devices to solve problems in the process of developing software applications for mobile devices	3
1.5	L5	<i>Synthesize specialized knowledge of Software Engineering for future career development</i>	4
1.5.1		Synthesize and propose solutions to handle big data systems effectively applying machine learning and artificial intelligence tools	4
1.5.2		Synthesize tools to find vulnerabilities, propose information security solutions for information technology systems	4
1.5.3		Synthesize and exploit Microsoft, Java and open source	4

Notation PLO		PLOs of SE programme	Proficiency level
		technology platforms to develop software projects.	
2		<i>Personal and professional skills and attributes</i>	
2.1	<i>L6</i>	<i>Apply critical thinking and problem-solving skills in building and consulting software application solution</i>	3
2.1.1		Define and state a software problem	3
2.1.2		Modeling software systems	3
2.1.3		Estimate and analyze software projects	3
2.1.4		consulte solutions software application	3
2.2	<i>L7</i>	<i>Apply systematical thinking in organization and deployment of software systems</i>	3
2.2.1		Think globally and holistically about the system	3
2.2.2		Perceive the interactions between components and arise in the system	2
2.2.3		Sort sequence of Prioritize and focus	3
2.2.4		Analyze the different factors in the way of problem solving.	3
2.3	<i>L8</i>	<i>Use creativity, critical thinking and self-confidence, ability to work independently in software project management</i>	3
2.3.1		Demonstrate confidence, willingness and ability to work independently	3
2.3.2		Apply creative thinking in software project management	3
2.3.3		Apply Critical thinking in software project management	3
2.3.4		Adapt to a new environment	3
2.3.5		Apply project management knowledge	3
2.4	<i>L9</i>	<i>Apply professional ethics in implementation and deployment of software systems</i>	3
2.4.1		Recognize and behave in accordance with ethical principles and standards.	2
2.4.2		Define roles, responsibilities and professional behavior in implementing the system	3
2.4.3		Apply information security skills to systems	3
2.4.4		Show honesty and credibility in work	3
3		Communication and teamwork skills	

Notation PLO		PLOs of SE programme	Proficiency level
3.1	L10	<i>Use teamwork skills effectively</i>	3
3.1.1		Identify the process of forming and working principles of the group	3
3.1.2		Apply motivation, plan activities, monitor, adjust and evaluate the group's performance results.	3
3.1.3		Apply skills of personal development and team development	3
3.2	L11	<i>Practice communication skills in idea explanation, representation, review, and developing communication relationships in professional life</i>	3
3.2.1		Apply communication skills, from forming coherent and logical ideas to supporting evidence, the ability to present, listen to and respect others' opinions.	3
3.2.2		Edit scripts and exploiting supporting tools in presentation.	3
3.2.3		Identify and suggest solutions to resolve conflicts in negotiations.	2
3.2.4		Build relationships with friends, colleagues and social networks	3
4		Competencies of conceiving, designing, implementing, and operating application software in the enterprise and societal context	
4.1	L12	<i>Recognize the enterprise, organization, and societal context</i>	3
4.1.1		Analyze the impact of software industry on society	3
4.1.2		Apply government regulations in the field of information technology and software sector	3
4.1.3		Recognized of social, economic and environmental issues in the field of information technolog	2
4.1.4		Understand the culture of the organization and the business	2
4.1.5		Analyze the goals, strategies and regulations of organizations and businesses on information technology investment	3
4.1.6		Apply start-up skills to develop product ideas, services, business plans and form a software-assisted business	3
4.2	L13	<i>Conceive ideas</i>	3
4.2.1		Identify project objectives, collect requirements based on technical methods and tools to collect requirements classification.	3
4.2.2		Analyze project feasibility and suitability.	3
4.2.3		Specify the project's objectives and requirements	3

Notation PLO		PLOs of SE programme	Proficiency level
4.3	L14	<i>Design systems</i>	3
4.3.1		Apply knowledge and skills in designing application software solutions	3
4.3.2		Apply processes, methods, and tools to software development	3
4.3.3		Design software application systems suitable for different goals: speed, cost, maintenance, evolution...	3
4.3.4		Design the architecture and components of the system (functions, databases, ...)	3
4.4	L15	<i>Deploy software projects (Elective)</i>	3
4.4.1		Apply processes, methods, tools, and environments to deploy software systems.	3
4.4.2		Apply knowledge and techniques to implement software system design.	3
4.4.3		Apply knowledge to integrate system components and functions during deployment.	3
4.5	L16	<i>Test, operate, and maintain software</i>	3
4.5.1		Apply product verification processes and methods.	3
4.5.2		Verify requirements, components or the entire system	3
4.5.3		Apply knowledge, system organization and operation skills based on knowledge of operating procedures, system capabilities, relationships, costs, quality and safety.	3
4.5.4		Develop documentation and user training for the product.	3
4.5.5		Apply product maintenance processes	3
4.5.6		Identify problems, unreasonable details to indicate possible improvements based on the operation of the system.	2
4.5.7		Identify problems, situations, and residual value when discarding or dismantling the system	2

III. WORKING POSITION AFTER GRADUATION

Job positions:

- Application developer.
- Software system engineer.
- Software testing and quality assurance engineer.
- Software production process engineer.
- Information systems analyst and designer.
- Data analyst and designer.

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

- Software industry.
- Digital content industry.
- Consulting on system construction.
- Game Industry.
- Trading in software and IT products.
- Software and IT services.
- Software and IT application fields.

VICE RECTOR



Ph.D Vu Duc Thai

HEAD OF IT FACULTY



Ph.D Nguyen Hai Minh