

**THAI NGUYEN UNIVERSITY
UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY**



**PROGRAMME SPECIFICATION
FOR ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING
TECHNOLOGY EDUCATION PROGRAMME**

THAI NGUYEN - 2020

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THAI NGUYEN UNIVERSITY
UNIVERSITY OF INFORMATION AND COMMUNICATION TECHNOLOGY
Faculty of Electronics and Communications Technology

**PROGRAMME SPECIFICATION
OF ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING TECHNOLOGY
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. Program name:

- + Vietnamese name: Công nghệ kỹ thuật điện tử - viễn thông.
- + English name: Electronics and Telecommunications Engineering Technology.

2. Program code: 7510302.

3. Program type: Full time.

4. Degree name:

- Bachelor's degree in Electronics and Telecommunications Engineering Technology 141 credits)
- Engineer's degree in Electronics and Telecommunications Engineering Technology (151 credits)

5. Training and degree places: Faculty of Electronics and Communications Technology - 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 Electronics and Telecommunications Engineering Technology with professional qualifications, solid political qualities, a sense of discipline, and professional ethics; graduates can independently solve technical problems, have solid professional knowledge in the design, construction, operation, and exploitation of telecommunications systems, electronic and telecommunications equipment; develop research in the field of Electronics and telecommunications, meeting the needs of society.

2.2. Detail objectives

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

- Have basic and intensive knowledge of electronic circuits and components to design, simulate, and assemble electronic circuits; Proficiently apply primary programming languages and simulation tools in electronic and telecommunications systems; Understand the processes of operation, exploitation, troubleshooting, and administration of electronics and telecommunications systems.
- 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 Electronics and Telecommunications Engineering Technology training program promulgated under Decision No. 99/QĐ-ĐHCNTT&TT are shown through the following contents (encoded: L1 ÷ L15):

Notation	PLOs of ETET programme
<i>L1</i>	Apply knowledge of math and physics in order to solve scientific and technical problems in Electronics and Telecommunication Engineering Technology
<i>L2</i>	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.
<i>L3</i>	Approach foreign language ability (English), level 3/6 of Vietnam's Foreign Language Competency Framework; specialized English skills.
<i>L4</i>	Obtain one of the following certificates: IC3, MOS, ICDL, Certificate of Information Technology Application (according to Circular 03/2014/TT – BTTTT of the Ministry of Information and Communications), or equivalent certificate.
<i>L5</i>	Have independent work and teamwork skills; report writing and presentation skills on technical issues; autonomy and self-responsibility.
<i>L6</i>	Have knowledge of professional responsibilities and professional ethics
<i>L7</i>	Have the ability to lead professionally; be creative in the working process; have the ability to self-study, accumulate knowledge and experience to improve professional qualifications; and plan, coordinate, and promote collective intelligence.
<i>L8</i>	Master the basic knowledge of electronic circuits, electronic components; applied to survey, analyze, design, simulate and assemble electronic circuits.
<i>L9</i>	Mastering knowledge of signal processing, transmission, and measurement in electronic and telecommunications systems.
<i>L10</i>	Proficient in basic programming languages in electronic and telecommunications systems
<i>L11</i>	Explain the processes of operation, exploitation, troubleshooting, and administration of telecommunications systems.
<i>L12</i>	Design, simulation, construction, and installation of telecommunication systems in practice
<i>L13</i>	Developing and improving technology and techniques to enhance the operational efficiency of telecommunications networks.
<i>L14</i>	Planning to implement projects on electronics and telecommunications, developing value-added service systems in the field of electronics and telecommunications.
<i>L15</i>	Apply new technologies in the development of advanced electronic and telecommunications systems.

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	Marxist-Leninist Philosophy		x			x	x	x								
2	Marxist-Leninist political economy		x			x	x	x								
3	Science socialism		x			x	x	x								
4	Ho Chi Minh Ideology		x			x	x	x								
5	History of the Communist Party of Vietnam		x			x	x	x								
6	Linear algebra	x				x		x								
7	Analytics	x				x		x								
8	General Physics	x				x		x								
9	General Informatics				x	x		x								
10	General law		x			x	x	x								
11	Statistics-Probability	x				x		x								
12	Soft skills					x	x	x								
13	English 1			x		x		x								
14	English 2			x		x		x								
15	English 3			x		x		x								
16	English 4			x		x		x								
17	Physical education					x		x								
18	Defense education		x			x		x								
Basic knowledge block																
19	Digital signal processing					x	x	x		x						
20	Analog Electronic Engineering					x	x	x	x							
21	Electronic Circuit Engineering					x	x	x	x							
22	Digital Electronic Engineering					x	x	x	x							
23	Electronic Measurement Technique					x	x	x		x						
24	Data Structures and Algorithms				x	x	x	x			x					
25	Microprocessing Engineering and Applications				x	x	x	x	x		x					

No.	Courses	Output standards of training programs														
		L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15
26	C Programming in Electronics				x	x	x	x			x					
27	Advanced C Programming in Electronics				x	x	x	x			x					
28	Networks and Data Transmission				x	x	x	x		x						
29	Digital Communications					x	x	x		x						
30	Transmission Engineering					x	x	x		x						
31	Mobile Communications					x	x	x		x						
32	Optical Communications					x	x	x		x						
33	Introduction to Electronics					x	x	x								
34	Analog and Digital Electronic Practice					x	x	x								
35	Basis Telecommunications Practice					x	x	x		x						
36	Microprocessor and Microcontroller Practice					x	x	x	x		x					
37	Wave Propagation and Antenna					x	x	x		x						

Specialized knowledge block

		<i>Required Courses/Modules:</i>														
38	Telecommunications Network Devices						x	x	x	x			x	x		
39	Switching and Exchange Technology					x	x	x		x		x		x		
40	Measurement in Telecommunications System						x	x		x		x		x		
41	Positioning and Navigation Systems				x	x	x	x	x	x				x		
42	Digital Broadcast and Television Technology					x	x	x		x				x		
43	Multimedia communication system						x	x					x	x		
44	Telecommunications Network Management				x	x	x	x	x	x			x	x		

No.	Courses	Output standards of training programs														
		L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15
45	Telecommunications Special Subject						x	x	x	x			x	x	x	
Elective Courses/Modules:																
<i>Specialization elective courses 1</i>																
46	Microwave - Satellite Communications						x	x		x						
47	Radio Communications Network						x	x		x			x	x		
48	Mobile Network Optimization						x	x		x			x	x		
<i>Specialization elective courses 2</i>																
49	Digital Communications Simulation						x	x	x	x	x	x	x			
50	Telecommunications Design and Planning						x	x	x	x			x	x		
<i>Specialization elective courses 3</i>																
51	Optical Transmission Devices Practice						x	x	x	x		x	x			
52	Broadband Access Devices Practice						x	x	x	x		x	x			
<i>Specialization elective courses 4</i>																
53	Switching Devices Practice						x	x	x	x		x	x			
54	BTS Installation and Maintenance Practice						x	x	x	x		x	x			
Internship / Graduation Thesis																
<i>Mandatory module</i>																
55	Specialized Internship				x	x	x	x		x	x		x			
56	Graduation internship			x	x	x	x	x	x	x	x	x	x	x	x	
57	Graduation Thesis			x	x	x	x	x	x	x	x	x	x	x	x	
Alternative Courses to replace Graduation Thesis																
58	Radio Transceiver Techniques						x	x	x	x						
59	Information Encoding Technique						x	x		x	x			x		
60	Electronic and Telecommunications Project Management					x	x	x					x		x	

No.	Courses	Output standards of training programs															
		L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	
61	Advanced Communications Technology	x					x	x	x	x		x	x	x			
List of Specialized Courses for Engineering Degree																	
62	4G LTE and 5G mobile communications					x		x		x	x		x			x	x
63	IoT and Telecommunications	x				x		x		x	x		x			x	x
64	Image and Sound Processing in Telecommunications					x			x	x	x		x			x	x

4. Training time:

4.5 years spread over 9 semesters.

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: + Mandatory: 18 + Optional: 0	
1.3	Foreign language: 12	
2	Basic faculty knowledge	49
	+ Mandatory: 49 + Optional: 0	
3	Specialized faculty knowledge	33
	+ Mandatory: 23 + Optional: 10	
4	Internship, Graduation Project	18
	+ Mandatory: 8 + Optional: 10	
Total (bachelor)		141
5	List of specialized courses for engineering degree	10
	+ Mandatory: 10 + 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:

- Managers, operators, and technicians at agencies and enterprises in the field of electronics and telecommunications;
- Engineers working at telecommunications service operators, domestic and foreign telecommunications service providers;
- Technicians at telecommunications centers, post offices, and broadcasting stations;
- Technical specialists in companies, factories, and industrial parks in the field of electronics and telecommunications;
- Consultant on equipment sales in electronic and telecommunications systems;
- Researchers and lecturers at research and training centers.

10. Teaching, learning and assessment methods

Teaching, learning, and assessment methods are carried out based on the requirements in the training program's output standards and each course, according to the accreditation standards issued by the Ministry of Education and Training. These methods are oriented towards regional and international standards like AUN-QA.

11. Course abstract

No.	Course code	Courses	Number of credits	Description
1. General knowledge				
1	ENG131	English 1	3	The course consists of 7 lessons with 7 basic

No.	Course code	Courses	Number of credits	Description
				<p>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.</p>
2	ENG132	English 2	3	<p>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.</p>
3	ENG136	English 3	3	<p>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.</p>
4	ENG135	English 4	3	<p>The course consists of 5 lessons with 5 basic grammar and vocabulary topics at the pre-</p>

No.	Course code	Courses	Number of credits	Description
				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.
5	DST131	Linear algebra	3	Provides basic knowledge of linear algebra such as: Sets, maps and complex numbers, Matrix and determinant, System of linear equations, Vector space, Linear mapping and quadratic form
6	VCP131	Revolutionary lines of Vietnamese Communist Party	3	To provide students with the basic contents of the Communist Party of Vietnam's revolutionary line, which mainly focuses on the Party's line in the renovation period on a number of basic fields of social life, service for life and work.
7	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.
8	MPP131	Marxist-Leninist Philosophy	3	The subject aims to provide learners with an understanding of the most common principles and laws of nature, society and thought. Based on that knowledge, learners can adequately 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.
9	MPE121	Marxist-Leninist political economy	2	The course is economic science, equipping students with basic and essential knowledge of political economy in the context of the country's development and today's world. On that basis, it helps students to form thinking, analytical skills, assessment, and

No.	Course code	Courses	Number of credits	Description
				identification of the nature of economic relations in the country's socio-economic development. The course contributes to building social responsibility for students suitable to their job position and life after graduation, forming the Marxist-Leninist school and ideology.
10	STS121	Science socialism	2	The course provides learners with basic knowledge about the theory of scientific socialism and the socialist regime; on the path, method and way of building the socialist regime; thereby, equipping students with a solid ideological and political system and corrective actions in accordance with ethical standards, strengthening confidence in the leadership of the Communist Party and the management of the State.
11	FOL121	General law	2	Equip with basic and important contents about the state and law as well as mentioned some basic branches of law in Vietnam today.
12	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.
13	HCM121	Ho Chi Minh Thought	2	Provide systematic insights into Ho Chi Minh's ideology, morality and cultural values; Basic knowledge of Marxism-Leninism.
14	PHY121	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.
15	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.
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.

No.	Course code	Courses	Number of credits	Description
2. Basic knowledge Courses/Modules:				
17	DSP231	Digital Processing Signal	3	The course covers the basics of signals and systems; Laplace signal transformations, Fourier transforms, and z transforms; Designs FIR and IIR filters using MATLAB tools; The course deals with some applications of DSP in audio and image processing; The course helps students have a general knowledge of signal processing as a basis for modules on audio, video, embedded systems, and other modules in electronics and telecommunications.
18	AET231	Analog Engineering Electronic	3	Equip students with basic knowledge about the structure and operating principle of basic electronic components such as Diode; Bipolar Transistor, Field-effect transistor; structure and operating principle of PN multiple-transistor semiconductor devices; structure and operating principle of optoelectronic components, operating principle of basic electronic circuits with Diode, Transistor, oscillator circuits.
19	EED231	Electronic Engineering Circuit	3	Equip students with knowledge of analysis, design, and simulation methods of applied electronic circuits. This course includes General problems of algorithmic amplifiers; linear computing and control circuits using algorithmic amplification; nonlinear computational and control circuits using algorithmic amplification; analog-to-digital converter circuits and digital-to-analog converters; power supply circuits; frequency converter circuits.
20	TDS231	Digital Engineering Electronic	3	Equips students with knowledge of Arithmetic and logical foundations of digital devices, Fundamentals of electronic computers, Logical algebra, and methods of representing variables, logic functions, and reducing logic functions. The course helps students to analyze and design special combinational circuits of arithmetic circuits, decoder, and encoder circuits, demultiplexers, multiplexers, counters, registers, etc.
21	ELM221	Electronic Measurement Technique	2	Equip students with knowledge of signal measurement methods and devices. Specific contents include basic concepts of measurement techniques; evaluation errors in measurement; observation and measurement signal form; oscilloscope structure; oscilloscope application; multi-ray

No.	Course code	Courses	Number of credits	Description
				oscilloscope; analog oscilloscope; digital oscillator; measure frequency, duration, and phase shift; measure voltage and power.
22	PGC232	C Programming in Electronics	3	The course aims to provide students with basic knowledge of the C programming language and its application in the fields of electronics and telecommunications. Students can have an overview of programming in embedded systems with microcontrollers, and microprocessors.
23	PGC234	Advanced Programming in Electronics	3	The course provides advanced knowledge of the C programming language applied in electronics such as pointers, file management, macros, and GIT... along with applied problems in advanced 32-bit and 64-Bit Microprocessors.
24	DAS231	Data Structures and Algorithms	3	Equip students with an overview of in-depth knowledge of standard data models (lists, stacks, queues, trees, graphs, sets, dictionaries, ...) and manipulate data elements. On that basis, applying the learned knowledge to solve problems using specific programming languages programmatically is possible.
25	MPT331	Microprocessing Engineering and Applications	3	The course provides students with knowledge about Microcontrollers and microprocessors, methods of organizing data input and output in microprocessors, Interrupts, and interrupts handling, introducing some advanced microcontroller families, programming applications with the 8051 families of microcontrollers, and with PIC16F877A Microcontroller.
26	NDC331	Networks and Data Transmission	3	The course introduces basic knowledge about communication networks, such as signal types and channel characteristics, data transmission methods, communication standards, modem devices, multi-media types, wired and wireless transmission, multiplexing techniques, data link layer issues, network layer, local area network LAN, WAN, wireless communication network, etc.
27	APT231	Antennas and Wave Propagation	3	Equip students with basic knowledge about antennas, specifically: principles of radio transmission; antenna structure and operation direction; antenna classification; Smart antenna techniques, and applications in telecommunications systems.

No.	Course code	Courses	Number of credits	Description
28	DIC231	Digital Communications	3	Equip students with basic knowledge of digital communication. The course includes essential components of digital information systems; factors affecting communication signals; baseband communications; digital modulation techniques, and analysis and evaluation of information signal quality.
29	TTM321	Transmission Engineering	2	Equip students with general knowledge of transmission engineering, specifically: transmission lines; signal digitization; source code engineering; signal coupling and decoupling techniques; synchronous and asynchronous digital transmission systems.
30	MOC321	Mobile Communications	2	Equip students with basic knowledge about the operation of mobile communication networks. The course content includes the concepts of cellular communication systems and cellular system designing methods; signal equalization and diversity techniques; introduced 2G, 3G, and 4G mobile communication systems.
31	OPC321	Optical Communications	2	The subject provides students with basic knowledge about optical communication systems, including the structure and principles of light transmission in optical fibers, essential components of optical communication systems, and design methods: simple optical communication system, the concept of new optical transmission technologies, and optical communication networks.
32	TEI121	Introduction to Electronics	2	The course provides students with knowledge and skills in using electronic measuring instruments such as digital clocks, multifunction generators, and oscilloscopes. Understand the basic concepts of passive and semiconductor electronic components. Simulate electrical circuits using Orcad software, and design printed circuits using Orcad. Assemble electronic circuit: The circuit generates pulses using IC 555; the circuit turns lights on and off using a photoresistor, and the counter circuit uses digital IC.

No.	Course code	Courses	Number of credits	Description
33	PAD221	Analog and Digital Electronic Practice	2	The course provides students with the skills to use several specialized ICs in surveying and designing applied electronic circuits such as Counter circuits, algorithmic amplifiers, voltage stabilizers, pulse generators, comparator circuits, ADC circuit, DAC circuit, etc.
34	MMP221	Microprocessor and Microcontroller Practice	2	Equip students with skills to work with microcontrollers such as AT89C51, PIC, Arduino, etc. Equipping application programming skills based on C programming language for microcontrollers and helping students use essential electrical circuit design devices such as led matrix, buttons, motors, LCD, sensors, and wireless signal transmission.
35	BTP221	Basis Telecommunications Practice	2	The course helps students approach, survey, and implement specialized electronic circuits applied in the field of electronics and telecommunications, such as Encoder and decoder circuits, switchboard switches, antennas, transceivers, signals, transmission lines, simulated switchboards, etc.
3. Specialized Knowledge Courses/Modules:				
36	STE331	Switching and Exchange Technology	3	The course introduces the basic knowledge of switching systems in telecommunications networks. From there, the course presents details about switching, signaling, and control techniques in the switchboard, specifically knowledge of digital switching and SPC, advanced switching techniques such as ATM switching, and MPLS.
37	TND332	Telecommunications Network Devices	3	Equip students with basic knowledge of telecommunications network devices; location of network-connected devices in the telecommunications system; hardware configuration, use, and operation of network terminal equipment: switchboard, telephone, modem, DSLAM. In addition, the course also equips students with skills in exploiting, managing, designing transmission lines, configuring, and debugging switches and mobile network devices.
38	PNS431	Positioning and Navigation Systems	3	The course equips students with basic knowledge about radio navigation systems, overview of radar systems, operating principles of navigation systems, advantages and disadvantages of navigation systems,

No.	Course code	Courses	Number of credits	Description
				pulse generation and calculating the receiver location, how to exploit and use the navigation system. General concepts of satellite navigation systems, principles of radio navigation, configuration of satellite navigation systems. Introduction to the global positioning system GPS, structure and operating principle of the GPS system.
39	DMM332	Digital Broadcast and Television Technology	3	Equip students with knowledge of digital broadcasting technology, principles of television, color television techniques, digital television and related issues, encoding and compression of television signals, transmission systems and new TV models such as DVB-T, DVB-C, DVB-S, and DVB-H television.
40	MTS331	Measurement in Telecommunications System	3	The course introduces measurement procedures, and test techniques on current telecommunications systems; the structure of measuring equipment, and methods of testing and assessing the quality of copper and optical cable transmission systems, xDSL, IPTV networks, radio communications, systems using technology PDH, SDH, etc.; metrics that evaluate the grade of a testing system.
41	CSD332	Multimedia Communications System	3	The course equips students with basic knowledge about multimedia communication systems, multimedia data, multimedia data compression techniques, real-time data transmission techniques, network protocols in multimedia communications, and related issues.
42	TNM322	Telecommunications Network Management	2	Equip students with fundamental knowledge about telecommunications network management activities and approaches to network technology management solutions in current telecommunications infrastructure.
43	TOS334	Telecommunications Special Subject	3	The course aims to equip students with knowledge of deployment simulation, analysis, and evaluation of electronics and telecommunications systems.
4. Elective Course/Modules:				
44	<i>Elective course 1</i>			
1	MSC332	Microwave - Satellite Communications	3	Equip students with general knowledge about digital microwave system: characteristics, system model, overview configuration, wave transmission base, digital microwave equipment, calculation, and design of microwave route. It also equips students with

No.	Course code	Courses	Number of credits	Description
				an overview of satellite communication, ground stations, satellites, and parameters for calculating satellite communication lines.
2	CNM332	Radio Communications Network	3	Equip knowledge about radio networks related to the system models, protocol architecture, and radio connection devices; enable students to analyze and design wireless networks.
3	THN331	Mobile Network Optimization	3	Equip students with basic knowledge about network optimization processes and methods, mobile network quality indicators (KPIs), coverage optimization solutions, and mobile network optimization tools.
45	<i>Elective course 2</i>			
1	SDC321	Digital Communications Simulation	3	The subject describes the principles of modern information systems, functions, and operating principles of the components in the system. Building simulations for the system, calculating the quality for modulation, coding, channel components, S/N ratio, BER, and bit error probability.
2	AND331	Telecommunications Design and Planning	3	Equip students with general knowledge of telecommunications network planning and design. The organization of the course includes the overview of telecommunications networks; the planning process; the basis of analysis and design of telecommunications networks; planning and optimization of telecommunications networks.
46	<i>Elective course 3</i>			
1	POT221	Optical Transmission Devices Practice	2	Equip basic knowledge about optical transmission, skills to read and understand technical features, the position of blocks in the system, the connection of optical transmission equipment, operation and exploitation of actual optical transmission equipment.
2	PBA221	Broadband Access Devices Practice	2	The course helps students understand the MANET broadband network structure in practice and organize network connections at provincial telecommunications stations. Operate and exploit broadband devices (Switch L2, DSLAM, Router).

No.	Course code	Courses	Number of credits	Description
47	Elective course 4			
1	PSW221	Switching Devices Practice	2	Equip knowledge about: PBX hardware devices (Hicom, OSB X5, X8); operation, exploitation, and maintenance of switches on the existing network.
2	BTS221	BTS Installation and Maintenance Practice	2	Equip knowledge about: BTS hardware device (Motorola, Alcatel, Huawei) and I/O connections; operation, exploitation, and maintenance of Base transceiver station (BTS).
5. Internship, Graduation Thesis				
48	SPP431	Specialized Internship	3	The course synthesizes and provides students with a way to synthesize the knowledge they have learned in the knowledge blocks from the training program, from which they can apply it to study specific subjects.
49	GRP451	Graduation Internship	5	In this course, learners perform the tasks assigned to apprentice engineers specializing in Electronics and Telecommunications at companies, factories, enterprises, and production facilities.
50	GRA905	Graduation Thesis	10	The course provides students with the ability to apply and synthesize knowledge about electronic and telecommunications systems to recognize all problems related to the field of electronics and telecommunications; Learners have the ability to collect information, analyze and select technical solutions to deploy related problems in the field of electronics and telecommunications.
6. Alternative Course to replace Graduation Thesis				
1	TTV331	Radio Transceiver Techniques	3	Equip students with basic knowledge of radio transceiver techniques and basic technical criteria. Working principle of radio transceiver system, block diagram in transceiver system.
2	TIC422	Information Encoding Technique	2	Equip students with basic knowledge of Information Theory and coding, and basic coding techniques. Investigate some types of anti-interference coding in radio communications.
3	ETP421	Electronic and Telecommunications Project Management	2	Equip with general knowledge on elaboration and management of electronic and telecommunications technology investment projects: concepts, sequence of project formulation, technical and technological analysis, financial analysis, socio-economic analysis meetings, project planning, project

No.	Course code	Courses	Number of credits	Description
				schedule management, project resource allocation, and project control.
4	TVT432	Advanced Communications Technology	3	Provides basic knowledge about the characteristics of radio channels and the effects of radio channels on signal quality. Equip the theoretical basis of modern radio communication techniques.
Total (Bachelor)			141	
7. List of Specialized Courses for Engineering Degree				
1	IOT333	IoT and Telecommunications	4	The course provides students with an overview of the Internet of Things and communication protocols for IoT. Introduction to next-generation advanced telecommunications technologies for connecting IoT devices. 5G-IoT connectivity architecture.
2	PSS332	Image and Sound Processing in Telecommunications	3	The course provides in-depth knowledge of image and audio processing in telecommunications: image and audio analysis techniques and tools to assist in image processing.
3	DDD333	4G LTE and 5G mobile communications	3	The course provides knowledge about wireless information systems in telecommunications systems, Equips students with basic knowledge about 4G LTE mobile communication systems and 5G technology issues. The course exposes students to new technologies in next-generation telecommunications systems.
Total (Engineer)			151	

VICE RECTOR

Ph.D Do Dinh Cuong

HEAD OF ECT FACULTY

Ph.D Vu Chien Thang