

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



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

THAI NGUYEN - 2021

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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 566/QĐ-ĐHCNTT&TT dated on August 30th, 2021 by the Rector
of TNU - University of Information and Communication Technology*

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 in the training system.

The Electronics and Telecommunications Engineering Technology program is designed according to the CDIO approach to training students comprehensively in both professional knowledge, skills, and ethical qualities, with emphasis on practical competence and awareness of social responsibility, ensuring students have active learning and practical experience. After graduation, students can meet the need for knowledge and professional qualifications of employers and society.

The curriculum is designed on the basis of compliance with the regulations and guidelines of the Ministry of Education and Training, Thai Nguyen University of Information and Communication Technology, to match the development orientation of the information technology and software industry, human resource needs, local labor market, economic region, reference to national and international quality assurance standards. The curriculum is referenced and compared with the programs of others in the country and international universities.

2. General information

2.1. Program name:

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

2.2. Program code: 7510302.

2.3. Specialization: Electronics and Telecommunications Engineering Technology.

2.4. Program type: Full-time.

2.5. Diploma Name:

- Bachelor's degree in Electronics and Telecommunications Engineering Technology (4 years training system).
- Engineer's degree in Electronics and Telecommunications Engineering Technology (5 years training system).

2.6. Training and degree place:

University of Information and Communication Technology - Thai Nguyen University.

II. PROGRAM OBJECTIVES

The objectives of the training program in Electronics and Telecommunications Engineering Technology are 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 of the school

1.1. Vision

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

1.2. Mission

The university's mission is to train human resources at undergraduate 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. Training Objectives

2.1. General objective

Training bachelors/engineers in Electronics and Telecommunications Engineering Technology with comprehensive professional knowledge; mastering the principles and laws of nature and society; having integrated mindset methods, basic practical skills, working independently and creatively, and solving problems in the field of electronics and telecommunications.

2.2. Detail objective:

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

O1. Basic scientific knowledge, foundational and advanced knowledge in the field of electronics and telecommunications; Foreign language and computer skills that meet the requirements to work in an interdisciplinary, multicultural, multinational environment.

O2. Basic knowledge of electronic circuit theory, signals and systems, measurement sensors, and primary programming languages in engineering.

O3. Essential practical skills in electronic telecommunication equipment; Apply advanced technology solutions in the field of electronics and telecommunications.

O4. Skills to work independently and in teamwork; Effective communication skills through presentations, discussions, and modern tools.

O5. The ability to propose ideas, analyze and implement technical solutions in business and social contexts; ability to solve problems related to electronics and telecommunications.

O6.The ability to participate in the design and construction of technical systems/products/solutions in the field of electronics and telecommunications (target for engineers).

3. Program Learning Outcomes

| Notation PLO | | PLOs of ETET programme | Proficiency level |
|-----------------|-----------|---|----------------------|
| 1 | | Technical knowledge and reasoning | |
| 1.1 | L1 | <i>Apply general knowledge in social and natural science (such as political theory, mathematics, and physics) to solve problems in specialization, career, and daily life.</i> | 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, and 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 the responsibility for the cause of national defense and health training to ensure the assigned tasks. | 3 |
| 1.2 | L2 | <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> | 4 |
| 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 |
| 1.3 | L3 | Computer skills: Achieve 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) | 3 |
| 1.3.1 | | Have basic knowledge of information technology. | 2 |
| 1.3.2 | | <i>Have the ability to use a computer at a basic level.</i> | 3 |
| 1.3.3 | | Have the ability to use word processing software at a basic level. | 3 |
| 1.3.4 | | Have the ability to use Excel software at a basic level. | 3 |
| 1.3.5 | | Have the ability to use PowerPoint software at a basic level. | 3 |
| 1.3.6 | | Have the ability to use the Internet at a basic level. | 3 |
| 1.4 | L4 | <i>Apply basic knowledge of electronic circuits, signal processing, computers, and programming languages</i> | 3 |
| 1.4.1 | | Apply basic knowledge of electronic circuits and signal processing. | 3 |
| 1.4.2 | | Apply basic knowledge of computers and programming languages. | 3 |
| 1.5 | L5 | <i>Apply professional knowledge in the analysis and design of electronics and telecommunications systems</i> | 3 |
| 1.5.1 | | Apply professional knowledge in the analysis and design of applied electronic products. | 3 |

| Notation PLO | | PLOs of ETET programme | Proficiency level |
|-----------------|------------|---|----------------------|
| 1.5.2 | | Apply professional knowledge in the analysis and design of telecommunications systems. | 3 |
| 2 | | Skills, personal and professional qualities | |
| 2.1 | L6 | <i>Apply critical thinking to detect and solve problems in the field of electronics and telecommunications</i> | 4 |
| 2.1.1 | | Analysis of problems in the field of electronics and telecommunications. | 4 |
| 2.1.2 | | Synthesize professional knowledge and skills to solve problems in the field of electronics and telecommunications. | 4 |
| 2.2 | L7 | <i>Professional skills</i> | 3 |
| 2.2.1 | | Operate electronic and telecommunications equipment effectively. | 3 |
| 2.2.2 | | Apply technology solutions to solve problems in the field of Electronics and telecommunications. | 2 |
| 2.3 | L8 | <i>Have the ability to filter and discover knowledge</i> | 3 |
| 2.3.1 | | Filter information through collected documents. | 3 |
| 2.3.2 | | Apply knowledge in practice. | 3 |
| 2.4 | L9 | <i>Have the ability to work in enterprise and social contexts, well-perform social responsibility and professional ethics</i> | 3 |
| 2.4.1 | | Understand enterprise culture and professional ethics. | 2 |
| 2.4.2 | | Solve problems in business and social contexts. | 3 |
| 2.5 | L10 | <i>Understand contemporary issues and a sense of lifelong learning</i> | 2 |
| 2.5.1 | | Self-awareness and contemporary issues. | 2 |
| 2.5.2 | | Have a lifelong learning mindset. | 2 |
| 3 | | Communication and teamwork skills | |
| 3.1 | L11 | <i>Skills to work independently and in teamwork</i> | 3 |
| 3.1.1 | | Make individual plans and group plans to carry out tasks. | 3 |
| 3.1.2 | | Implement individual plans and group plans | 3 |
| 3.2 | L12 | <i>Have communication skills through writing, presentation, discussion, and effective use of modern tools</i> | 3 |
| 3.2.1 | | Communicate effectively in written form. | 3 |
| 3.2.2 | | Communicate effectively in electronic, graphical, and presentation forms. | 3 |
| 4 | | The ability to form ideas, implement and operate in business and social contexts | |
| 4.1 | L13 | <i>Forming ideas, establishing requirements, determining the content of tasks to be performed to solve technical problems in the field of electronics and telecommunications</i> | 4 |

| Notation PLO | | PLOs of ETET programme | Proficiency level |
|-----------------|------------|--|----------------------|
| 4.1.1 | | Analyze ideas related to problems to be solved in the field of Electronics and telecommunications. | 4 |
| 4.1.2 | | Analyze technical solutions to solve problems related to the field of electronics and telecommunications | 4 |
| 4.2 | L14 | <i>Deploy technical solutions in the field of Electronics and Telecommunications</i> | 4 |
| 4.2.1 | | Compare technical solutions in electronics and telecommunications systems. | 4 |
| 4.2.2 | | Synthesize technical solutions to deploy electronic and telecommunications systems. | 4 |
| 4.3 | L15 | <i>Ability to participate in designing and building technical systems/products/solutions in the field of Electronics and telecommunications to solve practical problems (for engineers)</i> | 5 |
| 4.3.1 | | Design systems, products, and technical solutions in the field of electronics and telecommunications. | 5 |
| 4.3.2 | | Complete systems, products, and technical solutions in the field of electronics and telecommunications. | 5 |

4. The volume of knowledge of the whole course:

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

5. Mass distribution of knowledge blocks

| Name | No. of credits | | |
|--|----------------|------------|----------|
| | Total | Obligatory | Elective |
| General curriculum | 32 | 32 | 0 |
| Political theory | | 11 | 11 |
| English | | 12 | 12 |
| Math and Natural courses | | 6 | 6 |
| Informatics | | 3 | 3 |
| Professional knowledge block | 88 | 79 | 9 |
| Interdisciplinary foundational | 30 | 30 | |
| Disciplinary foundational | 15 | 15 | |
| Specialized | 31 | 22 | 9 |
| Graduation internships | 5 | 5 | |
| Graduation project | 7 | 7 | |
| Additional knowledge for engineering degree | 30 | | |
| Intensive courses | 25 | | |
| Engineer Internship | 5 | | |
| Block of knowledge of physical | (None) | | |

| Name | No. of credits | | |
|--|----------------|------------|----------|
| | Total | Obligatory | Elective |
| education and defense education | | | |
| Physical Education 1 | | | |
| Physical Education 2 | | | |
| Defense Education | | | |
| Extracurricular | (None) | | |

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 (Regulated 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

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

8. Assessment scale

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

9. Career prospects

Job positions:

- Job position for bachelor's degree in electronics and telecommunications engineering technology program:

+ Technicians in deploying next generation telecommunications networks in enterprises operating in the field of Electronics and Telecommunications.

+ Embedded system programmer on smart mobile devices.

+ Technical managers at enterprises in the field of electronics and telecommunications.

+ Continue studying to the level of engineer or master related to the field of electronics and telecommunications.

- Job position for Engineer's degree in electronics and telecommunications engineering technology program:

+ Engineers in designing electronic circuits and telecommunications equipment in electronics and telecommunications businesses.

+ Lecturers, researchers working at universities and research institutes in the field of Electronics and telecommunications.

- + Technical managers at enterprises in the field of electronics and telecommunications.
- + Studying to higher levels such as masters and doctorates.

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 which the lecturers are focused on practical applicability and focus on students. The assessment method is carried out based on the requirements in the output standards of the training program of each module and according to the accreditation standards issued by the Ministry of Education and Training towards regional and international standards like AUN-QA.

11. Program Content (Name and volume of required courses)

| No. | Courses name | Number of Credits | Practice credits | Semester | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Course TQ/HT/SH (0)/(2)/(1) | Core Courses (*) |
|--|---------------------------------------|-------------------|------------------|----------|----|----|----|----|----|----|----|----|----|----|---|------------------|
| | | | | | 15 | 17 | 17 | 14 | 17 | 16 | 15 | 12 | 15 | 15 | | |
| General knowledge category (Total credits: 32 credits / 12 Course) | | | | | | | | | | | | | | | | |
| 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 | Scientific socialism | 2 | | 3 | | | 2 | | | | | | | | Marxist-Leninist political philosophy (2) | |
| 6 | Marxist-Leninist political philosophy | 2 | | 2 | | 2 | | | | | | | | | Marxist – Leninist Philosophy (2) | |
| 7 | History of Vietnamese Communist Party | 2 | | 4 | | | | 2 | | | | | | | Scientific socialism (2) | |
| 8 | Marxist – Leninist Philosophy | 3 | | 1 | 3 | | | | | | | | | | | |
| 9 | Ho Chi Minh's Ideology | 2 | | 5 | | | | | 2 | | | | | | History of Vietnamese Communist Party (2) | |
| 10 | General Informatics | 3 | 1 | 1 | 3 | | | | | | | | | | | |
| 11 | Physics | 2 | | 1 | 2 | | | | | | | | | | | |
| 12 | Advanced Mathematics | 4 | | 1 | 4 | | | | | | | | | | | |
| Interdisciplinary foundational knowledge category (Total credits: 30 credits / 10 Course) | | | | | | | | | | | | | | | | |
| 13 | Analog | 3 | 1 | 2 | | 3 | | | | | | | | | Physics (2) | |

| No. | Courses name | Number of Credits | Practice credits | Semester | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Course TQ/HT/SH (0)/(2)/(1) | Core Courses (*) |
|--|--|-------------------|------------------|----------|----|----|----|----|----|----|----|----|----|----|---|------------------|
| | | | | | 15 | 17 | 17 | 14 | 17 | 16 | 15 | 12 | 15 | 15 | | |
| | Electronic Engineering | | | | | | | | | | | | | | | |
| 14 | Digital Electronic Engineering | 3 | 1 | 3 | | | 3 | | | | | | | | Analog Electronic Engineering (2) | * |
| 15 | Microprocessor and Microcontroller Engineering | 3 | 1 | 4 | | | | 3 | | | | | | | C programming in engineering (2) Digital Electronic Engineering (2) | * |
| 16 | C programming in engineering | 3 | 1 | 2 | | 3 | | | | | | | | | General Informatics (2) Advanced Mathematics (2) | * |
| 17 | Data Communications | 3 | | 4 | | | | 3 | | | | | | | Computer architecture and operating system (2) | |
| 18 | Measuring and sensing engineering | 3 | 1 | 3 | | | 3 | | | | | | | | Analog Electronic Engineering (2) Digital Electronic Engineering (1) | |
| 19 | Data structures and algorithms | 3 | 1 | 3 | | | 3 | | | | | | | | Advanced Mathematics (2) | |
| 20 | Computer architecture and operating system | 3 | | 2 | | 3 | | | | | | | | | General Informatics (2) | |
| 21 | Digital signal processing | 3 | 1 | 4 | | | | 3 | | | | | | | Advanced Mathematics (2) Matlab and its application in engineering (2) | |
| 22 | MATLAB and its application in engineering | 3 | 1 | 3 | | | 3 | | | | | | | | Advanced Mathematics (2) | |
| Disciplinary foundational knowledge category (Total credits: 15 credits / 5 Course) | | | | | | | | | | | | | | | | |
| 23 | Antennas and Wave propagation | 3 | | 5 | | | | | 3 | | | | | | Analog Electronic Engineering (2) | * |
| 24 | Communication and Pairing Programming | 3 | 1 | 5 | | | | | 3 | | | | | | Microprocessor and Microcontroller Engineering (2) | |
| 25 | Digital communications | 3 | 1 | 5 | | | | | 3 | | | | | | Digital signal processing (2) Data Communications | * |

| No. | Courses name | Number of Credits | Practice credits | Semester | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Course TQ/HT/SH (0)/(2)/(1) | Core Courses (*) |
|--|-----------------------------------|-------------------|------------------|----------|----|----|----|----|----|----|----|----|----|----|--|------------------|
| | | | | | 15 | 17 | 17 | 14 | 17 | 16 | 15 | 12 | 15 | 15 | | |
| | | | | | | | | | | | | | | | (2) | |
| 26 | Wireless Communications | 3 | | 6 | | | | | | 3 | | | | | Antennas and Wave propagation (2) | |
| 27 | Embedded programming techniques | 3 | 1 | 5 | | | | | 3 | | | | | | Microprocessor and Microcontroller Engineering (2) | |
| Specialized knowledge category (Total credits: 31 credits / 10 Course. Of which: 22 credits/7 Course; Elective: 9 credits/3 Course) | | | | | | | | | | | | | | | | |
| 28 | Transmission Engineering | 3 | | 5 | | | | | 3 | | | | | | Data Communications(2) | |
| 29 | Mobile Communications | 3 | | 6 | | | | | | 3 | | | | | Digital communications(2) | |
| 30 | Switching and Exchange Technology | 3 | 1 | 6 | | | | | | 3 | | | | | Transmission Engineering (2) | |
| 31 | FPGA Design | 3 | 1 | 6 | | | | | | 3 | | | | | Microprocessor and Microcontroller Engineering (2) Digital signal processing (2) | |
| 32 | Elective course 1 | 3 | 1 | 7 | | | | | | | 3 | | | | | |
| 33 | Elective course 2 | 3 | | 7 | | | | | | | 3 | | | | | |
| 34 | Elective course 3 | 3 | 3 | 7 | | | | | | | 3 | | | | | |
| 35 | Sensor networks and applications | 3 | | 6 | | | | | | 3 | | | | | Data Communications (2) Microprocessor and Microcontroller Engineering (2) Measuring and sensing engineering (2) | |
| 36 | Internet of Things | 3 | | 7 | | | | | | | 3 | | | | Data Communications (2) | |
| 37 | Specialized Internship | 4 | | 7 | | | | | | | 4 | | | | Wireless Communications (2) Switching and Exchange Technology (2) Mobile | |

| No. | Courses name | Number of Credits | Practice credits | Semester | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Course TQ/HT/SH (0)/(2)/(1) | Core Courses (*) |
|---|--|-------------------|------------------|----------|----|----|----|----|----|----|----|----|----|----|--|------------------|
| | | | | | 15 | 17 | 17 | 14 | 17 | 16 | 15 | 12 | 15 | 15 | | |
| | | | | | | | | | | | | | | | Communications (2) FPGA Design (2) Sensor networks and applications (2) | |
| List of electives course (9 credits) | | | | | | | | | | | | | | | | |
| | Elective course 1 | | | | | | | | | | | | | | | |
| 38 | Embedded operating system | 3 | 1 | | | | | | | | | | | | Embedded programming techniques (2) | |
| 39 | Programming controls on mobile devices | 3 | 1 | | | | | | | | | | | | Embedded programming techniques (2) | |
| 40 | Algorithm Application | 3 | 1 | | | | | | | | | | | | Data structures and algorithms (2) | |
| | Elective course 2 | | | | | | | | | | | | | | | |
| 41 | Information Encryption Technique | 3 | | | | | | | | | | | | | Wireless Communications (2) | |
| 42 | Multimedia communication system | 3 | | | | | | | | | | | | | Mobile Communications (2) | |
| | Elective course 3 | | | | | | | | | | | | | | | |
| 43 | Internet-of-Things and Embedded System Practice | 3 | 3 | | | | | | | | | | | | Embedded programming techniques (2) Communication and Pairing Programming (2) | |
| 44 | Practice simulation of digital information systems | 3 | 3 | | | | | | | | | | | | MATLAB and its application in engineering (2) | |
| Internships, Graduation thesis (12 credits) | | | | | | | | | | | | | | | | |
| 45 | Graduation internships | 5 | | 8 | | | | | | | | 5 | | | | |
| 46 | Graduation thesis | 7 | | 8 | | | | | | | | 7 | | | Graduation internships (0) | |
| List of courses to replace the Graduation thesis (7 credits) | | | | | | | | | | | | | | | | |
| 47 | Antenna Design | 4 | 2 | | | | | | | | | | | | Antennas and Wave propagation (2) | |

| No. | Courses name | Number of Credits | Practice credits | Semester | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Course TQ/HT/SH (0)/(2)/(1) | Core Courses (*) |
|---|---|-------------------|------------------|----------|----|----|----|----|----|----|----|----|----|----|--|------------------|
| | | | | | 15 | 17 | 17 | 14 | 17 | 16 | 15 | 12 | 15 | 15 | | |
| 48 | Advanced Microcontroller System | 3 | 1 | | | | | | | | | | | | Microprocessor and Microcontroller Engineering (2) | |
| Total accumulated credits for bachelor's training program | | | | | | | | | | | | | | | | 120 |
| List of Engineering Degree Courses (30 credits) | | | | | | | | | | | | | | | | |
| 49 | Embedded Software Project | 5 | 2 | 9 | | | | | | | | | 5 | | Graduation thesis (2) | |
| 50 | Mobile network design and optimization | 5 | 2 | 9 | | | | | | | | | 5 | | Graduation thesis (2) | |
| 51 | Design and optimize transmission network | 5 | 2 | 9 | | | | | | | | | 5 | | Graduation thesis (2) | |
| 52 | IoT project design | 5 | 2 | 10 | | | | | | | | | 5 | | Graduation thesis (2) | |
| 53 | Skills in electronics and telecommunications businesses | 5 | | 10 | | | | | | | | | 5 | | Graduation thesis (2) | |
| 54 | Engineer Internship | 5 | | 10 | | | | | | | | | 5 | | Graduation thesis (2) | |
| Total accumulated credits of the Engineer training program | | | | | | | | | | | | | | | | 150 |

Note:

- TQ(0) = Prerequisite; SH(1)= Parallel ; HT(2) = Learn first.
- Physical Education module 1 is placed in term 1, and Physical Education 2 is placed in semester 2.
- Course of National Defense - Security Education according to the schedule of Thai Nguyen University.

12. Course abstract

| No. | Course code | Courses | Number of credits | Description |
|-----------------------------|-------------|-----------|-------------------|--|
| 1. General knowledge | | | | |
| 1 | ENG131 | English 1 | 3 | The module equips students with basic grammar knowledge such as how to use the verb to be, singular and plural nouns, adverbs of frequency, simple present tense, and provides related |

| No. | Course code | Courses | Number of credits | Description |
|-----|-------------|-------------------|-------------------|---|
| | | | | vocabulary. to topics such as personal information, family, everyday objects, colors, how to tell the time, free time, etc. In addition, students are trained to evenly develop four skills: listening, speaking, reading, and writing, especially basic communication skills. At the same time, asymptotically the standard test format B1 |
| 2 | ENG132 | English 2 | 3 | The module equips students with basic grammar knowledge such as countable nouns, uncountable nouns, simple past tense, present continuous tense, comparative levels of adjectives, and equipped with the word system. Vocabulary related to Food, Money, Journeys, and Appearance topics. In addition, students are trained to evenly develop the four skills of listening, speaking, reading, and writing and at the same time approaching the standard test format B1 output. |
| 3 | ENG136 | English 3 | 3 | The module equips students with basic grammar knowledge such as how to use the 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 become familiar with and competently approach diverse communication situations and evenly develop intermediate-level listening, speaking, reading, and writing skills. Besides, students have access to exercise formats according to the standard test format of foreign language ability equivalent to level 3. |
| 4 | ENG135 | English 4 | 3 | The course equips with grammar knowledge at A2+ level and approaching B1 level (Level 3) such as conditional sentences of type 1, past continuous, passive sentences.... At the same time, it provides a vocabulary system related to the topics of means of transport, health, tourism, and technology... Besides, the subject continues to help students familiarize themselves with and approach competently with other topics. diverse communication situations and uniform development of skills in listening, speaking, reading, and writing at the pre-intermediate level (B1). In addition, students are reviewed with exercise formats according to the standard test format of foreign language ability equivalent to level 3 (B1). |
| 5 | 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 |

| No. | Course code | Courses | Number of credits | Description |
|-----|-------------|---|-------------------|--|
| | | | | Party and management of the State. |
| 6 | MPE121 | Marxist-Leninist political economy | 2 | Marxist-Leninist political economy is 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 |
| 7 | 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. |
| 8 | 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. |
| 9 | HCM121 | Ho Chi Minh Thought | 2 | The module helps students understand the basic knowledge about the origin, process of formation and development of Ho Chi Minh thought; the basic contents of Ho Chi Minh's thought on the basic issues of the Vietnamese revolution in the people's democratic national revolution and in the socialist revolution. Thereby fostering, consolidating and strengthening the ideals, beliefs and determination to make efforts to contribute to the construction and defense of the Fatherland for students. |
| 10 | GIS131 | General Informatics | 3 | The General Informatics module equips students with basic knowledge about computers and the Internet, hardware and software, understanding the |

| No. | Course code | Courses | Number of credits | Description |
|-----|-------------|---------------|-------------------|---|
| | | | | basic operation of the Windows operating system, shopping for computers, confident safe and effective computer programming and exploitation. After completing this subject, learners can use computers proficiently in tasks such as drafting documents, using electronic spreadsheets, presentation software, and using the Internet. presentation tools, exploitation and use of other application software. Through this very basic knowledge, students can self-study and apply this knowledge to each specific job later. |
| 11 | PHY121 | Physics | 2 | The course consists of two main parts: Electricity and Magnetism. The General Physics module provides basic knowledge about: Currents, Ohm's law with electric circuits, magnetic fields caused by constant currents, electromagnetic induction phenomena, electromagnetic fields and electromagnetic materials. These are the basic knowledge of physics, helping students to continue studying the modules in the basic and specialized fields. |
| 12 | MAT140 | Advanced math | 4 | The module 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, serving as the foundation for students to continue studying in the basic and specialized courses. |

2. Interdisciplinary foundational knowledge

| | | | | |
|----|--------|--------------------------------|---|---|
| 13 | AET231 | Analog Electronic Engineering | 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. |
| 14 | TDS231 | Digital Electronic Engineering | 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. |

| No. | Course code | Courses | Number of credits | Description |
|-----|-------------|--|-------------------|--|
| 15 | MPT331 | Microprocessor and Microcontroller Engineering | 3 | The course provides students with knowledge about Microprocessors and microprocessor systems, Data input and output organization in microprocessors, Interrupts and interrupt handling, Some advanced microcontroller families, Technology programming techniques with the 8051 families of microcontrollers, the PIC16F877A microcontroller. From the above knowledge, students have the skills to build practical electronic products. |
| 16 | PGC233 | C programming in Engineering | 3 | The course provides students with basic knowledge of programming, C programming language, and the application of C programming language in the fields of electronics and communication. Thereby, students are able to solve basic computer and electronic problems using the C programming language, and students also have basic knowledge about programming in embedded systems, programming with microcontrollers and microprocessors. |
| 17 | TDT231 | Data Communications | 3 | The course equips students with basic knowledge including: Communication networks, data transmission techniques, data encryption, connection interfaces, and data link control techniques, helping students understand basic and intensive knowledge about data transmission networks, data transmission network models, and network equipment. |
| 18 | EME231 | Measuring and sensing engineering | 3 | The course equips students with knowledge about measurement concepts in general and electrical measurement in particular, understand the principle of structure and operation of various types of indicator mechanisms, know the structure of meters' electrical quantity, know the methods of measuring electrical quantities such as current, voltage, resistance, capacitance, inductance, frequency, phase angle, types of power, electricity, know how to analyze and evaluate measurement errors, understand the principle and operation of electrical measurement systems in the industry. In addition, students gain knowledge about sensors, specifically delving into sensors: optical, thermal, displacement, velocity, acceleration, force sensor, volumetric flow, and applications of these sensors in the industry. |

| No. | Course code | Courses | Number of credits | Description |
|---|-------------|--|-------------------|--|
| 19 | DAS231 | Data Structures and Algorithms | 3 | Equip students with an overview of an intensive 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. |
| 20 | COM331 | Computer Architecture and operating system | 3 | The course covers the most basic knowledge of computer architecture and an understanding of the roles and activities of computer components. Students learn and practice the skills of installing and configuring basic Windows features while 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 implementation. Basic programming in the bash shell. |
| 21 | DSP231 | Digital Signal Processing | 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. |
| 22 | MBE332 | MATLAB and its application in engineering | 3 | The course helps students with the ability to analyze and model dynamic systems in control systems; Use system modeling languages; System design and testing; Process simulation. Help students know how to use MATLAB tools in designing and building a control system: from analyzing problems, choosing control methods, modeling the system, and building simulation models. Proficient in the use of simulation languages. Analyze and design automatic control electric drive systems and, test the system, calibrate the system to build a complete system. |
| 3. Disciplinary foundational knowledge | | | | |
| 23 | APT231 | Antennas and Wave | 3 | Equip students with basic knowledge about |

| No. | Course code | Courses | Number of credits | Description |
|---------------------------------|-------------|---------------------------------------|-------------------|--|
| | | Propagation | | antennas, specifically: principles of radio transmission; antenna structure and operation direction; antenna classification; Smart antenna techniques, and applications in telecommunications systems. |
| 24 | LTG331 | Communication and Pairing Programming | 3 | The course introduces the general issues of communication systems such as related concepts, communication protocols such as H323, SIP, and real-time communication protocols. In addition, students are introduced to communication standards paired with hardware. Students will gain knowledge of the object-oriented programming language java: basic concepts, data structures, control structures, basic objects like Thread/Stream, etc. Students know how to build a basic java program, used to build communication applications under the main socket mechanism to perform client - server communication model and use java to implement programming to control devices from remote through communication such as RS232 communication, COM port, USB, Bluetooth, wireless, etc. |
| 25 | 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. |
| 26 | VTP532 | Wireless Communications | 3 | The course provides students with an overview of radio communication, radio channel models, multipath diversity transmission phenomenon, the Doppler effect, the fading phenomenon in frequency and time domain, physical layer architecture, multiple access control layer, radio resource issues, design problems of radio communication systems, wireless energy collection, and typical radio network applications. |
| 27 | EPT331 | Embedded programming techniques | 3 | The course helps students understand the architecture and general characteristics of the STM32 family of microcontrollers and gain programming skills with the peripheral interfaces on the STM32 board. The Advanced Embedded Programming Technique module equips students with knowledge and skills to contribute to achieving relevant output standards of the training program. |
| 4. Specialized knowledge | | | | |
| 28 | TTM331 | Transmission Engineering | 3 | The course equips students with basic concepts, system diagrams, digital transmission principles, signal digitization, baseband signal processing, digital multiplexing techniques, and copper and |

| No. | Course code | Courses | Number of credits | Description |
|-----|-------------|-----------------------------------|-------------------|--|
| | | | | optical cable transmission network systems. |
| 29 | MOC331 | Mobile Communications | 3 | The course provides students with basic knowledge about mobile communication systems in the world deployed in Vietnam. Through the course, students are equipped with knowledge about the basic design of cellular communication systems, knowledge of GSM mobile communication systems, understanding of orthogonal codes and spread spectrum techniques, knowledge of architecture and characteristics of mobile communication systems that have been deployed in practice - 3G, 4G, 5G networks. Thereby, students gain the background knowledge to study more specialized subjects such as Mobile Network Design and Optimization, helping students achieve skills and ability to work at businesses in mobile communication after graduation. |
| 30 | 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. |
| 31 | ADF331 | FPGA Design | 3 | The course equips students with knowledge about programmable logic components, programming technology, general FPGA structure, Xilinx FPGA structure, VHDL hardware description language, FPGA design process using ISE, and some design examples of FPGA using ISE. At the end of the course, students can analyze and design applied problems with FPGA. |
| 32 | SNA231 | Sensor Networks and Applications | 3 | The course equips students with basic knowledge about IEEE 802.15.4 communication standard for wireless sensor networks, the hardware structure of a network node, the operating system for wireless sensor networks, how to write a Contiki OS-based software program for a sensor node, MAC layer protocols, and energy-efficient routing protocols for wireless sensor networks. |
| 33 | IOF333 | Internet of Things | 3 | The course provides an overview of the Internet of Things (IoT), IPv6 for IoT, IPv6 routing protocol for IoT, application layer protocol for IoT, and programming with IoT. In the overview, students are equipped with basic concepts, component technologies, communication technologies, and application models of IoT. Some knowledge about IPv6 address representation, IPv6 headers, IPv6 address autoconfiguration protocol, and 6LoWPAN protocol is presented in the next chapter. Students are also equipped with knowledge about IPv6 routing protocol, MQTT application layer protocols, and CoAP for IoT. Finally, students are |

| No. | Course code | Courses | Number of credits | Description |
|------------------------------------|---------------------------|--|-------------------|--|
| | | | | taught practical programming with hardware and communication protocols for IoT. |
| 34 | SPP441 | Specialized Internship | 4 | The course synthesizes and provides students with a way to synthesize the knowledge they have learned in the knowledge courses from the training program, from which they can apply it to study specific subjects. |
| 5. Elective courses/modules | | | | |
| 35 | <i>Elective courses 1</i> | | | |
| | EOS331 | Embedded operating system | 3 | The course provides basic knowledge of embedded operating systems on Linux. Students understand the basic concepts, construction tools, and development environment for an embedded operating system. The course shows the steps to program the communication on GPIO ports and the steps to build a driver for the device. |
| | POM332 | Programming controls on mobile devices | 3 | The course provides knowledge about operating principles, operating system architecture, specific characteristics of operating systems running on power-constrained devices, and the ability to customize the operating system to suit different operating systems. Mobile devices; Basic knowledge of software programming on mobile devices. Apply knowledge to design software programs and hardware products for mobile devices. |
| | APA331 | Algorithm Application | 3 | The course provides basic knowledge of algorithms, equips you with programming skills, and enhances practical skills in solving problems using programming languages. The course focuses on developing the ability to analyze, design, implement, and optimize algorithms. |
| 36 | <i>Elective courses 2</i> | | | |
| | TIC432 | Information encryption technique | 3 | The course provides students with basic knowledge of coding techniques: channel coding uses error detection and correction when transmitting over wired and wireless channels such as block encoders, convolutional codes, etc.; Data compression code; Encrypting data security, etc. helps students gain skills and knowledge to be able to work at enterprises in the field of mobile communications after graduation. |
| | CSD332 | Multimedia communication 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 protocol in multimedia communications, and wireless multimedia systems, multimedia IoT. In addition, the course also equips students with skills to read and understand the extensive knowledge of the multimedia module and to be |

| No. | Course code | Courses | Number of credits | Description |
|---|---------------------------|--|-------------------|--|
| | | | | able to analyze, design, and build programs and modules in multimedia communication. |
| 37 | Elective courses 3 | | | |
| | TTI231 | Internet of Things and Embedded System Practice | 3 | The course provides knowledge on the theory and practice of embedded systems related to the Internet of Things of Man & Tel company in Korea, including: IoT experimental device based on Raspberry Pi 3.0 including three sets: Embedded IoT - Training System/ IoT-1000; Embedded IoT - Training System/ GT- IoT900; AI (Artificial Intelligence) Training System/ GT-19; PLC with IoT training system/ PLC 2000 and Embedded Router/ Router310. |
| | THH231 | Practice simulation of digital information systems | 3 | The course equips students with knowledge about designing and building digital information systems through computer simulation. Help students use MATLAB software proficiently to simulate, design, and evaluate digital information systems, including components such as coding, modulation, and transmission channels. It also helps students improve their skills in analyzing and modeling digital information systems. |
| 6. Internship/Graduation Thesis | | | | |
| 38 | GRP451 | 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. |
| 39 | GRA975 | Graduation Thesis | 7 | 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. |
| 7. Alternative Course to replace Graduation Thesis | | | | |
| 40 | | Antenna Design | | The course equips and helps students to use HFSS antenna design software fluently. From there, students understand and consolidate basic knowledge of electromagnetic wave propagation, antenna theory and techniques, structure, and operating principles of some basic antennas applied in telecommunications and wireless communications. |
| 41 | | Advanced Microcontroller System | | The course equips students with knowledge of advanced ARM microcontroller systems and how to program several applications with the advanced |

| No. | Course code | Courses | Number of credits | Description |
|--|-------------|---|-------------------|---|
| | | | | microcontrollers FRDM-KL46Z of NXP, MSP430 and Tiva C of Texas Instruments. From there, students have the skills to build practical electronic products. |
| 8. List of courses for Engineering Degree | | | | |
| 42 | DAP251 | Embedded software project | 5 | The course provides students with basic knowledge about surveying, analyzing, designing, building, and testing software projects for embedded systems. It also offers state-of-the-art tools and methods used in the project development phases. During the learning process, students will be trained in skills to be able to complete an embedded software project and issues to be concerned about when building software in embedded systems. |
| 43 | TKT251 | Mobile network design and optimization | 5 | The course helps students and engineers in electronics and telecommunications to grasp the knowledge and process of designing and optimizing mobile networks, especially network optimization solutions, mobile network quality indicators (KPIs), coverage optimization, and mobile network optimization tools. In addition, the course also equips students with skills in mobile network design and the ability to analyze and evaluate the parameters of mobile network optimization, radio frequency optimization, coverage area, etc., and capacity for a mobile network. |
| 44 | TKA251 | Design and optimize transmission network | 5 | Provide students with knowledge, skills, and ways to classify transmission networks through cables and radio transmission environments and understand the basic principles of DWDM, and FTTH multiplexing systems to implement optimal performance, investment cost, and use efficiency. After completing this course, learners can use Optisystem software proficiently to design and optimize optical transmission lines. |
| 45 | IOT251 | IoT project design | 5 | The course provides students with basic knowledge about the IOT system, and the protocols used in the IOT system. Developing IoT projects such as intelligent agricultural systems, and smart transportation. Remote monitoring projects via the internet, etc. |
| 46 | KND251 | Skills in electronics and telecommunications businesses | 5 | Provide students with knowledge according to the actual recruitment requirements of electronics and telecommunications enterprises in each development stage of the economy, science, and society. |
| 47 | TKS251 | Engineer Internship | 5 | Synthesize knowledge and skills to solve electronics and telecommunications projects effectively |
| Total | | | 150 | |

13. Facilities for training

13.1. Workshops, laboratories, and important laboratory equipment systems

- Analog and digital electronics lab
- Microprocessor and Application Engineering Laboratory
- Advanced Embedded Systems Lab
- Embedded Measurement and Control Laboratory
- Practice room for embedded systems and IOT
- Computer room

13.2. Libraries, Websites

- Library of the University of Information and Communication Technology
- List of websites (see detailed outline set)

14. Instructions for implementing the program

14.1 The training program is implemented according to the university training regulations of the regular system of the current credit system of the Ministry of Education and Training and of the University of Information and Communication Technology, Thai Nguyen University.

Scheduled hours are as follows:

- 1 Credit = 15 periods of theory teaching or class discussion
- =30 hours of experimentation or practice
- = 45 hours of self-study
- = 45 - 90 hours of internship at the facility.
- = 45 - 60 hours of project implementation, graduation thesis. Course hours are multiples of 15.

14.2 The foreign language output standards are decided by the School's Science and Training Council. During the study period, the School will control the development of students' foreign language proficiency over each academic year to decide the number of credits of subjects in the semester that students are allowed to register. Students can study on their own or register for a foreign language development program according to the University's project.

VICE RECTOR



Ph.D Do Dinh Cuong

HEAD OF ECT FACULTY



Ph.D Vu Chien Thang

