MINISTRY OF EDUCATION AND TRAINING
THAI NGUYEN UNIVERSITY
THAI NGUYEN UNIVERSITY OF TECHNOLOGY

UNDERGRADUATE ADVANCED PROGRAM

ELECTRICAL ENGINEERING

BASED ON THE CURRICULUM FROM THE OKLAHOMA STATE UNIVERSITY, USA

THAI NGUYEN 2020

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UNDERGRADUATE ADVANCED PROGRAM

ELECTRICAL ENGINEERING

This advanced electrical engineering undergraduate programme has been approved and accepted by University's Science and Education Council

SCIENCE AND EDUCATION COUNCIL CHAIR

RECTOR

Assoc. Prof. Dr. Nguyễn Duy Cương

THAI NGUYEN 2020

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ADVANCED ELECTRICAL ENGINEERING UNDERGRADUATE PROGRAMME

PART I GENERAL INFORMATION

I. GENERAL INFORMATION ABOUT PROGRAMME

1. Training Program: Advanced Program in Electrical engineering

2. Training level: Undergraduate

3. Training duration: 5 years.

4. Training form: Full time - Taught in English

5. Diploma: Engineer in Electrical Engineering

II. LEARNING OUTCOMES AND TRAINING PROGRAM

2.1. Educational objectives:

The Advanced Program in Electrical Engineering provides students with general education knowledge, technical specialization, basic practice skills, can be able detect and solve Electrical Engineering problems.

2.1.1 The knowledge

- Equipped Marxist – Leninist knowledge, social sciences – humanities, physical educa- tion and national defence education (For Vietnamese students only).

- The basic knowledge of mathematics, natural science to study the concentration courses and developing study in higher educational level.

- Fluency in software as CAD/CAM/CNC, work with C, C++, Matlab, etc...

- Analysing the circuit, electronic circuits in the industry, the problem of power trans- mission, electric equipment, power supply systems, Program control.

- Knowledge on development, documentation and presentation of projects is part of the program.

2.1.2 Skills

- To design power devide system for industrial and residential areas, workshops, fac- tories, residential and industrial lighting systems, protect thunderbolt systems, security systems and general electrical safety.

- To operate automatic control systems, services and public systems as PLCs, micro- processors, mini SCADA...

- To maintain, repair the install electrical circuits – electronics, industrial machinery in electrical engineering.

- Having basic skill in listening, speaking, reading and writing English. Have the ability to work in groups and work independently.

2.1.3 Attitude

To produce graduates equipped with virtuous characters, imbued with love and loyalty to the Socialist Republic of Vietnam, being healthy and committed to the responsibility of working for the industrialization and modernization of Vietnam.

2.1.4 Job Opportunities

- Opportunities work in technical departments, room design, mechanical and electrical rooms and other consulting companies, design and construction of electricity; the training institutions, research institutes and technology transfer in the fields of electrical engineering.

- Continuing study subjects at the postgraduate level (Master, PhD).

2.2. Program Learning Outcomes - PLO

Table 1. Learning outcomes of the programme

Symbol	Program Outcomes
PLO-01	**Technology knowledge**: An ability to apply knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex engineering problems.
PLO-02	**Problem analysis**: An ability to identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PLO-03	**Investigation**: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data and synthesis of information to derive valid conclusions.
PLO-04	**Design/Development of solution**: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

PLO-05	**Modern tool usage**: An ability to create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
PLO-06	**The engineer and society**: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.
PLO-07	**Environment and Sustainability**: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PLO-08	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PLO-09	**Individual and team work**: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.
PLO-10	**Communication**: An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PLO-11	**Project management**: Ability to demonstrate management skills and apply engineering principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.
PLO-12	**Life-long learning**: An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments.

2.3. Program Duration

Duration of training: 5 years.

2.4. Required Total Credits

Total credit hours for the program: 153 credits, exclusive of Physical education, Military education and English enhance- ment in the first year.

2.5. Enrollment

Individuals who meet the following requirements can be admitted to this program:

Passed the entry examination in group A00, A01, D01, D07 to Thai Nguyen

University or other university and attain benchmark meet the requirements of the advanced program.

2.6. Educational process and graduation requirements

2.6.1. Educational process

Students will study in English, in the best learning and teaching environment of TNUT. The curriculum and syllabus are based on the Electrical Engineering (ME) undergraduate program of the Oklahoma State University (OSU), which is accredited ABET. Compulsory subjects are added as the rule of MOET. The educational process is designed in accordance with the credit-based system, following the follow chart from OSU.

2.6.2. Graduation requirements

- Students who complete greater than or equal to 150 credits in the Electrical Engineer- ing Program with a GPA of 2.0 or higher in their engineering courses are awarded the BSc degree. This fact is noted in the graduation program and on the graduate transcript.

- In additions, students must have TOEFL-ITP certificate $\geq$ 500 or equivalent one.

2.7. Grading System

The 4-scale grading system, which is currently used in TNUT as well as Oklahoma will be applied. The system uses either letters or numbers to mark the scores, as shown below.

Granding system	Granding system 4	Granding system 10
A	4	8,50 - 10,00
B	3	7,00 - 8,49
C	2	5,50 - 6,99
D	1	4,00 - 5,49
F	0	< 4,00

2.8. Curriculum

2.8.1. Curriculum structure

Course modules			(No. Credits)
Compulsory courses (153 credits)	11	General Education, Math and basic Science	57 (56)
	22	Basic core courses	50
	33	Concentration courses	46
Total			153 (152)

2.8.2. List of courses

A - General education block

No.	Code	Subject	Acc credits	Credits
1	MLV101	Philosophy of Marxism and Leninism	3	3
2	TCV101	Physical strength education 1	0	1
3	GMA001	Engineering principles	3	3
4	ENG104	English for academic purposes	4	4
5	PHY001	Physics 1	4	4
6	MAT001	Introductory linear algebra	3	3
7	MAT002	Calculus 1	4	4
8	MAE001	Statics	3	3
9	PHY002	Physics 2	3	3
10	PHY003	Physics laboratory	1	1
11	CHE001	General Chemistry	4	4
12	MAT003	Calculus 2	4	4
13	ENG106	English for engineering	3	3
14	MLV102	Political economics of Marxism and Leninism	0	1
15	TCV102	Physical Strength Education 2	3	3

16	MAT004	Calculus 3	4	4
17	GMA005	The Evolution of Earth and Solar system	4	4
18	TCV103	Physical strength education 3	3	3
19	MAT005	Differential Equations	4	4
20	MLV103	History of Vietnamese communist party	3	3
21	MLV004	Ho Chi Minh's ideology	3	3
22	MLV005	Scientific socialism	1	1
23	GMA007	Principles of communication. *For foreign students only*	4	4
24	GMA002	Introduction to engineering drawing and CAD *For foreign students only*	4	4
25	GMA004	Introduction to MAE Practice *For foreign students only*		
Total			**57(56)**	**60(59)**

B – Basic core courses

No.	Code	Subject	Acc credits	Credits
1	GEE001	Electrical Sciences	3	3
2	GEE011	Energy Conversion	3	3
3	EE0002	Microcomputer principles and applications	3	3
4	GEE003	Electromagnetic fields	3	3
5	GEE004	Experimental methods 1	1	1
6	EE0003	Solid state electronic devices	3	3
7	EE0004	Electronic devices and applications 2	4	4
8	EE0005	Linear electronics circuit design	3	3
9	EE0006	Digital logic design	3	3
10	GEE005	Experimental methods 2	1	1

No.	Code	Subject	Acc credits	Credits
11	EE0017	Introduction to Digital Signal Processing	3	3
12	EE0107	Network analysis	3	3
13	EE0108	Signal analysis	4	4
14	EE0009	Senior Design 1	3	3
15	EE0011	Engineering optics (Elective)	3	3
	MAE014	Instrumentation and computer (Elective)	3	3
16	GEE006	Experimental methods 3	1	1
17	EE0001	Electronic devices and applications 1	3	3
18	GEE002	Engineering economy	3	3
Total			**50**	**50**

C – Professional education

No.	Code	Subject	Acc credits	Credits
1	EE0012	Power electronics	3	3
2	EE0013	Communication electronics	3	3
3	EE0014	Digital electronics circuit design	3	3
4	EE0015	Power system analysis and design	3	3
5	EE0016	Senior design 2	3	3
6	EE0018	Microwave engineering	3	3
	GMA006	Higher level language	3	3
7	GEE007	Random signals and noise	3	3
8	GEE010	Introduction to biomedical engineering modeling and systems (Elective)	3	3
	EE0020	Control systems (Elective)	3	3
9	EE0010	Systems analysis	4	4
10	GEE008	Communication theory	3	3

No.	Code	Subject		Credits	Note
11	GEE009	Data communications	3	3	
12	TTV003	Internship in industry	6	6	
13	EE0019	Final design project	6	6	
		Total	**46**	**46**	

2.9. Curriculum Structure

No.	Code	Subject	Acc credits	Credits	Note
1st semester (16 weeks + 1 week for exams)					
1	GEN101	Integrated skills - Elementary	0	9	FIT
2	GEN102	Learner training 1	0	7	FIT
3	GEN103	Listening skill 1	0	4	FIT
4	GEN104	Reading skill 1	0	4	FIT
		Total	0	24	
2nd Semester (16 weeks + 1 weeks for exams)					
1	GEN201	Speaking skill	0	3	FIT
2	GEN202	Learner training 2	0	7	FIT
3	GEN203	Listening skill 2	0	7	FIT
4	GEN204	Reading skill 2	0	7	FIT
		Total	0	24	
3rd Semester (16 weeks + 3 weeks for exams)					
1	GMA001	Engineering principles	3	3	FIT
2	ENG104	English for academic purposes	4	4	FIT
3	PHY001	Physics 1	4	4	FIT
4	TCV101	Physical strength education 1	0	1	FIT
5	GEE001	Electrical sciences	3	3	FIT
6	MAT001	Introductory linear algebra	3	3	FIT
7	MAT002	Calculus 1	4	4	FIT
		Total	21	22	
4th Semester (16 weeks + 3 weeks for exams)					
1	MAE001	Statics	3	3	FIT
2	PHY002	Physics 2	3	3	FIT
3	CHE001	General chemistry	4	4	FIT
4	EE0007	Network analysis	3	3	FIT

5	MAT003	Calculus 2	4	4	FIT
6	ENG106	English for engineering	3	3	FIT
7	TCV102	Physical strength education 2	0	1	FFS
8	PHY003	Physics laboratory	1	1	FIT
		Total	21	22	

Second year's summer semester

1	TCV004	National defense education	0	4 weeks	

5th Semester (16 weeks + 3 weeks for exams)

1	MAT004	Calculus 3	4	4	FIT
2	EE0001	Electronic devices and applications 1	3	3	FIT
3	GEE003	Electromagnetic fields	3	3	FIT
4	GEE004	Experimental methods 1	1	1	FIT
5	EE0003	Solid state electronic devices	3	3	FIT
6	TCV103	Physical strength education 3	0	1	FIT
7	MLV101	Philosophy of Marxism and Leninism *For Viet- namese students only.*	3	3	FIT
8	GMA007	(Principles of communication) *For foreign students only*	(3)	(3)	FIT
		Total	17 (17)	18 (18)	

6th Semester (16 weeks + 3 weeks for exams)

1	MAT005	Differential equations	3	3	FIT
2	EE0004	Electronic devices and applications 2	4	4	FIT
3	EE0008	Signal analysis	4	4	FIT
4	EE0006	Digital logic design	3	3	FIT
5	GEE005	Experimental methods 2	1	1	FIT
6	GEE011	Energy conversion	3	3	FIT
7	MLV102	Political economics of Marxism and Leninism *For Vietnamese students only.*	2	2	DPT
		Total	20 (18)	20 (18)	

Third year's summer semester

1	TTV002	Workshop	0	2 weeks (80 hours)	

7th Semester (16 weeks + 3 weeks for exams)

1	EE0017	Introduction to Digital Signal Processing	3	3	FIT

2	GEE007	Random signals and noise	3	3	FIT
3	EE0009	Senior design 1	3	3	FIT
4	EE0010	Systems analysis	4	4	FIT
5	EE0005	Linear electronics circuit design	3	3	FIT
6	EE0015	Power system analysis and design	3	3	FIT
7	MLV005	Scientific socialism *For Vietnamese students only.*	2	2	DPT
8	GMA002	Introduction to engineering drawing and CAD *For foreign students only*	(4)	(4)	FIT
		Total	21 (23)	21 (23)	

8th Semester (16 weeks + 3 weeks for exams)

1	GEE006	Experimental methods	1	1	FIT
2	EE0013	Communication electronics	3	3	FIT
3	GEE008	Communication theory	3	3	FIT
4	EE0018	Microwave engineering (*Elective*)	3	3	FIT
	GMA006	Higher level language (*Elective*)	3	3	FIT
5	EE0016	Senior design 2	3	3	FIT
6	EE0012	Power electronics	3	3	FIT
7	EE0014	Digital electronics circuit design	3	3	FIT
8	MLV103	History of Vietnamese communist party *For Vietnamese students only.*	2	2	DPT
9	GMA004	Introduction to MAE Practice *For foreign students only*	(3)	(3)	FIT
		Total	21 (22)	21 (22)	

9th Semester (16 weeks + 3 weeks for exams)

1	GEE002	Engineering economy	3	3	FIT
2	GEE009	Data communications	3	3	FIT
3	EE0011	Engineering optics - *Elective*	3	3	FIT
	MAE014	Instrumentation and computer (*Elective*)	3	3	FIT
4	GEE010	Introduction to Biomedical engineering modeling and systems (*Elective*)	3	3	FIT
	EE0020	Control systems (*Elective*)	3	3	FIT
5	GMA005	The evolution of the earth and Solar system	3	3	FIT

6	EE0002	Microcomputer principles and applications	3	3	FIT
7	MLV004	Ho Chi Minh's ideology *For Vietnamese students only.*	2	2	DPT
		Total	20 (18)	20 (18)	
10th Semester					
1	TTV003	Internship in industry	6	6 (8 weeks)	FIT
2	MAE020	Final design project	6	6	FIT
		Total	12	12	
		Total credits	153 (152)	204 (203)	

PART II TRAINING PROGRAM COURSE DESCRIPTION

1. SEMESTER 3

1.1 Engineering Principles (GMA001)

- Prerequisites: None

- Corequisites: None

- Course description: This course is the first-level course intended to introduce students to various aspects of Engineering and the fundamental principles used in engineering analysis and design. It also introduces students to the engineering professions and aspects of professionalism including ethics and etiquette. Moreover, it presents engineering problem solving methods and several common engineering models.

1.2 English for Academic Purposes (ENG104)

- Prerequisites: None

- Corequisites: None

- Course description: English for Academic Purposes is the course in which learners are trained with reading skills and writing skills through a various types of tasks relating to common everyday life topics at level B1. Moreover, learners have chances to reinforce their vocabulary and grammar as well as improve their competences in communication.

1.3 Physics I (PHY001)

- Prerequisites: None

- Corequisites: None

- Course description: This is a first course in general physics for engineering, mathematics and computer science majors. Topics covered include the calculus-based study of vectors, particle kinematics, Newton's laws, friction, conservation of energy and momentum, gravitation and rotation. Emphasis is placed on problem solving and applications to laboratory experience.

1.4 Physical Strength Education 1 (TCV001)

- Prerequisites: None

- Corequisites: None

- Course description: Physical Strength Education (Volleyball 1) provides students with basic knowledge, skills, and techniques in volleyball. Through this, students apply them in training and competitions to improve their health and develop physical qualities, form personalities, and adopt a healthy lifestyle, meeting the comprehensive development needs of students.

1.5 Electrical Sciences (GEE001)

- Prerequisites: Physis I

- Corequisites: None

- Course description: Electrical Science introduces the basic concepts of electrical engineering, and methodologies that are widely used in theoretical and applied electric circuits. Basic laws such as Ohm's and Kirchhoff's laws, methods of analysis like nodal and mesh analysis, and circuit theory, e.g., Thevenin's and Norton's theorems will be covered. The step response of first-order and second-order circuit and also introductory-level AC circuits will be included.

1.6 Introductory Linear Algebra (MAT001)

- Prerequisites: None

- Corequisites: None

- Course description: This course is an introduction to the theory and applications of systems of linear equations and linear operations, focusing on these on finite demension spaces. Applying widely of this theory, especially in the engineering, is very useful for the developping of the model technology. The linear objects are always simplest and do not take much time to handle. And the results we get are normally very nice. Morever, many complicated processes can be linearization locally, then solve the problems on each local.

1.7 Calculus I (MAT002)

- Prerequisites: None

- Corequisites: None

- Course description: Calculus I is concerned with change and motion, it deals with quantities that approach other quantities. Calculus I is the beginning of a three-semester sequence in calculus for students of mathematics, natural sciences, and engineering.

2. SEMESTER 4

2.1 Statics (MAE001)

- Prerequisites: None

- Corequisites: None

- Course description: This course is designed to give you an introduction to engineering mechanics in static systems. Statics deals with two- and three-dimensional systems of particles and rigid bodies in static equilibrium. Additional topics include concentrated and distributed forces, centers of gravity and centroids, and moments of inertia. Special attention is devoted to forces in frames, structures, beams, and cables. For many of you, this will be your first engineering

course. In fields such as mechanical or civil engineering, statics is indispensable in the design and analysis of structures that must hold their shape while bearing a load or performing a task where dynamic forces (forces arising from acceleration of the system) are absent or negligible.

2.2 Physics II (PHY002)

- Prerequisites: PHY001

- Corequisites: None

- Course description: Provide the students a calculus-based introductory course primarily for chemistry, engineering, and physics majors. Covers the electric field, Gauss' law, electric potential, capacitance, DC circuits, RC circuits, magnetic field, Faraday's law, inductance, LR circuits, AC circuits, and Maxwell's equations.

2.3 General Chemistry (CHE001)

- Prerequisites: High school algebra

- Corequisites: None

- Course description: General Chemistry investigate states of matter, atomic and molecular structure, stoichiometry, thermochemistry, and the periodictable. This course includes gases, solutions, intermolecular forces, kinetics, equilibrium, acidbase theory, and electrochemistry.

2.4 Network Analysis (EEC007)

- Prerequisites: Experimental Methods I, Electrical Science, Differential equations

- Corequisites: None

- Course description: Laplace transform, transfer functions, frequency response, the Fourier series and two-port networks. Theoretical concepts and methods are demonstrated and reinforced through Matlab.

2.5 Calculus II (MAT003)

- Prerequisites: MAT002

- Corequisites: None

- Course description: Calculus II is a second course in the calculus of one variable intended for techology, biology, computer science, economics. Topics include applications of Integrations, Parametric Equations and Polar Coordinates, and Infinite Squences and Series.

2.6 English for Engineering (ENG106)

- Prerequisites: None

- Corequisites: None

- Course description: English for Engineering is the course in which learners are provided with common technical knowledge of Electrical and Mechanical Engineering. Moreover, they can train to realize their knowledge and skills as well as improve their competences in communicating.

2.7 Physical Strength Education 2 (TCV002)

- Prerequisites: None

- Corequisites: None

- Course description: This course provides students with knowledge and basic techniques in football. Through this, students apply them in training and competitions to improve their health and develop physical qualities, form personalities, adopt a healthy lifestyle, and meet the comprehensive development needs of students.

2.8 Physics laboratory (PHY003)

- Prerequisites: PHY001, PHY002

- Corequisites: None

- Course description: To provide students a calculus-based introductory course primarily for chemistry, engineering, and physics majors. Covers the electric field, Gauss' law, electric potential, capacitance, DC circuits, RC circuits, magnetic field, Faraday's law, inductance, LR circuits, AC circuits, and Maxwell's equations.

3. SECOND YEAR'S SUMMER SEMESTER

3.1 National defence education (TCV004)

- Course duration: 4 weeks

4. SEMESTER 5

4.1 Calculus III (MAT004)

- Prerequisites: MAT002, MAT003

- Corequisites: None

- Course description: This is the third and the final part of our standard three-semester calculus sequence. The distinct feature of this part of the course is its focus on the multi-dimensional analysis, as opposed to one-dimensional analysis that students learned Calculus I and Calculus II.

4.2 Electronic Devices and Applications I (EE0001)

- Prerequisites: Network Analysis

- Corequisites: None

- Course description: Semiconductor electronic components including MOSFETs, BJTs, DIODEs, and OpAmps. Emphasis on device models and use of solid state electronic devices to analyze, synthesize and design amplifiers and switching circuits. SPICE simulations are extensively utilized. Basic building blocks for analog and digital applications. Theoretical concepts and methods are demonstrated and reinforced through laboratory exercises.

4.3 Electromagnetic Fields (GEE003)

- Prerequisites: Electrical Science; Calculus I, II, III

- Corequisites: None

- Course description: Electromagnetic Fields is the course focusing on time-harmonic and transient response of transmission lines. Maxwell's equations and their applications to engineering problems in electrostatics, magnetostatics, time-harmonic fields and plane wave propagation

4.4 Experimental Methods I (GEE004)

- Prerequisites: Physics I; Physics II; Electrical Sciences

- Corequisites: None

- Course description: Basic electrical measurements and instrumentation techniques and devices. Use of voltmeters, ammeters, oscilloscopes, impedance bridges to study resistive, inductive and capacitive circuit elements in steady state and transient operation. Reinforces GEE001 and introduces design of instrumentation networks. Serves as introduction for nonmajors

4.5 Solid State Electronic Devices (EE0003)

- Prerequisites: Electronic Devices and Applications I

- Corequisites: None

- Course description: Solid state physics basis of modern electronic devices. Introductory quantum mechanics. Energy bands in solids. Electronic properties of semiconductors. Junction diodes. Bipolartransistors. Field effect transistor.

4.6 Physical Strength Education 3 (TCV003)

- Prerequisites: None

- Corequisites: None

- Course description: This course provides students with basic knowledge, skills, and techniques in badminton. Through this, students apply them in training and competitions to improve their health and develop physical qualities, form personalities, adopt a healthy lifestyle, and meet the comprehensive development needs of students.

4.7 Philosophy of Marxism - Leninism (MLV101)

- Prerequisites: None

- Corequisites: None

- Course description: The course on Marxist-Leninist Philosophy is the first compulsory subject in the system of political theory courses in the training program. The content of the course includes three chapters, studying the most general laws of motion and development of nature, society, and thought; constructing a worldview, scientific methodology, revolution, and applying them to scientific cognitive activities and revolutionary practice.

4.8 Principle of communication (GMA007)

- Prerequisites: None

- Corequisites: None

- Course description: Principles of communication" is a course designed to develop the communication skills for engineering students in the context of creativity, negotiation, interpersonal and problem solving environment. The course introduces and experiences students with reading academic documents, writing technical definitions, descriptions, instructions and engineering reports. The whole attitudinal framework that enables effective and purposeful exchange of information for learning and working in engineering environment is also provided.

5. SEMESTER 6

5.1 Differential Equations (MAT005)

- Prerequisites: MAT002, MAT003, MAT004

- Corequisites: None

- Course description: Differential equations are mathematical equations that relate some functions of one or more variables with their derivatives. They provide the students a course of analytic solutions, qualitative behavior of solutions to differential equations. Topics include first-order and higher-order ordinary

differential equations, including nonlinear equations, Linear systems, and Laplace transforms.

5.2 Electronic Devices and Applications II (EE0004)

- Prerequisites: Network Analysis

- Corequisites: None

- Course description: Semiconductor electronic components including MOSFETs, BJTs,JETs, and OpAmps. Emphasis on device models and use of solid state electronic devices to analyze, synthesize and design amplifiers and switching circuits. SPICE simulations are extensively utilized. Basic building blocks for analog and digital applications. Theoretical concepts and methods are demonstrated and reinforced through laboratory exercises.

5.3 Signal Analysis (EE0008)

- Prerequisites: Network Analysis, Experimental Methods II

- Corequisites: None

- Course description: Periodic signals. Linear time-invariant (LTI) systems. Impulse response. Convolution. Fourier series, Fourier transform. Sampling theorem. Modulation and Multiplexing.

5.4 Digital Logic Design (EE0006)

- Prerequisites: None

- Corequisites: None

- Course description: Boolean algebra, optimization of logic networks. Design using SSI, and MSI, LSI components. ROM and PLA applications. Analysis and design of clock sequential logic networks. Flip-flops, counters, registers. A synchronous circuit design and analysis. Laboratory experience in implementing combinational and sequential logic devices.

5.5 Experimental Methods II (GEE005)

- Prerequisites: Electrical Sciences; Network Analysis

- Corequisites: None

- Course description: Second laboratory in electrical measurements and instrumentation techniques and devices. Frequency response using gain/phase meter. Identification of unknown two-port networks, steady state operation and linear networks. Reinforces EE0007 and continues with the design of networks.

5.6 Energy Conversion (GEE011)

- Prerequisites: Calculus I, II, III, Network Analysis

- Corequisites: None

- Course description: Physical principles of electromagnetic and electromechanical energy conversion devices and their application to conventional transformers and rotating machines. Network and phasor models; steady-state performance.

5.7 Political economics of Marxism and Leninism (MLV102)

- Prerequisites: MLV001

- Corequisites: None

- Course description: The course content consists of 6 chapters: Chapter 1 discusses the object, research methods, and functions of Marxist-Leninist Political Economy. From Chapter 2 to Chapter 6, the core content of Marxist-Leninist Political Economy is presented according to the objectives of the course. Specifically, topics include: Commodities, markets, and the roles of subjects in the market economy; Surplus value production in the market economy; Competition and monopoly in the market economy; Market-oriented socialism and economic interest relations in Vietnam; Current industrialization, modernization, and international economic integration of Vietnam.

6. THIRD YEAR'S SUMMER SEMESTER

6.1 Workshop (TTV002)

- Course duration: 2 weeks (80 hours)

7. SEMESTER 7

7.1 Introduction to Digital Signal Processing (EE0017)

- Prerequisites: Junior standing or above

- Corequisites: None

- Course description: Introduction to discrete signals and linear systems using difference equations, z transforms, and discrete Fourier transforms. Design of digital filters. Sampling theorems. Multirate DSP techniques. Applications of DSP in theory and practice. MATLAB programming of DSP applications.

7.2 Random Signals and Noise (GEE007)

- Prerequisites: Signal Analysis, Network Analysis

- Corequisites: None

- Course description: Random signals and noise is mainly committed to theory, which however, can be of good predictive value. With a strong mathematical grounding and many examples, problems, random signals and noise gives the student the knowledge of probability, random variable, random function and random process.

7.3 Senior Design I (EE0009)

- Prerequisites: Experimental Methods I, Network Analysis, or (Experimental Methods II and Network Analysis), Electronic Devices and Applications, or (Experimental Methods III and Electronic Devices and Applications), Microcomputer Principles & Applications, Digital Logic Design

- Corequisites: None

- Course description: Senior I is the course that complete design cycle for several small design projects, each including establishing objectives, synthesis, analysis, construction, testing and evaluation. Use of modern lab equipment and fabrication techniques. Development of communication skills.

7.4 Systems Analysis (EE0010)

- Prerequisites: Junior standing or above

- Corequisites: None

- Course description: Physical and mathematical modeling of electrical and mechanical dynamic systems. Transient response of first-and second-order systems. Laplace transform techniques for solving differential equations, transfer functions, frequency response and resonance..

7.5 Linear Electronics Circuit Design (EE0005)

- Prerequisites: Electronic Devices and Applications I, II, Systems I

- Corequisites: None

- Course description: Study of the circuit building blocks utilized in CMOS and BJT integrated circuits; differential and multistage amplifiers and output stages. Topics related to amplifier circuits; such as bias, small-signal operation, frequency response, stability, and feedback are covered. Emphasis is on preparation for the practice of electronics design and for more advanced courses on analog integrated circuit design.

7.6 Power System Analysis and Design (EE0015)

- Prerequisites: Junior standing or above

- Corequisites: None

- Course description: Power system component models from circuit theory. Formulation and design of the load flow model and the optimum economic generator allocation problem utilizing computer methods.

7.7 Scientific socialism (BAS305)

- Prerequisites: None

- Corequisites: None

- Course description: The course presents the fundamental content of Scientific Socialism, such as: the historical mission of the working class; socialism and the transition period to socialism; democratic socialism and the socialist state; social structure - classes and class alliances, and layers during the transition to socialism; issues of nationality, religion, and family during the transition to socialism.

7.8 Introduction to engineering drawing and CAD (GMA002)

- Prerequisites: None

- Corequisites: None

- Course description: Engineering drawing is a basic course for all undergraduate Engineering program. Though engineering drawing is considered as the language of engineers, most of the universities offer this course as a practical course without any lecture component. This course is therefore introduced to provide the basic understanding of the fundamentals of Engineering Drawing, mainly visualization, graphics theory, standards and conventions of drawing, the tools of drawing and the use of drawings in engineering applications.

8. SEMESTER 8

8.1 Experimental Methods III (GEE006)

- Prerequisites: Electronic Devices and Applications I, II

- Corequisites: None

- Course description: Third laboratory in electrical measurements and instrumentation techniques and devices. Become familiar with the use of transistor curve tracers, transistor operating points and application related models. This includes the behavior of simple BJT and FET amplifiers and switching circuits, operational amplifiers and feedback circuits. The lab reinforces EE0001, continuing the design experience in the context of electronics, continuing the design experience in the context of electronics.

8.2 Communication Electronics (EE0013)

- Prerequisites: Electronic Devices and Applications, Experimental Methods III

- Corequisites: None

- Course description: Communication electronics focuses on design filters and implement modulation method using electronic components.

8.3 Communication Theory (GEE008)

- Prerequisites: Signal Analysis, Random Signals and Noise

- Corequisites: None

- Course description: This course is concerned with signal and system in the communication field. Methods of analog modulation such as AM, FM, PM also are included as well as ASK, FSK, PSK, QAM in digital communication.

8.4 Higher Level Language (GMA006)

- Prerequisites: None

- Corequisites: None

- Course description: C++ (pronounced cee plus plus) is a general purpose programming language. It has imperative, object-oriented and generic programming features, while also providing the facilities for low level memory manipulation.

8.5 Senior Design II (EE0016)

- Prerequisites: Senior Design I

- Corequisites: None

- Course description: Senior II is the course that student project teams design, build, test and present results for realistic projects from university and industrial sponsors. Formulation of specifications, consideration of alternative solutions, feasibility considerations, detailed system descriptions, economic factors, safety, reliability, aesthetics, ethics and social impact.

8.6 Power Electronics (EE0012)

- Prerequisites: Electronic Devices and Applications, System I, Electrical Science

- Corequisites: None

- Course description: Power Electronics is the course learning about Power electronic devices, components and their characteristics; DC to AC conversion; fundamentals of inverters and wave-shaping devices; application aspects; control aspects; characteristics and state-of-the-art of advanced power inverter and power conditioning topologies.

8.7 Digital Electronics Circuit Design (EE0014)

- Prerequisites: Digital Logic Design, Electronic Devices and Applications

- Corequisites: None

- Course description: Theory of digital and electronics circuits. Digital logic families TTL, IIL, ECL, NMOS, CMOS, GaAs. Large signal models for transistors. Implementation at RAM and ROM. Circuit design for LSI and VLSI.

8.8 History of Vietnamese communist party (MLV103)

- Prerequisites: MLV102

- Corequisites: None

- Course description: The course on the History of the Communist Party of Vietnam provides students with knowledge about the establishment of the Communist Party of Vietnam and its leadership throughout the revolutionary periods from 1930 to the present. It affirms the successes and summarizes the experiences of the Party's revolutionary leadership to help students enhance their awareness and confidence in the Party. Moreover, it aims to apply the knowledge gained to practical work, contributing to the construction and defense of the Vietnamese homeland.

8.9 Introduction to MAE Practice (GMA004)

- Prerequisites: None

- Corequisites: None

- Course description: This course is an overview of engineering in industry that introduces engineering design concepts, some common engineering components and tools, and fundamentals of traditional and advanced manufacturing processes.

9. SEMESTER 9

9.1 Engineering Economy (GEE002)

- Prerequisites: English for Engineering

- Corequisites: None

- Course description: Engineering Economy is an introductory course that introduces the basic models of microeconomic theory, and mathematical reasoning that is widely used in theoretical and applied microeconomics. Consumer decision theory, demand curves for goods, producer decision theory, production process and associated cost function, cost-minimizing and profit-maximizing behavior of firms, and introductory-level deregulated electricity market will be covered.

9.2 Data Communications (GEE009)

- Prerequisites: Random Signals and Noise

- Corequisites: None

- Course description: Fundamentals of Digital Communication. Communication channel, Measure of information, Encoding of source output, Shannon's Encoding algorithms, Discrete and continues channel, Entropy, Variable length codes, Data compression, Shannon-Hantly Theorem.

Base band data transmission, Baseband pulseshaping, Inter Symbol Interface (ISI), Dubinary Baseband PAM, System Many signaling schemes, Equalisation, Synchronisation Scrambler and Unscrambler.

Band-pass data transmission system ASK, PSK, FAK, DPSK &PSK, MSK, Modulation schemes coherent and Non Coherent detector. Probability of Error (PE) , Performance Analysis and Comparison.

Error detection and correction codes, Linear Block Encoding, Algebraic Codes, Cyclic Codes, Convolution codes, Best Error, Correeding Codes, performance of Codes.

Synchronous and Asynchronous transmission, Modem, Serial interface, Circuit Switching, Packet Switching, Hybrid switching, Architecture of computer network, OSI model, Data communication protocols.

9.3 Engineering Optics (EE0011)

- Prerequisites: English for Engineering

- Corequisites: None

- Course description: 'Optics engineering' is the field of study that focuses on applications of optics. Optics is the branch of physics which involves the behaviour and properties of light, including its interactions with matter and the construction of instruments that use or detect it. Optical engineers design components of optical instruments such as lenses, microscopes, telescopes, and other equipment that utilizes the properties of light. Other devices include optical sensors and measurement systems, lasers, fiber optic communication systems, optical disc systems.

9.4 Instrumentation and Computer (MAE014)

- Prerequisites: None

- Corequisites: None

- Course description: This course introduces data acquisition using A/D converters. Theory of A/D and D/A converters, fundamentals and examples of transducers used for mechanical measurements, static and dynamic response, amplifiers, theory of A/D and D/A converters, error analysis, elementary statistics.

9.5 Intro to Biomedical Engineering Modeling and Systems (GEE010)

- Prerequisites: Network Analysis, Introduction to Digital Signal Processing

- Corequisites: None

- Course description: An introduction to the modeling approaches implemented in understanding several basic physiological phenomena. Topics include action potential and bio-electrical modeling, saccadic movement and bio-mechanical modeling, compartmental modeling, and bio-signal processing techniques.

9.6 Control systems (EE0020)

- Prerequisites: EE0010

- Corequisites: None

- Course description: An introduction to the modeling approaches implemented in understanding several basic physiological phenomena. Topics include action potential and bio-electrical modeling, saccadic movement and bio-mechanical modeling, compartmental modeling, and bio-signal processing techniques.

9.7 The Evolution of Earth and Solar System (GMA005)

- Prerequisites: Physics I; Physics II; Electrical Sciences

- Corequisites: None

- Course description: Evolution of the Earth and Solar System is scientific course studying origin, formation and evolution of the Earth and Solar System.

9.8 Microcomputer Principles & Applications (EE002)

- Prerequisites: Junior standing or above

- Corequisites: None

- Course description: Introductory microcomputers. Digital logic elements and number systems, memory components and organization. Microprocessor and microcomputer system architecture, assembly language programming, software development, interfacing techniques.

9.9 Ho Chi Minh's ideology (MLV004)

- Prerequisites: Principles of Marxist - Leninist Philosophy 1, 2

- Corequisites: None

- Course description: The Ho Chi Minh's ideology is a fundamental subject within the system of Political Theory courses. Building upon the knowledge provided about worldview, methodology, principles, laws, and dialectics (covered in the course "Principles of Marxist - Leninist Philosophy 1"); along with knowledge about the theory of value, surplus value, monopoly capitalism; and the historical mission of the working class and socialist society (covered in the course "Principles of Marxist - Leninist Philosophy 2"). The course on Ho Chi Minh's ideology will equip students with knowledge to serve the study, application, learning, and emulation of the ideology, ethics, and style of President Ho Chi

Minh. Additionally, the course on Ho Chi Minh's ideology, along with the course on the Fundamental Principles of Marxism-Leninism, forms the foundation of the course on the revolutionary path of the Communist Party of Vietnam.

10. SEMESTER 10

10.1 Internship in Industry (TTV003)

- Prerequisites: Students who have obtained 140 credits are eligible for 'Internship in Industry' course.

- Corequisites: None

- Course description: As an integral part of engineering education, the course "Internship in Industry" provides students with an opportunity to gain work experience that will enhance and complement their academic learning; Enables correlation of class room learning with its application in industry; Broadens understanding of the types of employment available in the field; Helps students discover their individual interests; Builds resume credentials for the students; and develops relationships between TNUT and industrial firms.

10.2 Final design project (MAE020)

- Prerequisites: All courses in syllabus.

- Corequisites: None

- Course description: Final design project is the course that student project teams design, build, test and present results for realistic projects from university and industrial sponsors. Formulation of specifications, consideration of alternative solutions, feasibility considerations, detailed system descriptions, economic factors, safety, reliability, aesthetics, ethics and social impact.

PART III TEACHING FACILITIES

I. EXISTING LABORATORIES

1.1. Chemistry and Physics Laboratory

- For experiments of Physics 1, Physics 2 and Physics Lab: TNUT supplements and coordinates with Hanoi University of Natural Sciences in order to offer the experiments for which contents are suitable with Advanced Program.

- For experiments of Physics general Chemistry: TNUT supplements and coordinates with Hanoi University of Natural Sciences in order to offer the experiments for which contents are suitable with Advanced Program.

1.2. Mechanical engineering laboratory

- The laboratory is to help the experiments of the subject "An introduction to practicing Mechanics"

- It helps the experiments of the subjects "Manufacturing processes".

1.3. Computing laboratory

The laboratory is to assist the experimental activities of the subject "Technical drawing and CAD". This is to give assistance to practicing contents of the Advanced program.

1.4. Technical heat laboratory

The laboratory is to provide technical – know how for the subject of "Heat transfer and Heat transfer lab".

1.5. Materials Technology laboratory

TNUT takes the expenditure from ADB project to improve the experimental activeties of the subject "Material for Engineering".

1.6. Automation laboratory

The laboratory is to give aid to the experiments of the subject "General technical Electronic".

1.7. Measurement laboratory

The laboratory is to help the experiments of the subject "Computer and measurement device".

II. LIBRARY

The library is modern with full equipment and materials regularly updated to cater for the teaching and learning of staff and students:

- The number of seats for readers: 1,000

- The number of English books: 4,000

- The number of Vietnamese books: 80,000

- The computer room: 150 computers

- Online English Documents: 1500

In particular, every year, TNUT focuses on the investment to purchase full English books of all majors with 2-3 billion VND in order to expedite the process of international integration on basis of lecturers to meet the English national Foreign Language project in 2020.

III. INFORMATION TECHNOLOGY

With the determination that the application of Information Technology is one of the important goals, the current infrastructure of the university was modernized in all aspects. The network system includes 11 high-speed fiber optic cables (60Mbps), 11 modern Servers is capable of storing thousands of gigabytes of data along with the modern Cisco devices to create a platform of Information Technology infrastructure fulfilling the services in teaching, research, study, dissemination of information, ... of the university.

The Information Technology Services for staff and students include:

Vietnamese Website: There are more than 30 sites serving the posting of information on all aspects such as facilities, staff, training, science and technology and students of the university and member institutions.

English Website: 15 English websites posted the information on the employees, training, science and technology, student mission, ... serve to promote the image of the university with international partners.

E-learning: Website managing E-learning online courses services for faculty and students with over 4000 hits / day, fulfill requests for lectures, course materials, assignments, scores, ... as Universities in the United States.

Management Software: Software System Edusoft services for credit training of the university. It also consists of financial management software, facilities management, library management, ...

Providing Email accounts: Provide Email accounts @tnut.edu.vn for students in the entire university. For all exchanges with university and teachers, students have to use the school's email.

Providing E-learning account: Provides E-learning accounts for the students to access and use the learning materials of the subject that they participate.

Providing Internet system for staff and students:

- Wired and wireless network system is provided for over 600 staff members of the university to meet the full demands of work and research.

- Each room at the dormitory is equipped with free Internet servicing for students' learning needs.

Providing free Wi-Fi system: Students studying at 4-floor library have free Wifi at the first, the second and the third Floor of the library. The wifi system also fully coverages in the Large Hall.

Provides online learning: Students use this system to learn directly from the professor teaching at the University of the United States and other countries around the world.

IV. OTHER FACILITIES

Advanced program student has their own studying room satisfying the requirement of partner university with full devices for teaching and studying.

The university has a block of dormitory for the advanced program students only to stay.

<div align="center">

FACULTY DEAN   **RECTOR**

Dr. Nguyen Tien Hung   **Assoc. Prof. Dr. Nguyen Duy Cuong**

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