MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

UNDERGRADUATE PROGRAM
Major of
ELECTRONICS AND COMMUNICATIONS ENGINEERING TECHNOLOGY

(Issued under Decision No. 3744 /QĐ-ĐHSPKT dated 06 / 10 /2025 by the President of Ho Chi Minh City University of Technology and Education)

Education Name: Electronics and Communications Engineering Technology
Level: Undergraduate
Major: Electronics and Communications Engineering Technology
Major Code: 7510302A

Ho Chi Minh City, 2025

THE MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

UNDERGRADUATE PROGRAM

Education Name: Electronics and Communications Engineering Technology

Level: Undergraduate

Major: Electronics and Communications Engineering Technology

Major Code: 7510302A

Type of Training: FULL-TIME

Graduation Diploma: ENGINEER

(Issued under Decision No. 3744 /QĐ-ĐHSPKT dated 06 / 10 /2025 by the President of Ho Chi Minh City University of Technology and Education)

1. **Training Duration:** 4 years
2. **Admission Requirements:** High School Graduate
3. **Grading Scale, Training Process, and Graduation Requirements**
    - Grading Scale: 10
    - Training Process: According to Decision No. 3116/QD-ĐHSPKT dated 22/08/2025 of Ho Chi Minh City University of Technology and Education on promulgating the university-level training regulations.
    - Graduation Requirements:
        - General Requirements: According to Decision No. 3116/QD-ĐHSPKT dated 22/08/2025 of Ho Chi Minh City University of Technology and Education on promulgating the university-level training regulations.
        - Specialized Requirements: According to the general regulations of Ho Chi Minh City University of Technology and Education.
4. **Training Goals and Learning Outcomes**

Goals:

Graduates in Electronics and Telecommunications will possess a strong foundation in basic sciences, along with core and specialized knowledge in electronics and telecommunications. They will be capable of analyzing, problem-solving, and evaluating solutions. Furthermore, they will have the skills to build and manage electronic and telecommunication systems, communicate effectively, and collaborate in teams. Graduates will demonstrate a professional attitude suitable for meeting the evolving demands of the industry and society.

Upon graduation, students can pursue careers in agencies and organizations specializing in electronics and telecommunications, units applying electronics and telecommunications technologies, and educational institutions focused on electronics and telecommunications. Within 5 to 7 years of graduation, alumni are expected to advance into leadership roles such

as directors, department heads, or team leaders within these specialized organizations and application units, or become heads of departments in electronics and telecommunications training institutions.

Objectives: Graduates will possess the following knowledge, skills, and competencies:

1. Foundational Knowledge: They will have a strong understanding of both social and natural sciences.
2. Intellectual Development: Graduates will develop their ability to self-study, explore knowledge, solve problems, engage in systems thinking, master professional attributes, and cultivate individual character.
3. Communication and Teamwork Skills: They will enhance their ability to communicate effectively and work proficiently within multidisciplinary teams.
4. System Development and Operations: Graduates will develop the capacity to conceptualize, design, implement, and operate electronic and telecommunication systems within various social and business contexts.

Program outcomes

Code	Expected Learning Outcomes	Competency Level
ELO1	Ability to apply knowledge of mathematics, natural sciences, and engineering principles to identify, formulate, and solve complex engineering problems.	4
ELO2	Ability to apply engineering design to create solutions that meet specified needs while considering public health, safety, and welfare, as well as economic, environmental, and societal factors.	4
ELO3	Ability to communicate effectively with diverse audiences and communicate proficiently in English across various contexts.	4
ELO4	Ability to recognize professional and ethical responsibilities in engineering situations and make informed judgments, considering the impact of engineering solutions in economic, societal, environmental, and global contexts.	3
ELO5	Ability to function effectively on a team, where members collectively demonstrate leadership, foster an inclusive and collaborative environment, establish goals, plan tasks, and meet objectives.	4
ELO6	Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	4
ELO7	Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	5

ELO8	Ability to operate and maintain industrial electronic systems.	4
ELO9	Ability to analyze, manage, and evaluate the quality of industrial electronic projects.	4

Competency Level Scale

Competency Level	Description
0.0 ≤ Competency Level ≤ 1.0: Basic	**Remember:** Students recall/recognize/retrieve knowledge through actions such as defining, repeating, listing, identifying, determining, etc.
1.0 ≤ Competency Level ≤ 2.0: Satisfactory	**Understand:** Students construct knowledge from materials and existing knowledge through actions such as explaining, classifying, illustrating, inferring, etc.
2.0 ≤ Competency Level ≤ 3.0: Apply	Students perform/apply knowledge to create products such as models, physical objects, simulated products, reports, etc.
3.0 ≤ Competency Level ≤ 4.0: Proficient	**Analyze:** Students analyze materials/knowledge into details/components and point out their relationships within the whole through actions such as analyzing, classifying, comparing, synthesizing, etc.
4.0 ≤ Competency Level ≤ 5.0: Evaluate	Students provide assessments and predictions about knowledge/information according to predefined standards, criteria, and measurement indicators through actions such as commenting, critiquing, proposing, etc.
5.0 ≤ Competency Level ≤ 6.0: Excellent	**Create:** Students construct/arrange/organize/design/generalize details/components in a different/new way to create new structures/models/products.

5. Total program credits: 158 credits

(not including physical, national defense education and Enterprise Seminar)

Foreign Language Knowledge:

Students with an IELTS >= 4.5 or equivalent (as per Decisions No. 3239/QĐ-ĐHSPKT dated 03/09/2025) will be exempted from the English placement test. Their scores will be converted for English courses in the program and English proficiency requirement (Outcome).

- English Placement Test for Level Classification: Students without IELTS certificate must participate in an English placement test to determine their proficiency level.
  - If a student achieves Level 1, they will study Communicative English 1,2.
  - If a student achieves Level 2, they will study Academic English 1,2.
- Sequence of English courses: Communicative English 1,2 → Academic English 1, 2.

Note:

- Communicative English 1 and 2 are supplementary courses designed to enhance English communication skills for students not accumulating credits in the program.
- Academic English 1 and 2 are academic courses that accumulate credits in the program.

6. Allocation of Knowledge Group

Groups of Courses	**Credits**		
	Total	**Compulsory**	**Elective**
General Knowledge	**59**	**55**	**4**
General Politics + Laws	14	14	
Social Sciences and Humanities	4		4
English (Academic English 1, Academic English 2)	8	8	
Mathematics and Natural Sciences	27	27	
Introduction to ECET	3	3	
Informatics	3	3	
Professional knowledge	**99**	**90**	**9**
Foundation of major	34	31	3
Professional Major	35	29	6
Practices	18	18	
Internship	2	2	
Capstone project (final thesis)	10	10	
Physical and National Defense Education	Non-accumulation		
National Defence Education 1	1		
National Defence Education 2	1		
National Defence Education 3	1		
National Defence Education 4	1		
Physical Education 1	1		
Physical Education 2,3	2		
Comunicative English	Non-accumulation		

Communicative English 1	4		
Communicative English 2	4		
Enterprise Seminar	1		
Total	**158**	**145**	**13**

7. Content of Program

A – Compulsory Courses

7.1. General Knowledge

No.	Course's ID	Course name	Credits	Prerequisite
	General Politics + Laws		**14**	
1.	LLCT130105E	Philosophy of Marxism and Leni	3	
2.	LLCT120205E	Political economics of Marxism and Leninism	2	
3.	LLCT120405E	Scientific socialism	2	
4.	LLCT220514E	History of Vietnamese communist party	2	
5.	LLCT120314E	Ho Chi Minh's ideology	2	
6.	GELA 236939E	General Law	3	
	Mathematics and Natural Sciences		**27**	
7.	MATH132401E	Calculus 1	3	
8.	MATH132501E	Calculus 2	3	MATH132401E
9.	MATH132601E	Calculus 3	3	MATH132401E
10.	MATH132901E	Mathematical Statistics for Engineers	3	MATH132501E
11.	PHYS130902E	Physics 1	3	
12.	PHYS131002E	Physics 2	3	
13.	PHYS111202E	Physics - Laboratory 1	1	
14.	PHYS111302E	Physics - Laboratory 2	1	
15.	GCHE130603E	Chemistry for Engineers	3	
16.	AMEE341944E	Applied Mathematics for EEE.	4	MATH132401E
17.	IECE130564E	Introduction to ECET	3 (2+1)	
	Informatics			
18.	CPRL130064E	C Programming language	3	

19.	ACEN340535E	Academic English 1	4	
20.	ACEN340635E	Academic English 2	4	
21.	**Knowledge of Social Sciences and Humanities**		**4**	
22.	ENTW621038E	English for Thesis Writing	0(2)	
23.	GDQP110131	Giáo dục quốc phòng 1 (*National Defence Education 1)*	1	Non-accumulation
24.	GDQP110231	Giáo dục quốc phòng 2 (*National Defence Education 2)*	1	Non-accumulation
25.	GDQP110331	Giáo dục quốc phòng (*National Defence Education 3)*	1	Non-accumulation
26.	GDQP110431	Giáo dục quốc phòng 4 (*National Defence Education 4)*	1	Non-accumulation
27.	PHED110130	Giáo dục thể chất 1 (*Physical Education 1)*	1	Non-accumulation
28.	GDQP110431	Giáo dục quốc phòng 4	1	Non-accumulation
29.	PHED110130	Giáo dục thể chất 1	1	Non-accumulation
30.	**Giáo dục thể chất 2,3 (***Physical Education 2,3)*		**2**	**Choose 2**
31.	FOOT112330	Bóng đá (*Football)*	1	Non-accumulation
32.	VOLL112330	Bóng chuyền (*Volleyball)*	1	Non-accumulation
33.	BASK112330	Bóng rổ (*Basketball)*	1	Non-accumulation
34.	BADM112330	Cầu lông (*Badminton)*	1	Non-accumulation
35.	TENN112330	Quần vợt (*Tennis)*	1	Non-accumulation
36.	KARA112330	Không thủ đạo (*Karate)*	1	Non-accumulation

37.	CHES112330	Cờ vua (*Chess)*	1	Non-accumulation
38.	CHIN112330	Cờ tướng (Chinese Chess)	1	Non-accumulation
39.	YOGA112330	Yoga (Yoga)	1	Non-accumulation
40.	PICK112330	Pickleball	1	Non-accumulation
Total			**59**	

7.2. Professional knowledge

7.2.1. Foundation of major

No.	Course's ID	Course name	Credits	Prerequisite
1.	ELCI140144E	Electric Circuit	4	
2.	ELEC230262E	Electronic Circuits 1	3	
3.	ELEC330362E	Electronic Circuits 2	3	
4.	DIGI330163E	Digital Systems	3	
5.	MICR330363E	Microprocessor	3	DIGI330163E
6.	SISY330164E	Signals and Systems	3	MATH132401E
7.	DACO430664E	Data communication	3	
8.	DSPR431264E	Digital Signal Processing	3	SISY330164E
9.	EMIN230244E	Measurements and Sensors	3	
10.	ELFI230344E	Electromagnetic Field	3	
	Fundamental knowledge Elective		3	
Total			**34**	

7.2.2.a Professional Major Courses (Theory and Practice courses)

– Compulsory subjects

No.	Course's ID	Course name	Credits	Prerequisite
1.	DDCS336764E	Integrated Circuits and Systems Design	3	DIGI330163E
2.	EMSY435664E	Embedded Systems	3	
3.	COSY330464E	Communication Systems	3	SISY330164E
4.	MIEN330364E	Microwave Engineering	3	

5.	WCSY431364E	Wireless Communication Systems	3	
6.	AICD433164E	Analog Integrated Circuit Design	3	
7.	ITFA336064E	IoT: Foundations and Applications	3	
8.	MLAI338364E	Machine Learning	3	
9.	OPEP338564E	Object-Oriented Programming and Software Engineering	3	
10.	SEMI310026E	Enterprise Seminar	0 (1)	
11.	**Professional knowledge Elective**		6	
Total			**33**	

7.2.2.b Major Practices

No.	Course's ID	Course name	Credits	Prerequisite
1.	SEPR411464E	Senior Project 1	1	
2.	SEPR411664E	Senior Project 2	1	
3.	ELPR320762E	Basic Electronics Lab	2	BAEL340662
4.	PRDI310263E	Digital Systems Lab	1	DIGI330163
5.	PRMI320463E	Microprocessor Lab	2	MICR330363
6.	PRMS310844E	Measurements and Sensors Lab	1	EMIN230244
7.	EMSL425664E	Embedded Systems Lab	2	
8.	DACL411164E	Data Communication Lab	1	
9.	ITFL416064E	IoT: Foundations & Applications Lab	1	
10.	AICL323764E	Analog Integrated Circuit Design Lab	2	
11.	WCSL411364E	Wireless Communication Systems Lab	1	
12.	DSPL411264E	Digital Signal Processing Lab	1	
13.	DDCL316764E	Digital Systems and IC Design Lab	1	
14.	MLAL318364E	Machine Learning and Artificial Intelligence Lab	1	
15.	COSL420764E	Communication Systems Lab	2	
Total			**20**	

7.2.3. Internship and Capstone project

No.	Course's ID	Course name	Credits	Prerequisite
1.	INTE423064E	Internship (ICC)	2	
2.	CAPR403964E	Capstone Design Project (ICC)	10	
Total			**12**	

B – Optional Subjects

Knowledge of Social Sciences and Humanities: 4 Credits *(Choose 2 courses)*

No.	Course's ID	Course name	Credits	Prerequisite
1.	GEFC220105E	General Economics	2	Choose 1
2.	IQMA220205E	Introduction to Quality Management	2	
3.	INMA220305E	Introduction of Management	2	
4.	INLO220405E	Introduction to Logic	2	
5.	BPLA121808E	Business Plan	2	
6.	ENPS220591E	Engineering Psychology	2	Choose 1
7.	SYTH220491E	System Thinking	2	
8.	PLSK120290E	Planning Skills	2	
9.	WOPS120390E	Workplace Skills	2	
10.	REME320690E	Research Method	2	
11.	INSO321005E	Introduction to Sociology	2	
12.	LESK120190E	Learning skills	2	
	Total		**4**	

Professional Major: 9 Credits *(Choose 3 courses)*

No.	Course's ID	Course name	Credits	Prerequisite
1.	COEL330264E	Communication Electronics	3	Choose 1 Fundamental knowledge
2.	ACSY330346E	Automatic Control Systems	3	
3.	EEMA330544E	Electronic and Electrical Materials	3	
4.	ELIN330444E	Electricity Instrument	3	
5.	AWPR330964E	Antenna and Wave Propagation	3	Choose 1

6.	MICI421964E	Microwave Circuits	2	Professional knowledge
7.	FOCS 432064E	Optical Communication	3	
8.	BDAN437764E	Big Data Analytics	3	
9.	MOCO431864E	Mobile Information Systems	3	
10.	CCNW432364E	Computer and Communication Networks	3	
11.	DICD436264E	Digital Integrated Circuit Design	3	
12.	DLTA437664E	Deep Learning Theory and Applications	3	
13.	DICO432264E	Digital Communication	3	Choose 1 Professional knowledge
14.	SOCD334264E	System-on-Chip (SoC) Design	3	
15.	CIPD334364E	CMOS Physical Design	3	
16.	TTDE334464E	Design-for-Testability (DFT) and Testing Techniques	3	
17.	MICD436464E	Mixed-Signal Integrated Circuit Design	3	
18.	ICFT436964E	IC Fabrication and Technology	3	
19.	ICPK439464E	IC Packaging Technology	3	
20.	PDCI439664E	Pulse and Digital Circuits	3	
21.	LITO432464E	Linux Programming Tools	3	
22.	RICD436864E	RF Integrated Circuit Design	3	
23.	VIDA439764E	VLSI Design Automation	3	
	Total		**9**	

Interdisciplinary: 6 Credits *(Students may select 6 interdisciplinary credits as substitutes for courses in the elective section of the major knowledge block.)*

No.	Course's ID	Course name	Credits	Prerequisite
1.	ROTE430946E	Robotics Engineering	3	Choose 1
2.	ELPS330345E	Electric Power Supply	3	
3.	WSNW439564E	Wireless Sensor Networks	3	Choose 1
4.	VRSY338764E	Virtual Reality Systems	3	

	Total	**6**	

C – MOOCs (Massive Open Online Courses):

To facilitate enhanced access to advanced training programs, students can independently choose proposed online courses from the following table to be considered equivalent to courses in the curriculum:

No.	Course's ID	Course name	Credits	Course eligible for MOOC equivalency (registration link provided)
1.	CPRL130064E	C Programming language	3	Beginning C++ Programming - From Beginner to Beyond (https://www.udemy.com/beginning-c-plus-plus-programming/)
2.	MALE331063E	Machine Learning	3	Artificial Intelligence (https://www.edx.org/course/artificial-intelligence-ai-columbiax-csmm-101x-2)

8. Training plan

Courses not included in the official teaching plan will be offered by the Training Department in designated semesters, allowing students to plan their studies independently.

1st Semester

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	GELA 236939E	General Law	3		1
2.	IECE130564E	Introduction to ECET	3	3 (2+1)	1
3.	MATH132401E	Calculus 1	3		1
4.	PHYS130902E	Physics 1	3		1
5.	CPRL130064E	C Programming language	3		2
6.	PHED110130	Giáo dục thể chất 1 **(***Physical Education1)*	0		2
7.	ACEN340535E	Academic English 1	4		1
8.	ACEN340635E	Academic English 2	4		1
Total			**23**		

2nd Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	LLCT130105E	Philosophy of Marxism and Leninism	3		2

2.	MATH132501E	Calculus 2	3		1
3.	GCHE130603E	Chemistry for Engineers	3		1
4.	AMEE341944E	Applied Mathematics for EEE	4		1
5.	ELCI140144E	Electric Circuit	4		1
6.	ELEC230262E	Electronic Circuits 1	3		2
7.	ELFI230344E	Electromagnetic Field	3	MATH132401	2
8.	PHYS111202E	Physics - Laboratory 1	1		1
9.		Giáo dục thể chất 2 (tự chọn 1) *Physical Education 2 (Option 1)*	0(1)		
10.		Giáo dục Quốc phòng *National Defence Education*	0(4)		
Total			**24**		

3rd Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	LLCT120205E	Political Economics of Marxism and Leninism	2		**1**
2.	LLCT120405E	Scientific socialism	2		**2**
3.	MATH132601E	Calculus 3	3		2
4.	MATH132901E	Mathematical Statistics for Engineers	3		**1**
5.	PHYS131002E	Physics 2	3		1
6.	EMIN230244E	Measurements and Sensors	3		1
7.	ELEC330362E	Electronic Circuits 2	3		1
8.	SISY330164E	Signals and Systems	3		1
9.	DIGI330163E	Digital Systems	3	ELEC230262	2
10.	Social Sciences and Humanities Elective 1		2		1
11.	Giáo dục thể chất 3 (tự chọn 2) *Physical Education 3 (Option 2)*		0(1)	Non-accumulation	2
Total			**27**		

4th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term

1.	LLCT120314E	Ho Chi Minh's ideology	2		1
2.	LLCT220514E	History of Vietnamese communist party	2		2
3.	MICR330363E	Microcontroller	3	DIGI330163	1
4.	DACO430664E	Data Communication	3		2
5.	PHYS111302E	Physics – Laboratory 2	1		1
6.	DSPR431264E	Digital Signal Processing	3		1
7.	ELPR320762E	Electronics Practice	2		1
8.	PRMS310844E	Measurements and Sensors Lab	1	EMIN230244	1
9.	DDCS336764E	Digital Systems and IC Design	3		2
10.	DSPL411264E	Digital Signal Processing Lab	1		2
11.	PRDI310263E	Digital Systems Lab	1		1
12.		Major/Interdisciplinary Elective 1	3		1
Total			**25**		

5th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	PRMI320463E	Microprocessor Lab	2		1
2.	COSY330464E	Communication Systems	3	SISY330164	1
3.	EMSY435664E	Embedded Systems	3		2
4.	AICD433164E	Analog Integrated Circuit Design	3		1
5.	MIEN330364E	Microwave Engineering	3		2
6.	AICL413164E	Analog Integrated Circuit Design Lab	2		2
7.	COSL420764E	Communication Systems Lab	2		2
8.	DACL411164E	Data Communication Lab	1		1
9.	DDCL316764E	Integrated Circuits & Systems Design Lab	1		1
Total			**20**		

6th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	MLAI338364E	Machine Learning	3		1
2.	OPEP338564E	Object-Oriented Programming and Software Engineering	3		2
3.	ITFA436064E	IoT: Foundations & Applications	3		1
4.	WCSY431364E	Wireless Communication Systems	3		1
5.	MLAL318364E	Machine Learning Lab	1		2
6.	EMSL425664E	Embedded Systems Lab	2		1
7.	ITFL416064E	IoT: Foundations & Applications Lab	1		2
8.	WCSL411364E	Wireless Communication Systems Lab	1		2
9.	SEPR411464E	Senior Design Project 1	1		1-2
Total			**18**		

7th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	SEPR411664E	Senior Design Project 2	1		1-2
2.	SEMI310026E	Enterprise Seminar	0 (1)		1-2
3.	INTE423064E	Internship (ICC)	2		1-2
4.	Social Sciences and Humanities Elective 2		2		2
5.	Major/Interdisciplinary Elective 2		3		1
6.	Major/Interdisciplinary Elective 3		3		1
Total			**11**		

8th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term
1.	CAPR403964E	Capstone Design Project (ICC)	10		1-2
Total			**10**		

10. Course Descriptions

Academic English 1 **Credits: 4**

Prerequisite course(s): Communicative English 1
Corequisite course(s): Academic English 2
Previous course(s): N/A
Course Description:

This is the first course of the Academic English series designed for students majoring in the areas other than English to achieve the intermediate level of English language proficiency (equivalent to B2.1 level of CEFR) in Speaking and Listening skills. The series aims to enhance students' English competence to deal with complex matters of everyday life in other countries, to exchange specific information and personal ideas with young people and adults who speak English, and to achieve a wider understanding of thoughts from people of other cultures. This course particularly provides students with the opportunities to understand the main ideas of complex oral English on quite abstract topics, including basic technical discussions in their fields of specialization. Students are asked to orally interact with a degree of fluency that makes regular interactions with native English speakers quite possible with some strain. They are also prepared to orally produce clear, detailed texts on a limited range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of a few options. In addition, this course promotes students' development of presentation skills, teamwork ability, and learner autonomy by engaging them in various interactive activities.

Textbooks:

Kisslinger, E., & Baker, L. (2024). *Skillful 3 Listening and Speaking* (3rd ed.). Macmillan Education.

Academic English 2 **Credits: 4**

Prerequisite course(s): Communicative English 2
Corequisite course(s): Academic English 1
Previous course(s): N/A
Course Description:

This is the second course of the Academic English series designed for students majoring in the areas other than English to achieve the intermediate level of English language proficiency (equivalent to B2.1 level of CEFR) in Reading and Writing skills. The series aims to enhance students' English competence to deal with complex matters of everyday life in other countries, to exchange specific information and personal ideas with young people and adults who speak English, and to achieve a wider understanding of thoughts from people of other cultures. This course particularly provides students with the opportunities to understand the main ideas of complex English texts on quite abstract topics, including basic technical discussions in their fields of specialization. Students are asked to interact in written English with a degree of fluency that makes regular interactions with native English speakers quite possible with some strain. They are also prepared to produce clear, detailed written texts on a limited range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of a few options. In addition, this course promotes students' development of presentation skills, teamwork ability, and learner autonomy by engaging them in various interactive activities.

Textbooks:

Rogers, L., & Zemach, D. E. (2024). *Skillful 3 Reading and Writing* (3rd ed.). Macmillan Education.

Marxist-Leninist Philosophy

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): None

Corequisite Course(s): None

Course Description:

This course consists of three chapters and provides students with foundational knowledge in Marxist-Leninist philosophy:

Chapter 1 offers a general overview of philosophy, the foundations of Marxist-Leninist philosophy, and its role in social life.

Chapter 2 covers the core principles of dialectical materialism, including the relationship between matter and consciousness, the laws of dialectical materialism, and the theory of knowledge from the dialectical materialist perspective.

Chapter 3 presents the fundamental concepts of historical materialism, focusing on socio-economic formations, class and ethnicity, the state and social revolution, social consciousness, and the philosophical view of human beings.

Marxist-Leninist Political Economy

Study-time distribution: (2 credits – 2 lecture / 0 lab / 4 self-study)

Prerequisite Course(s): —

Corequisite Course(s): None

Course Description:

This course consists of six chapters and provides students with essential knowledge in Marxist-Leninist political economy:

Chapter 1 introduces the subject, research methods, and functions of Marxist-Leninist political economy.

Chapters 2 to 6 cover the core content of the discipline, aligned with the course objectives. Topics include:

Commodities, markets, and the roles of economic agents in a market economy;

The production of surplus value within the market economy;

Competition and monopoly in the market economy;

The socialist-oriented market economy and economic interest relations in Vietnam;

Vietnam's industrialization, modernization, and international economic integration.

Scientific Socialism

Study-time distribution: (2 credits – 2 lecture / 0 lab / 4 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course consists of seven chapters, providing students with foundational knowledge of Scientific Socialism:

Chapter 1 introduces the fundamental and introductory concepts of Scientific Socialism, including its formation and historical development.

Chapters 2 to 7 present the core content of Scientific Socialism in alignment with the course objectives.

Ho Chi Minh's Ideology

Study-time distribution: (2 credits – 2 lecture / 0 lab / 4 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course consists of six chapters and provides students with essential knowledge of Ho Chi Minh's ideology, including:

The concept, subject, research methods, and significance of studying Ho Chi Minh's ideology;

The foundations, formation, and development of Ho Chi Minh's ideology;

Ho Chi Minh's thoughts on:

National independence and socialism;

The Communist Party of Vietnam and a state of the people, by the people, and for the people;National unity and international solidarity;Culture and human development;Ethics.

History of the Communist Party of Vietnam

Study-time distribution: (2 credits – 2 lecture / 0 lab / 4 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course consists of three chapters and equips students with a comprehensive understanding of the subject, objectives, tasks, research methods, and key knowledge of the history of the Communist Party of Vietnam. The course covers:

The foundation of the Party (1920–1930);

The Party's leadership during the struggle for national power (1930–1945);

Leadership of the two resistance wars against French colonialism and American imperialism, culminating in national liberation and reunification (1945–1975);

Leadership during the transition to socialism and the implementation of the national renewal (Đổi Mới) process (1975–2018).

The course emphasizes the Party's achievements, identifies its limitations, and draws practical lessons from its revolutionary leadership. It aims to enhance students' understanding, foster trust in the Party, and develop their ability to apply acquired knowledge to real-world contexts in the cause of building and defending the Socialist Republic of Vietnam.

Introduction to Law

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with fundamental knowledge about the state and the legal system, including:

General theories of the state and law (origin, nature, functions, and basic characteristics of the state; origin, forms, concepts, and attributes of law);

The legal system and legal relationships; legal violations and legal liability;

Fundamental legal institutions of several major branches of law.

Calculus 1

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course helps students review and strengthen their foundational and advanced mathematical knowledge. Topics include:
Number sets: rational numbers, real numbers, and complex numbers;
Limits: functions, limits of functions, and continuous functions;
Differential calculus of single-variable functions: derivatives, differentials, Taylor-Maclaurin expansions, function analysis, and curves in polar coordinates;
Integral calculus of single-variable functions: indefinite integrals, definite integrals, and improper integrals;
Series: numerical series, function series, power series, Taylor-Maclaurin series, Fourier series, Fourier expansions, and trigonometric series.

Calculus 2

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Calculus 1
Corequisite Course(s): —
Course Description:
This course provides students with essential knowledge in linear algebra and multivariable calculus, including:
Matrices and Determinants: types of matrices, inverse matrices, determinants, and matrix rank;
Systems of Linear Equations: linear systems, Cramer's rule, Gaussian elimination method, and homogeneous systems;
Vector Spaces: vector spaces, subspaces, linear independence and dependence, basis, dimension, and Euclidean spaces;
Matrix Diagonalization and Quadratic Forms: eigenvalues, eigenvectors, eigenspaces, matrix diagonalization, quadratic forms, canonical forms, and second-degree surfaces;
Differential Calculus of Multivariable Functions: multivariable functions, partial derivatives, differentials, extrema of multivariable functions, and applications of differential calculus in spatial geometry.

Calculus 3

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Calculus 1
Corequisite Course(s): —
Course Description:
This course provides students with advanced knowledge in multivariable integration and vector calculus, including:
Multiple Integrals: double integrals (with applications in calculating area of plane regions, surface area, and volume of solids), triple integrals (with applications in volume calculation);
Line Integrals: line integrals of the first and second kind and their applications, Green's theorem, and conditions for path independence of line integrals;
Surface Integrals: surface integrals of the first and second kind, Gauss-Ostrogradsky (Divergence) theorem, vector fields, flux and divergence, the vector form of Gauss's theorem;

Stokes' Theorem: circulation, curl of a vector field, and the vector form of Stokes' theorem.

Applied Probability and Statistics

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Calculus 1, Calculus 2

Corequisite Course(s): —

Course Description:

This course equips students with foundational and applied knowledge in probability and statistics, covering the following key topics:

Basic Concepts in Probability Theory: counting principles, combinations, permutations, Newton's binomial theorem, experiments, events, probability, and conditional probability;

Random Variables: definitions, probability distributions, and numerical characteristics such as expectation, variance, mode, and median;

Common Probability Distributions: binomial, Poisson, normal (Gaussian), and Student's t-distributions;

Sampling Theory: population and sample concepts, random sampling, sampling methods, sample statistics, and the distribution of sample statistics;

Estimation Theory: point estimation, interval estimation, and estimation methods;

Hypothesis Testing: Type I and Type II errors, significance levels, tests for means and proportions, comparison of two means and two proportions, and tests of independence;

Correlation and Regression: bivariate random variables, correlation coefficients (population and sample), empirical correlation tables, and regression lines based on observed data.

Physics 1

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with foundational knowledge in the following areas:

Mechanics: kinematics of particles, dynamics of particles, conservation laws, and rigid body motion;

Thermodynamics: fundamentals of the kinetic molecular theory, the First Law of Thermodynamics, and the Second Law of Thermodynamics;

Electricity and Magnetism: electric fields, magnetic fields, and time-varying electromagnetic fields.

Physics 2

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with in-depth knowledge in modern physics through the following key topics:

Einstein's Theory of Relativity: covering both special and general relativity;

Optics: wave optics and phenomena such as interference and diffraction of light, quantum optics including the photoelectric effect and Compton scattering;

Quantum Physics: de Broglie and Heisenberg's hypotheses, the Schrödinger equation, particle motion, and the quantization of physical quantities.
The course is supplemented by laboratory experiments designed to give students a more intuitive and practical understanding of the theoretical concepts. These experiments include:
Fundamentals of error analysis;
Determination of the moment of inertia of a wheel and friction force in bearings;
Measurement of gravitational acceleration using a physical pendulum;
Determination of the specific heat ratio of gases;
Investigation of RLC resonance circuits and measurement of RLC parameters using an oscilloscope;
Study of diode and transistor characteristics;
Measurement of the electron's charge-to-mass ratio using the magnetron method;
Laser diffraction through a plane grating and determination of laser wavelength;
Study of thermal radiation and verification of Stefan–Boltzmann law;
Observation of the photoelectric effect and determination of Planck's constant.

Physics Laboratory 1

Study-time distribution: (1 credits – 0 lecture / 1 lab / 6 self-study)

Prerequisite Course(s): Calculus 1
Corequisite Course(s): Physics 1
Course Description:
Physics Laboratory 1 consists of one module with nine experiments covering topics in kinematics, dynamics of particles, rigid body dynamics, and thermodynamics.
This course is designed to supplement theoretical knowledge for students in technology-related programs at both college and university levels. It helps learners better understand the nature of physical phenomena occurring in nature and reinforces the physics theories studied in the curriculum.
The course also aims to develop essential skills for future engineers, including observation, experimental techniques, measurement and calculation, data analysis, and data processing.

Physics Laboratory 2

Study-time distribution: (1 credits – 0 lecture / 1 lab / 6 self-study)

Prerequisite Course(s): Calculus 1, Physics 1, Physics Laboratory 1
Corequisite Course(s): —
Course Description:
Physics Laboratory 2 consists of one module with nine experiments focused on electromagnetism and optics.
This course is designed to supplement theoretical knowledge for undergraduate students in engineering and technology fields. It provides deeper insights into the nature of physical phenomena in the natural world and reinforces physics theories previously studied.
The course also aims to train future engineers in essential skills such as observation, conducting experiments, measurement and calculation, data analysis, and data processing.

General Chemistry

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:

This course provides students with fundamental knowledge of chemistry, serving as a foundation for understanding scientific and technical materials related to chemical processes.
The course helps students:
Understand the nature of atoms and molecules to explain the properties of matter;
Develop basic quantitative problem-solving skills related to thermodynamics, reaction kinetics, chemical equilibrium, solution properties, and electrochemical processes.
The course lays the groundwork for students to develop a deeper understanding of the material world, recognize the connection between chemistry and various engineering disciplines, and prepares them for advanced studies or second-degree university programs.

Advanced Mathematics for Electrical and Electronic Engineering

Study-time distribution: (4 credits – 4 lecture / 0 lab / 8 self-study)

Prerequisite Course(s): Calculus 1

Corequisite Course(s): —

Course Description:

This course provides foundational mathematical tools essential for electrical and electronic engineering, including:
Transform Methods: basic concepts and applications of mathematical transforms used in signal and system analysis;
Linear Algebra: matrix operations, vector spaces, eigenvalues and eigenvectors;
Differential Algebra: algebraic approaches to solving differential equations relevant to engineering problems;
Complex Functions: fundamentals of complex variable theory and its applications in engineering analysis.
The course aims to equip students with advanced mathematical skills to model, analyze, and solve complex problems in electrical and electronic engineering.

C Programming Language

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with fundamental knowledge about programming languages, including their definitions, classifications, and basic usage purposes.
It focuses on the C programming language, covering:
Data structures and control structures in C;
Practical knowledge and hands-on skills to design and implement programs for control and management tasks using C.
By the end of the course, students will have developed strong programming skills applicable in various engineering and technical domains.

Introduction to ECET

Study-time distribution: (3 credits – 2 lecture / 1 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:This 45-period course introduces students to general knowledge about the engineering profession, with a focus on the roles, responsibilities, and ethics of engineers.
Key topics include:

Basic concepts of engineering design;
Essential soft skills such as teamwork, communication, and presentation techniques.
The course aims to help students develop effective learning strategies during their academic studies and cultivate professional attitudes, behavior, and foundational knowledge to secure employment after graduation.

Electrical Circuits

Study-time distribution: (4 credits – 4 lecture / 0 lab / 8 self-study)

Prerequisite Course(s): Calculus 1
Corequisite Course(s): —
Course Description:
This course provides students with foundational knowledge of electrical circuits, including:
Kirchhoff's Laws (KCL and KVL);
Circuit Analysis Methods: equivalent transformations, nodal analysis, and mesh current analysis;
Circuit Theorems: Thevenin's and Norton's theorems, maximum power transfer theorem, and superposition theorem;
AC Steady-State Analysis: application of complex numbers to solve sinusoidal steady-state problems;
Special Circuits and Topics:
Reactive (inductive/capacitive) circuits;
Operational amplifier circuits;
Symmetrical and asymmetrical three-phase circuits;
Two-port networks;
Time-domain and frequency-domain analysis;
Bode plots;
Nonlinear circuits.
The course aims to build a strong analytical foundation for further study and application in electrical and electronic engineering.

Electronic circuits 1

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course provides students with fundamental knowledge of semiconductor materials and electronic components, along with the analysis of basic electronic circuits. Key topics include:
Semiconductor Devices: introduction to semiconductor materials and basic electronic components;
Diode Applications: rectifier circuits, clippers, clampers, logic gates, voltage multipliers, and Zener-based voltage regulators;
Transistor Amplifiers: single-stage amplifier circuits using Bipolar Junction Transistors (BJTs);
Basic Operational Amplifier (Op-Amp) Circuits: inverting and non-inverting amplifiers, voltage followers (buffers), integrators, differentiators, summing amplifiers (inverting and non-inverting), and differential amplifiers;
Power Supply and Voltage Regulation Circuits.

The course aims to establish a solid foundation for understanding and designing basic analog electronic systems.

Electronic circuits 2

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with advanced knowledge of electronic circuits, focusing on both analysis and design. Key topics include:Multistage Amplifiers;Feedback Circuits; Power Amplifiers;Oscillator Circuits;Filter Circuits.

The course builds upon foundational electronics to deepen students' understanding of circuit behavior and enhance their skills in designing more complex analog electronic systems.

Digital Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Basic Electronics

Corequisite Course(s): —

Course Description:

This course provides students with foundational and practical knowledge in digital systems, covering the following topics:

Number Systems and Basic Logic Gates;

Fundamental Theorems of Boolean Algebra;

Structure and Operation of Digital ICs: TTL and CMOS logic families, their characteristics, and classification;

Analog-to-Digital and Digital-to-Analog Conversion Principles;

Memory Devices: structure, operation, and applications;

Principles of Digital Oscillator Circuits;

Combinational and Sequential Logic Circuits: identification, analysis, and problem-solving strategies;

Digital System Design: methods to design and implement basic digital systems.

The course aims to develop students’ ability to analyze, interpret, and design fundamental digital electronic systems.

Digital Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Basic Electronics

Corequisite Course(s): —

Course Description:

This course provides students with foundational and practical knowledge in digital systems, covering the following topics:

Number Systems and Basic Logic Gates;

Fundamental Theorems of Boolean Algebra;

Structure and Operation of Digital ICs: TTL and CMOS logic families, their characteristics, and classification;

Analog-to-Digital and Digital-to-Analog Conversion Principles;

Memory Devices: structure, operation, and applications;

Principles of Digital Oscillator Circuits;

Combinational and Sequential Logic Circuits: identification, analysis, and problem-solving strategies;
Digital System Design: methods to design and implement basic digital systems.
The course aims to develop students' ability to analyze, interpret, and design fundamental digital electronic systems.

Microprocessors

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Digital Systems
Corequisite Course(s): —
Course Description:
This course equips students with fundamental and applied knowledge of microprocessor systems, including:
Role and Function of Microprocessors and the evolution of microcontroller systems;
Internal Architecture and Operating Principles of 8-bit microcontrollers;
Peripheral Devices of Microcontrollers: including timers/counters, analog-to-digital converters (ADC), interrupts, pulse-width modulation (PWM), and serial communication interfaces such as UART, SPI, and I2C;
Basic Assembly Language Programming and Advanced Programming in C for developing microcontroller-based control applications and embedded system circuits.
The course prepares students to understand, program, and apply microcontrollers in various engineering control systems.

Signals and Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Calculus 1
Corequisite Course(s): —
Course Description:
This course introduces methods for analyzing and processing analog signals, which are widely studied and applied in electrical and electronic engineering. The course covers:
Fundamental Concepts of analog signals and systems;
Time-Domain Analysis and Processing of analog signals;
Application of Operator Methods in analog signal processing;
Frequency-Domain Analysis and Processing of analog signals;
Practical Applications of analog signal processing techniques.
The course builds a solid theoretical foundation for further study in signal processing, communications, and control systems.

Data Communication

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Signals and Systems
Corequisite Course(s): —
Course Description:
This course provides students with a unified perspective on the broad field of computer and data communications, emphasizing fundamental principles and essential topics, including:
Core Concepts in data communication;
Multiplexing and Demultiplexing Techniques;
Error Detection and Correction Methods;

Flow Control Techniques;
Data Transfer Services between devices within circuits and across networks.
The course aims to equip students with both theoretical knowledge and practical understanding needed to analyze and design data communication systems.

Digital Signal Processing

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Signals and Systems
Corequisite Course(s): —
Course Description:
This course equips students with fundamental concepts and techniques in digital signal processing (DSP), including:
Sampling and Quantization of continuous-time signals;
Z-Transform and its applications in analyzing discrete-time systems;
Design and Implementation of Digital Filters (FIR and IIR);
Applications of digital signal processing in engineering systems.
The course provides both theoretical foundations and practical skills for analyzing and designing DSP systems in various fields such as communications, control, and multimedia.

Measurement and Sensors

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Signals and Systems
Corequisite Course(s): —
Course Description:
This course provides students with essential knowledge in electrical measurement and sensor technologies, including:
Fundamentals of Electrical Measurement;
Types of Indicating Mechanisms;
Measurement Techniques for quantities such as voltage, current, resistance, capacitance, inductance, frequency, phase angle, power, energy, and power factor;
Sensor Technologies: structure and operating principles of common industrial sensors;
Sensor Interface Circuits: basic circuits used for signal acquisition and processing from various types of sensors.
The course aims to prepare students for practical measurement tasks and sensor applications in industrial and automation systems.

Electromagnetic Fields

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Calculus 1, Calculus 2
Corequisite Course(s): —
Course Description:
This course introduces students to the fundamental concepts and equations governing electromagnetic fields, including:
Basic Concepts and Maxwell’s Equations;
Static Electromagnetic Fields;
Time-Invariant (Steady-State) Electromagnetic Fields;
Time-Varying Electromagnetic Fields;
Electromagnetic Radiation;

Waveguides and Resonant Cavities.
The course provides essential theoretical foundations for understanding electromagnetic phenomena in electrical and communication engineering.

Digital System and Integrated Circuit Design

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course equips students with knowledge and skills in the design of digital circuits and application-specific integrated circuits (ASICs). Key topics include:

Digital Circuit Design Flow and step-by-step methodology for designing digital systems;

Application-Specific Integrated Circuit (ASIC) Design Principles;

Hardware Description Language (HDL): fundamentals of Verilog HDL;

Design Using Verilog: modeling and implementation of combinational circuits, sequential circuits, synchronous and asynchronous systems, and finite state machines (FSMs).

The course aims to develop students' capabilities in designing and verifying digital systems at the register-transfer level (RTL) using modern design tools and methodologies.

Embedded Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): C Programming Language, Computer Architecture and Organization or Microprocessors

Corequisite Course(s): —

Course Description:

This course provides students with fundamental knowledge and practical skills in the design, interfacing, configuration, and programming of embedded systems.

The Arduino platform, a widely-used, low-cost embedded system popular among hobbyists, researchers, and industry professionals, is used throughout the course to implement the techniques learned in class.

By the end of the course, students will have a solid understanding of embedded system design and programming, preparing them for careers in both industry and research.

Telecommunication Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Electronic circuits 2, Communication Electronics

Corequisite Course(s): —

Course Description:

This course provides students with foundational knowledge in telecommunications, covering key concepts such as:

Signals, Spectra, Signal-to-Noise Ratio (SNR), and Bit Error Rate (BER);

Modulation Techniques for both analog and digital communication systems;

Multiplexing and Multiple Access Techniques;

Switching Techniques and Telecommunication Exchanges;

Overview of Modern Communication Systems.

The course aims to establish a theoretical and practical basis for further study and application in communication and network engineering.

Microwave Engineering

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Communication Electronics
Corequisite Course(s): —
Course Description:
This course introduces students to the fundamental theories of microwave engineering, with a focus on:
Wave Propagation Phenomena at microwave frequencies;
Smith Chart analysis and its applications;
Impedance Matching Techniques for efficient power transfer in microwave systems.
The course provides a theoretical foundation essential for understanding and designing high-frequency circuits and components used in advanced communication systems..

Wireless Communication Systems
Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Telecommunication Systems
Corequisite Course(s): —
Course Description:
This course provides students with foundational and advanced concepts in wireless communication systems, including:
Mobile Communication Technologies: overview of 2G, 3G, 4G, and 5G systems;
Microwave and Satellite Communications;
Advanced Wireless Solutions to enhance frequency reuse, security, capacity, diversity, and energy harvesting;
Multiple Access Techniques used in modern wireless systems.
The course prepares students to understand and analyze the structure, technologies, and challenges of contemporary and future wireless communication systems.

Analog Integrated Circuit Design
Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course equips students with the knowledge and skills to design and analyze analog integrated circuit applications, including:
Operational Amplifiers, Current Mirrors, and Differential Amplifiers;
Voltage References, Charge Pumps, and various memory structures such as DRAM, SRAM, and Flash Memory.
The course emphasizes designing circuits under constraints such as chip area, power efficiency, gain, stability, and frequency response.
Students will also learn to evaluate different circuit design techniques, analyze trade-offs, and propose optimal analog design solutions.

Foundations and Applications of IoT
Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Embedded Systems
Corequisite Course(s): —
Course Description:

This course introduces students to the fundamental concepts and practical applications of the Internet of Things (IoT), focusing on:
IoT Platforms: including both hardware and software platforms commonly used in IoT systems;
M2M Communication Protocols: such as Zigbee, Bluetooth, IEEE 802.15.4, IEEE 802.15.6, and IEEE 802.11 (Wi-Fi), and their roles in IoT networks;
Data Processing and Information Handling Mechanisms within IoT architectures.
The course provides students with a comprehensive understanding of how to design, implement, and manage IoT systems for real-world applications.

Machine Learning and Artificial Intelligence

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course provides students with foundational knowledge in applied mathematics for machine learning (ML) and artificial intelligence (AI), along with key concepts and methodologies, including:
Fundamentals of Machine Learning and Artificial Neural Network Architectures;
Training Algorithms and Optimization Methods;
Design and Training of Deep Learning Models, including multilayer networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs);
Hands-on Development of AI/ML Applications using open-source libraries.
The course prepares students to understand, design, and implement intelligent systems using modern AI/ML techniques and frameworks.

Object-Oriented Programming and Software Engineering

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course introduces students to object-oriented programming (OOP) concepts, which differ from the sequential programming approach taught in earlier courses. Key topics include:
Fundamental Principles of OOP: such as classes, objects, inheritance, encapsulation, and polymorphism;
C# Programming Language: based on the standard C language, emphasizing object-oriented features;
Object-Oriented Design and Development: understanding how to model and build software using object-oriented techniques;
Basic Software Engineering Practices: including object-oriented system design, construction, and testing.
The course aims to equip students with the skills to develop modular, maintainable, and testable software systems using modern programming paradigms.

Power Electronics

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
This course provides students with comprehensive knowledge in power electronics, focusing on the following key topics:
Basic Power Semiconductor Devices: characteristics and switching behavior;
Rectifiers: definitions, classifications, applications, operating principles, control methods, voltage/current equations, and waveform analysis;
DC-DC Converters: types, operation, analysis, control methods, voltage/current relations, and waveform characteristics;
Inverters: definitions, types (voltage-source and current-source, single-phase and three-phase), operating principles, harmonic analysis, and control strategies;
AC-AC Converters (Cycloconverters and AC Voltage Controllers): classifications, applications, circuit operation, waveform analysis, and voltage/current expressions;
Inverter Control Techniques and Simulation Tools for analyzing and modeling power electronic circuits.
The course equips students with theoretical foundations and practical simulation skills to analyze and design power conversion systems in industrial and renewable energy applications.

Embedded Systems in Industry

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Microcontrollers
Corequisite Course(s): —
Course Description:
This course provides students with the essential knowledge to develop embedded systems with diverse functionalities. Students will learn how to integrate hardware and software components within an embedded system and apply them across various domains such as:
Industrial Automation
Agricultural Technology
Medical Devices
Consumer Electronics
Key topics include methods for system design, embedded programming, simulation, testing, and performance evaluation. The course prepares students to confidently design and deploy embedded solutions in real-world applications.

Programmable Control Systems

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Microprocessors, Digital Systems
Corequisite Course(s): —
Course Description:
This course equips students with practical knowledge in programmable control systems, focusing on:
Sensor Output Interpretation: methods to determine and calculate output values as required;
Sensor and Actuator Interfacing: various connection types between sensors, actuators, and PLC controllers;
PLC (Programmable Logic Controller): structure, operating principles, functions, and control logic;
Instruction Set Programming: application of PLC command sets to implement industrial control systems.

The course aims to provide hands-on skills and theoretical understanding for designing and deploying PLC-based automation solutions.

Image Processing

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with foundational mathematical concepts and practical techniques in digital image processing, including:

Mathematical Foundations: convolution, filtering, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT), and Wavelet transforms;

Image Processing Techniques: image enhancement, restoration, edge detection, segmentation, recognition, compression, and reconstruction.

The course aims to equip students with the theoretical background and practical skills to analyze and develop image processing applications across various domains such as computer vision, robotics, and multimedia.

Digital IC Design with HDL

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This course provides students with essential knowledge of digital integrated circuit (IC) design using Hardware Description Languages (HDL), with a focus on VHDL. Topics include:

Introduction to IC Design Technologies: including ASIC, FPGA, and PLD;

VHDL for Digital Design: modeling and implementation of combinational and sequential circuits;

Design Optimization Techniques:

Operator Sharing Optimization

Functional Unit Sharing Optimization

Finite State Machine (FSM) Modeling: for designing more complex sequential digital systems;

Simulation Tools: application of industry-supported simulation software from Xilinx and Altera to verify functionality and validate digital designs.

By the end of the course, students will be able to describe, simulate, and optimize digital circuits using VHDL for practical hardware implementation.

Sensor Technology

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

With the rapid growth in modern technologies, the use of various types of sensors has expanded across diverse fields such as environmental monitoring, manufacturing, industrial automation, and biomedical engineering.

This course focuses on:

Theoretical Foundations and Operating Principles of different sensor types;

Practical Applications of sensors in real-world systems;
Measurement Techniques related to sensor integration;
Sensor Signal Processing and Sensor-Based Measurement Systems.
The course aims to provide students with a comprehensive understanding of sensor technologies and their role in intelligent and automated systems.

Android Programming for Control Applications

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course equips students in Electronics and Telecommunication Engineering with fundamental knowledge of Android application development for control systems. Key topics include:
Introduction to Android OS Development Tools and architecture;
Basic Components of an Android Application;
User Interface Design and Control Objects in Android;
Event Handling Methods and packaging/deployment of Android applications;
Integration with Modern Technologies: SMS, Bluetooth, Wi-Fi, NFC, voice recognition, and accelerometer sensors.
The course emphasizes combining Android programming skills with foundational knowledge in electronics and microprocessors to build practical control-oriented applications.

Intelligent Systems

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —
Corequisite Course(s): —
Course Description:
This course provides students with foundational knowledge for implementing intelligent processing models as functional systems. It introduces four key types of intelligent systems:
Cloud-Based Systems
Edge Computing Systems
IoT Hardware-Interfacing Systems
Mobile Robotics-Interfacing Systems
The course emphasizes the integration of intelligent algorithms within practical system architectures, preparing students to design and deploy smart solutions across various modern technology domains.

Artificial Intelligence and Applications

Study-time distribution: (3 credit – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Probability and Statistics
Corequisite Course(s): —
Course Description:
This course introduces students to the training of deep learning models for solving complex real-world problems. The curriculum is divided into three main parts:
Basic Python Programming: including core Python syntax and object-oriented programming concepts;

Deep Learning Fundamentals: key components of deep learning models and training methodologies;
Data Annotation and Analysis Tools: tools and techniques for labeling and analyzing datasets used in classification and object detection tasks.
The course equips students with both theoretical understanding and practical skills for developing AI-driven solutions in various application domains.

Electronics Practice

Study-time distribution: (2 credit – 0 lecture / 2 lab / 8 self-study)

Prerequisite Course(s): Electrical Circuits, Basic Electronics, Electrical Practice
Corequisite Course(s): —
Course Description:
This hands-on course provides students with practical skills in electronics through the following activities:
Use of Measurement Instruments commonly applied in electronic engineering;
Identification of Basic Electronic Components: such as resistors (R), inductors (L), capacitors (C), diodes, BJTs, FETs, and operational amplifiers (Op-Amps);
Verification of Basic Circuit Applications: comparing theoretical knowledge with real-world implementation and analyzing circuit behavior;
Application and Analysis: applying basic electronic circuits in practical contexts and evaluating their performance in real systems.
The course aims to strengthen students' ability to connect theoretical concepts with practical electronic systems.

Digital Systems Lab

Study-time distribution: (1 credit – 0 lecture / 1 lab / 4 self-study)

Prerequisite Course(s): Digital Systems

Course Description:

This laboratory course guides students through hands-on practice with digital electronic circuits, including:

Basic Digital Components: logic gates, flip-flops, counters, and registers;

Combinational and Sequential Circuit Design;

Memory Modules;

Analog-to-Digital Converters (ADC) and Digital-to-Analog Converters (DAC);

Practical Applications of digital circuits in real-world systems.

The course aims to reinforce students' understanding of digital design concepts through experimental implementation and testing.

Microprocessor Lab

Study-time distribution: (2 credit – 0 lecture / 2 lab / 8 self-study)

Prerequisite Course(s): Microprocessors
Corequisite Course(s): —
Course Description:
This practical course provides students with hands-on experience in programming and interfacing microcontrollers with various peripheral devices. Key activities include:

Controlling Output Devices: single LEDs, 7-segment displays, LCDs, and LED matrices;

Interfacing Input Devices: keypads and real-time clocks;

Data Communication and Signal Processing: serial communication, timers, and counters for product counting;

Analog Signal Handling: ADC conversion for temperature measurement;

Practical Embedded Applications using microcontrollers.

The course helps students bridge the gap between theory and practice, preparing them for real-world embedded system development.

Measurement and Sensor Lab

Study-time distribution: (2 credit – 0 lecture / 2 lab / 8 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

This hands-on course familiarizes students with electrical measuring instruments and practical techniques in measurement and sensor applications. Key activities include:

Operation, Testing, and Calibration of electrical measuring devices;

Measurement Techniques for quantities such as voltage, current, resistance, capacitance, inductance, frequency, phase angle, power, energy, and power factor;

Identification, Analysis, and Application of common industrial sensors.

The course aims to develop students' technical skills in performing accurate measurements and applying sensor technologies in real-world industrial systems.

Embedded Systems Lab

Study-time distribution: (2 credit – 0 lecture / 2 lab / 8 self-study)

Prerequisite Course(s): Embedded Systems

Corequisite Course(s): —

Course Description:

This practical course provides students with hands-on experience in building and operating embedded systems, focusing on:

Embedded System Architecture

Fundamentals of Embedded Operating Systems

Real-Time Operating Systems (RTOS): structure, scheduling, and task management

Through lab exercises, students will gain practical skills in configuring and programming embedded platforms, working with real-time constraints, and integrating software with hardware components for embedded applications.

Data Communication Lab

Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)

Prerequisite Course(s): Data Communication

Corequisite Course(s): —

Course Description:

This laboratory module gives students practical experience in data-communication engineering. Activities include interconnecting digital network devices and computers, configuring links, and examining real-world data-transfer protocols and their performance.

Foundations & Applications of IoT Lab
Study-time distribution: **(1 credit – 0 lecture / 1 lab / 2 self-study)**
Prerequisite Course(s): Data Communication
Corequisite Course(s): —

CourseDescription:
Students learn to deploy IoT operating-system platforms and design complete IoT applications in diverse domains. Lab work covers central processors, wireless standards (e.g., Zigbee, Bluetooth, IEEE 802.15.4/6/11), end-to-end data protocols, and cloud or on-premise web servers.

Analog IC Design Lab
Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)
Prerequisite Course(s): Analog Integrated Circuit Design
Corequisite Course(s): —

CourseDescription: Hands-on sessions lead students through CMOS analog-circuit design, schematic capture, layout, and SPICE-level simulation. Typical blocks include op-amps, current mirrors, references, and charge pumps, with emphasis on area, power, gain, stability, and bandwidth trade-offs

Wireless Communication Systems Lab
Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)
Prerequisite Course(s): Wireless Communication Systems
Corequisite Course(s): —

CourseDescription:
Experiments explore wireless-channel models, fading and ISI impacts, multicarrier and OFDM techniques, spread-spectrum signaling, MIMO processing, and multi-user scenarios. Students evaluate system performance using MATLAB/Simulink or SDR platforms.

Digital Circuit Design Lab

Study-time distribution: **(1 credit – 0 lecture / 1 lab / 2 self-study)**

Prerequisite Course(s): Digital System

Corequisite Course(s): —

Course Description:
Students design, simulate, and build digital circuits such as EPROM interfaces, counters, combinational networks, and semiconductor memories. Emphasis is on schematic capture, timing analysis, PCB prototyping, and functional testing.

Machine Learning & AI Lab
Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
This practicum focuses on coding ML/AI applications in Python. Students customize data

loaders, loss functions, and deep-network topologies, then train and evaluate models with open-source frameworks to meet varied data-set requirements.

Telecommunication Systems Lab

Study-time distribution: (2 credits – 0 lecture / 2 lab / 4 self-study)

Prerequisite Course(s): Telecommunication Systems

Corequisite Course(s): —

Course Description:
Through circuit-level experiments, students assemble and characterize AM/FM transceiver blocks, digital-modulation and pulse-modulation schemes, and basic RF front-end stages, linking theory to hardware performance.

Industrial Embedded Systems Lab

Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)

Prerequisite Course(s):

Embedded Systems in Industry

Corequisite Course(s): —

Course Description:
The lab guides students in architecting microcontroller-based systems that integrate hardware/software interfaces for audio processing, data acquisition, and industrial communications, followed by functional verification and performance assessment.

Image Processing Lab

Study-time distribution: **(1 credit – 0 lecture / 1 lab / 2 self-study)**

Prerequisite Course(s): Image Processing

Corequisite Course(s): —

Course Description:
Students implement image-processing algorithms in MATLAB and deploy real-time recognition pipelines on Raspberry Pi hardware, culminating in a proof-of-concept vision application.

Power Electronics Lab

Study-time distribution: (2 credits – 0 lecture / 2 lab / 4 self-study)

Prerequisite Course(s): Power Electronics

Corequisite Course(s): —

Course Description:
Learners assemble rectifiers, inverters, AC voltage controllers, and DC-DC converters; capture waveforms; compute key parameters; debug faults; and design synchronized gate-drive and modulation circuits for efficient power conversion.

Digital IC Design with HDL Lab

Study-time distribution: (2 credits – 0 lecture / 2 lab / 4 self-study)

Prerequisite Course(s): Digital IC Design with HDL

Corequisite Course(s): —

Course Description:

Using VHDL, students describe, simulate, synthesize, and implement digital circuits on PLD/FPGA platforms, then validate functionality through on-board testing in real-world applications.

AI & Applications Lab

Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

Advanced exercises train students to tailor deep-learning pipelines—custom data ingestion, bespoke loss definitions, and architecture variations—to create versatile models accommodating heterogeneous data types.

Programmable Control Lab

Study-time distribution: **(2 credits – 0 lecture / 2 lab / 4 self-study)**

Prerequisite Course(s): Programmable Control Systems

Corequisite Course(s): —

Course Description:

Students interface diverse sensors with PLCs, select suitable hardware, and develop ladder-logic or structured-text programs to meet specified industrial-automation tasks, followed by system testing and performance evaluation.

AI & Applications Lab

Study-time distribution: (1 credit – 0 lecture / 1 lab / 2 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:

Advanced deep-learning practice focused on:

- Custom data loaders and loss functions
- Tailoring architectures for heterogeneous data

Training, validation, and deployment of diverse AI models

Programmable Control Lab

Study-time distribution: **(2 credits – 0 lecture / 2 lab / 4 self-study)**

Prerequisite Course(s): Programmable Control Systems

Corequisite Course(s): —

Course Description:

Students will:

- Interface industrial sensors and actuators with PLCs
- Select suitable PLC hardware for specified tasks
- Develop ladder-logic or structured-text programs and validate system performance

Communication Electronics

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:
This course supplies a systematic overview of communication-electronics circuits, covering:

- High-frequency amplifiers and tuned circuits
- Band-pass and image-rejection filters
- Impedance-matching networks
- Analogue modulation and demodulation blocks used in radio-frequency transmitters and receivers

Automatic Control Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:
Students learn fundamental science and mathematical tools for analysing and designing feedback control systems used in electrical and electronic devices:

- Mathematical modelling of dynamic plants
- Time- and frequency-domain analysis (root-locus, Bode, Nyquist)
- Stability criteria and performance indices
- Design of PID and lead/lag controllers and compensators

Electrical and Electronic Materials

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): —

Corequisite Course(s): —

Course Description:
Topics include:

- Electrical conduction, insulation, and carrier control in conductors, semiconductors, and dielectrics
- Transduction mechanisms that convert non-electrical variables to electrical quantities
- Material choices for magnetic, optoelectronic, nano- and superconducting applications
- Material selection for device packaging, machines, and sensors

Antenna and Wave Propagation

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)

Prerequisite Course(s): Electromagnetic Fields, Communication Electronics, Microwave Circuit

Corequisite Course(s): —

Course Description:
The course develops the mathematical foundations of antenna theory and radio-wave propagation:

- Transmission lines and waveguides

- Free-space, tropospheric, and optical-fibre propagation modes
- Antenna parameters, radiation patterns, and array synthesis

Microwave Circuits

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): Microwave Engineering
Corequisite Course(s): —

Course Description:
Students study components and subsystems at microwave frequencies, including:

- Lumped and distributed microwave devices
- Low-noise and power amplifiers, oscillators
- Power dividers/combiners and impedance-matching networks

Optical Communication Systems

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): Telecommunication Systems
Corequisite Course(s): —

Course Description:
Key topics:

- Electro-optic and opto-electronic conversion
- Optical modulation, amplification, and multiplexing techniques
- Connector, splice, and coupling technologies for optical fibre links
- Signal-to-noise ratio (SNR), bit-error rate (BER), and optical-network architectures

Deep-Learning Theory and Applications

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
The course covers:

- Optimisation principles for training neural networks
- Architectures: deep fully connected, convolutional, recurrent, and residual networks
- Practical techniques (regularisation, normalisation, transfer learning)
- Representative applications across computer vision, speech, and natural-language processing

Big-Data Analytics

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Students receive an overview of big-data characteristics, challenges, and value extraction. Content includes:

- Predictive analytics and data-mining workflows
- Hadoop ecosystem, MapReduce paradigm, and Apache Spark processing engine
- Design and implementation of large-scale analytical pipelines

Digital Integrated Circuit Design

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): Digital System and IC Design
Corequisite Course(s): —

Course Description:
Focus areas:

- Design of basic combinational and sequential logic gates
- Timing analysis, parasitic R–L–C effects, and power optimisation
- Standard-cell layout and full-chip floorplan methodologies

Mobile Communication Systems

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Core subjects:

- Evolution from 2G GSM through 3G WCDMA, 4G LTE, to 5G NR
- Wireless channel modelling and cellular network architecture
- Signalling, quality-of-service measurement, and network performance assessment

Computer Communication Networks

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Coverage includes:

- TCP/IP protocol suite and network services
- Hubs, switches, routers, and fixed-access topologies
- Data-link, network, and transport-layer functions in telecommunication networks

Digital Communications

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Digital System and IC Design
Corequisite Course(s): —

Course Description:
Students gain fundamental knowledge of modern digital-transmission systems:

- Signal representation, coherent and non-coherent modulation/demodulation
- Optimum receiver design and performance analysis
- Multicarrier techniques, ISI mitigation, equalisation, and channel coding

SoC Design

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Using SystemVerilog and industrial EDA tools, the course addresses:

- Top-down SoC architecture and bus-based integration
- IP reuse, system-level synthesis, and on-chip verification methodologies
- Testbench construction and formal-verification concepts

CMOS Physical IC Design

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Students explore physical-design automation for VLSI, including:

- Clustering, partitioning, floorplanning, placement, and detailed/global routing
- Layout compression, design-rule checking, and parasitic extraction

DFT Techniques and Testing

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Graduate-level coverage of VLSI test methods:

- Fault models, fault simulation, and ATPG
- Scan-path design, built-in self-test (BIST), and boundary-scan standards
- Yield analysis and design-for-reliability considerations

Mixed-Signal IC Design

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Fundamentals of mixed-signal circuits, focusing on:

- Switched-capacitor techniques
- A/D and D/A converter architectures
- System-level and transistor-level modelling with Verilog-A

IC Fabrication Technology

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
An introduction to semiconductor manufacturing:

- Clean-room protocols and wafer cleaning
- Diffusion, lithography, wet & dry etching, CVD, sputtering
- Process integration steps leading to complete ICs

IC Packaging Engineering

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Covers principles, materials, and technologies used in microelectronic packaging:

- Package design trade-offs, fabrication processes, and assembly techniques
- Signal-integrity and power-integrity verification (EM/IR)
- Emerging multi-chip and 3D-integration approaches

Pulse and Digital Circuits

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Topics include:

- Pulse-waveform generation and linear-network response
- Switching-circuit analysis, multivibrators, one-shots, flip-flops
- Logic-family characteristics (TTL, NMOS, ECL, CMOS, LVT) and timing issues

Linux Programming Tools

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
A practical guide to becoming an effective Unix/Linux user:

- Shell scripting, build systems, debugging, and version control
- Text processing, networking commands, and automation scripting

RF IC Design

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Principles and design of CMOS RF integrated circuits:

- System-level considerations for wireless transceivers
- Design of LNAs, mixers, VCOs, and phase-locked loops
- Simulation with Cadence SpectreRF and layout guidelines

VLSI Design Automation

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Key CAD issues across the VLSI flow:

- Logic synthesis and partitioning
- Floorplanning, placement, global/detailed routing
- Clock-tree and power-grid synthesis; emerging EDA trends

Digital Television and Multimedia

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Digital Techniques
Corequisite Course(s): —

Course Description:
Content spans:

- Analogue radio/TV fundamentals (AM, FM, monochrome, colour)
- Digital audio and video broadcasting architectures
- Serial bit stream framing, audio/video compression, HDTV standards

Biomedical Signal and Image Processing

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Digital Techniques
Corequisite Course(s): —

Course Description:
Overview of biomedical signals (EEG, EMG, fNIRS) and images (CT, MRI):

- Digital-signal transforms, filtering, and feature extraction
- Neural-network methods for biomedical data analysis

Advanced Microprocessors

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): Microprocessors
Corequisite Course(s): —

Course Description:
Detailed study of 32-bit ARM Cortex microcontrollers:

- Core architecture, pipeline, and instruction set
- On-chip peripherals and advanced interfacing techniques
- Firmware development for real-time embedded applications

Electronics Circuit Design

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): Basic Electronics, Digital Systems
Corequisite Course(s): —

Course Description:
Covers the design of:

- Linear power supplies and audio-frequency power amplifiers
- Common sensors (photoresistors, thermocouples, accelerometers) and their interface circuits
- Widely used ICs (555 timer, LM741, TL082, LM339, ISD2560) within complete electronic subsystems

Machine Learning

Study-time distribution: **(3 credits – 3 lecture / 0 lab / 6 self-study)**
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Fundamentals of machine-learning algorithms and Python implementation:

- Supervised learning, unsupervised learning, and recommender systems
- Model evaluation and selection techniques using Scikit-learn

Industrial Communications

Study-time distribution: (3 credits – 3 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Provides a broad view of industrial electronic-communication circuits:

- High-frequency amplification, filtering, and impedance matching
- Analogue modulation/demodulation methods for field and factory networks

Project 1

Study-time distribution: (1 credit – 0 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
Students practise product-design principles:

- Specification drafting, design-option evaluation, technical reporting, and presentation
- Considerations of intellectual property, standards, techno-economics, reliability, safety, and engineering ethics

Project 2

Study-time distribution: (1 credit – 0 lecture / 0 lab / 6 self-study)
Prerequisite Course(s): —
Corequisite Course(s): —

Course Description:
A continuation of *Project 1*, further reinforcing professional design skills and deliverables under similar guidelines.

Internship

Study-time distribution: (2 credits – 0 lecture / 2 lab / 4 self-study)
Prerequisite Course(s): Project 1, Project 2
Corequisite Course(s): —

Course Description:
Students work at local or international electronics companies, performing real engineering tasks under industrial supervision, thereby gaining professional experience as future electronics-telecommunication engineers.

Graduation Thesis

Study-time distribution: (10 credits – 0 lecture / 10 lab / 20 self-study)
Prerequisite Course(s): Completion of all graduation-eligible courses and the Internship
Corequisite Course(s): —

Course Description:
Under faculty guidance, students undertake an independent research or design project in one of the following areas: switching, transmission and telecom networks, VHDL, digital-signal processing, or embedded systems. Findings are documented and defended before an academic committee.

Digital IC Design with HDL Lab

Study-time distribution: (2 credits – 0 lecture / 2 lab / 4 self-study)
Prerequisite Course(s): Digital IC Design with HDL
Corequisite Course(s): —

Course Description:
Using VHDL and PLD/FPGA boards, students will:

Describe, simulate, and synthesise combinational and sequential logic

Implement designs on hardware and verify in-circuit functionality

10. Facilities for Learning

10.1 Workshops, Laboratories & Major Experimental Systems

- Electronics Laboratory
- Digital Systems Laboratory
- Microprocessor Laboratory
- Digital IC Design Laboratory
- Telecommunication Laboratory
- IC Design Laboratory
- Signal Processing Laboratory
- Embedded Systems Laboratory

10.2 Library & Web Resources

- Library of Ho Chi Minh City University of Technology and Education
- Internet-based resources

11. Program Implementation Guidelines: The training program is implemented in accordance with the current regulations for full-time university-level credit-based training,

as stipulated by the Ministry of Education and Training and Ho Chi Minh City University of Technology and Education.

The specified hours are calculated as follows:

- 1 credit = 15 hours of theoretical lectures or in-class discussions
- 1 credit = 30 - 45 hours of laboratory work or practical exercises
- 1 credit = 30 hours of self-study
- 1 credit = 45 - 90 hours of on-site internship
- 1 credit = 45 - 60 hours for project work or graduation thesis

The total hours for a course must be a multiple of 15.

Political Theory Knowledge: Implemented according to the regulations of the Ministry of Education and Training.

Foreign Language Knowledge: The foreign language output standard is determined by the university's Science and Training Council at the beginning of each admission cohort. Throughout their studies, the university will monitor the students' foreign language proficiency development each academic year to decide the number of credits for courses that students are allowed to register for in a semester. Students can self-study or register for the foreign language proficiency development program according to the university's plan.

Physical Education Knowledge: Implemented according to the regulations of the Ministry of Education and Training. For Physical Education 2 and 3, students can select from the course catalog when registering for modules.

National Defense Education Knowledge: Implemented according to the regulations of the Ministry of Education and Training. Students accumulate credits and are granted a certificate after completing the requirements of the module.

Elective Social Sciences and Humanities Knowledge: Students select 2 courses, equivalent to 4 credits, from the course catalog when registering for modules.

Elective Foundational Major Knowledge: Students select 2 courses, equivalent to 6 credits, from the course catalog when registering for modules.

Elective Specialized Major Knowledge: Students select 2 courses, equivalent to 6 credits, from the course catalog when registering for modules.

The remaining knowledge blocks are arranged into 8 semesters as presented in section 8.

VICE PRESIDENT	**DEAN OF FACULTY OF INTERNATIONAL EDUCATION**
Dr. Quach Thanh Hai	**Assoc. Prof. Dr. Truong Dinh Nhon**