

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

UNDERGRADUATE PROGRAM
Major of
MECHATRONIC 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: Mechatronic Engineering Technology

Level: Undergraduate

Major: Mechatronic Engineering Technology

Major Code: 7510203A

Ho Chi Minh City, 2025

UNDERGRADUATE PROGRAM

Education Name: Mechatronic Engineering Technology

Level: Undergraduate

Major: Mechatronic Engineering Technology

Major Code: 7510203A

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/QĐ-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/QĐ-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 will be able to grasp natural and social principles and laws; possess fundamental practical skills; have political and ethical qualities; be capable of independent and creative work and solving problems in the automotive engineering technology field; be able to pursue further education; have good health; demonstrate professional responsibility, meeting societal demands; and have a sense of serving the people, contributing to socio-economic development, ensuring national defense, security, and international integration.

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

- 1 Form a stable foundation of general knowledge, foundation and core knowledge and specialised/ major knowledge of **Mechatronic Engineering Technology**.

2 Use proficiently self-studying skillsmajor, problem solving skills and professional skills in the major of **Mechatronic Engineering Technology**.

3 Communicate effectively, organize, lead and conduct teamwork.

4 Apply well competences of brainstorming, designing, deploying, and operating the **Mechatronic systems**

Program outcomes

ELOs	Program outcomes	Competency Level
ELO1	Able to apply knowledge of mathematics and natural sciences to solve engineering problems in the field of mechatronics.	
PI1.1	Able to apply laws, theorems, and principles in natural sciences to build mathematical models for engineering problems in the field of mechatronics.	3
PI1.2	Able to apply laws, theorems, and principles in mathematics to construct engineering problems in the field of mechatronics.	3
PI1.3	Able to explain and analyze engineering problems in the field of mechatronics, thereby knowing how to apply the results to design components of a mechatronic system.	4
ELO2	Able to design experiments, conduct experiments, analyze results, and draw conclusions.	
PI2.1	Able to design experiments, use laboratory equipment, and conduct experiments to collect data.	3
PI2.2	Able to analyze experimental data and consequently conclude the results for the research problem.	4
PI2.3	Able to present technical reports in the field of mechatronics.	3
ELO3	Able to develop technical solutions for the mechatronics field, both domestically and globally, based on technical knowledge, specialized skills, and professional ethics.	
PI3.1	Recognize the impact of the mechatronics field on social, environmental, and economic contexts, both domestically and globally.	4
PI3.2	Apply professional responsibility and ethics in the process of developing technical solutions for the mechatronics field.	3
PI3.3	Understand the concepts and approaches to entrepreneurial implementation	2

ELO4	Able to continuously update necessary knowledge and skills when encountering new situations.	
PI4.1	Able to identify new solutions (or techniques) and tools when encountering a new situation in the field of mechatronics.	4
PI4.2	Able to interpret new solutions (or techniques) and tools in the field of mechatronics.	4
PI4.3	Able to apply appropriate solutions (or techniques) and tools in a given situation in the field of mechatronics.	3
ELO5	Able to work effectively in a team.	
PI5.1	Able to establish a collaborative work environment with high cooperation among team members to achieve work objectives.	3
PI5.2	Understand assigned work responsibilities and contribute to the team's success.	2
PI5.3	Able to establish plans, organize implementation, and facilitate the team in achieving work objectives.	3
ELO6	Able to interact effectively through presentations or in the form of written documents and technical drawings.	
PI6.1	Able to explain and convey work content through presentations.	4
PI6.2	Able to explain and convey work content in the form of written documents and technical drawings.	4
PI6.3	Able to read, understand, and write using English in engineering.	3
ELO7	Able to identify and analyze complex problems in mechatronic systems by modeling and simulating them with the aid of specialized software.	
PI7.1	Able to use specialized software (Matlab, Ansys, etc.) to build models and simulate the mechanical-control components that constitute a mechatronic system.	4
PI7.2	Able to calculate and analyze results from the simulation process.	4
ELO8	Able to design and develop mechatronic systems	
PI8.1	Able to select appropriate sensors, actuators, materials, and mechanical components to design highly automated mechatronic parts or products.	5

PI8.2	Able to design the constituent parts of mechatronic systems with the aid of specialized software to create highly automated mechatronic products.	5
PI8.3	Able to write software and manufacture hardware for controllers with the aid of appropriate software and tools	5
PI8.4	Able to use equipment/tools to manufacture mechanical components within mechatronic systems.	3
ELO9	Able to operate, maintain, manage maintenance, and improve mechatronic systems.	
PI9.1	Able to operate machinery or highly automated production lines.	3
PI9.2	Able to plan and manage maintenance for mechatronic systems.	4
PI9.3	Able to improve automated production systems to achieve higher production efficiency.	5

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.
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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 → English for Thesis Writing.

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	57	2
General Politics + Laws	14	14	
Social Sciences and Humanities	2		2
English	8	8	
Mathematics and Natural Sciences	25	25	0
Technical Computer Sciences	7	7	
Introduction to Mechatronic Engineering Technology	3	3	
Professional knowledge	99	87	12
Foundation of Major	44	38	6
Professional Major	27	21	6

Practices	16	16	
Internship	2	2	
Capstone project (MET)	10	10	
Physical and National Defense Education	Non-accumulation		
<i>National Defence Education 1</i>	1		
<i>National Defence Education 2</i>	1		
<i>National Defence Education 3</i>	1		
<i>National Defence Education 4</i>	1		
<i>Physical Education 1</i>	1		
<i>Physical Education 2,3</i>	2		
Communicative English	Non-accumulation		
Communicative English 1	4		
Communicative English 2	4		
Enterprise Seminar	1		
Total	158	144	14

7. Content of Program

A – Compulsory Courses

7.1. General Knowledge

No.	Course's ID	Course name	Credits	Prerequisite
1.	LLCT130105E	Philosophy of Marxism and Leninism	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.	GELA236939E	General Law	3	
7.	MATH132401E	Calculus 1	3	
8.	MATH132501E	Calculus 2	3	
9.	MATH132601E	Calculus 3	3	

10.	MATH132901E	Mathematical Statistics for Engineers	3	
11.	INME130729E	Introduction to Mechatronic Engineering	3(2+1)	
12.	AMME231529E	Applied Mathematics in Mechanical Engineering	3(2+1)	
13.	PHYS130902E	Physics 1	3	
14.	PHYS131002E	Physics 2	3	
15.	PHYS111202E	Physics - Laboratory 1	1	
16.	GCHE130603E	General Chemistry for Engineers	3	
17.	COPR134529E	Computer Programing	3(2+1)	
18.	DSAL220229E	Data Structure and Algorithm	2	
19.	ACEN340535E	Academic English 1	4	
20.	ACEN340635E	Academic English 2	4	
21.	ENTW621038E	English for Thesis Writing	2	
22.	COEN140135E	Communicative English 1	4	Non-accumulation
23.	COEN140235E	Communicative English 2	4	Non-accumulation
24.	GDQP110131	Giáo dục quốc phòng 1 (<i>National Defence Education 1</i>)	1	Non-accumulation
25.	GDQP110231	Giáo dục quốc phòng 2 (<i>National Defence Education 2</i>)	1	Non-accumulation
26.	GDQP110331	Giáo dục quốc phòng 3 (<i>National Defence Education 3</i>)	1	Non-accumulation
27.	GDQP110431	Giáo dục quốc phòng 4 (<i>National Defence Education 4</i>)	1	Non-accumulation
28.	PHED110130	Giáo dục thể chất 1 (<i>Physical Education 1</i>)	1	Non-accumulation
29.	Giáo dục thể chất 2,3 (<i>Physical Education 2,3</i>)		2	Choose 2
30.	FOOT112330	Bóng đá (<i>Football</i>)	1	Non-accumulation
31.	VOLL112330	Bóng chuyền (<i>Volleyball</i>)	1	Non-

				accumulation
32.	BASK112330	Bóng rổ (<i>Basketball</i>)	1	Non-accumulation
33.	BADM112330	Cầu lông (<i>Badminton</i>)	1	Non-accumulation
34.	TENN112330	Quần vợt (<i>Tennis</i>)	1	Non-accumulation
35.	KARA112330	Không thủ đạo (<i>Karate</i>)	1	Non-accumulation
36.	CHES112330	Cờ vua (<i>Chess</i>)	1	Non-accumulation
37.	CHIN112330	Cờ tướng (<i>Chinese Chess</i>)	1	Non-accumulation
38.	YOGA112330	Yoga (<i>Yoga</i>)	1	Non-accumulation
39.	PICK112330	Pickle ball	1	Non-accumulation
40.		Knowledge of Social Sciences and Humanities	2	
		Total	59	

7.2. Professional knowledge

7.2.1. Foundation of major

No.	Course's ID	Course name	Credits	Prerequisite
1.	ELEN220829E	Electrical Engineering	2	
2.	ENMA220230E	Materials Science	2	
3.	MEDR141123E	Mechanical Engineering Drawing	4(3+1)	
4.	ENME142020E	Engineering Mechanics	4(3+1)	
	TOMT220225E	Measuring Techniques & Tolerances	2	
5.	MEMA230720E	Mechanics of Materials	3	
6.	MMCD230323E	Mechanisms and Machine Components Design	3	
7.	MDPR310423E	Machine Design Project	1	

8.	SESI230529E	Sensor and Signal Processing Technology	3(2+1)	
9.	INAU220629E	Industrial Automation	2	
10.	AUCO230329E	Automatic Control	3(2+1)	
11.	ELEE220929E	Electronics Engineering	2	
12.	FMMT330825E	Fundamentals of Machinery Manufacturing Technology	3	
13.	AFME324020E	Applied Fluid Mechanics	2	
14.	DITE226829E	Digital Techniques	2	
15.		Knowledge of Social Sciences and Humanities	6	
		Total	44	

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

– Compulsory subjects

No.	Course's ID	Course name	Credits	Prerequisite
2.	POED320429E	Power Electronics and Drive	2	
3.	MICO231329E	Microcontrollers and Microprocessors	3(2+1)	
4.	IRBO321429E	Introduction to Robot	2(1+1)	
5.	DEMA331629E	Design of Mechatronic Systems	3(2+1)	
6.	MAEN321729E	Maintenance Engineering	2	
7.	CACC322525E	CAD/CAM-CNC	2	
8.	INCO331829E	Intelligent Control	3(2+1)	
9.	PAEN334329E	Applied Programming in Engineering	3(2+1)	
10	SEMI310026E	Enterprise Seminar	0(1)	
11.	MDPR412429E	Mechatronic System Design Project	1	
		<i>Elective specialized knowledge (section B)</i>	6	
Total			27	

7.2.2.b Major Practices

No.	Course's ID	Course name	Credits	Prerequisite
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1.	MHAP110127E	Mechanical Works Practice	1	
2.	BMPR230227E	Basic Mechanical Practice	3	
3.	IALA323229E	Industrial automation Laboratory	2	
4.	MSLA313129E	Measurement and Sensor Laboratory	1	
5.	EDLA213529E	Electronic Circuit Design Laboratory	1	
6.	MCAD218829E	Mechatronic CAD Practice	1	
7.	MILA313629E	Microcontroller Laboratory	1	
8.	CELA313329E	Control Engineering Laboratory 1	1	
9.	CELA313729E	Control Engineering Laboratory 2	1	
10.	MALA313829E	Industrial Automation Equipment operation and Maintenance Laboratory	1	
11.	PCCC322725E	Practice of CAD/CAM-CNC	2	
12.	PDSA214129E	Practice of Data Structure and Algorithm	1	
13.	FAIN426029E	Mechatronics Internship	2	
Total			18	

7.2.3. Capstone project

No.	Course's ID	Course name	Credits	Prerequisite
1.	GRAT405029E	Graduation Thesis	10	
Total			10	

B – Optional Subjects

Knowledge of Social Sciences and Humanities: 2 Credits (*Choose 1 course*)

No.	Course's ID	Course name	Credits	Prerequisite
1.	PRQU220526E	Production and Quality Management	2	
2.	BPLA121808E	Business Plan	2	
3.	SYTH220491E	System Thinking	2	
4.	PLSK120290E	Planning Skills	2	
5.	REME320690E	Research Method	2	

6.	REME435325E	Advanced Research in Mechanical Engineering	3	
7.	AEST220224E	Industrial Fine Arts	2	
8.	SCDR120324E	Sketch Drawing	2(1+1)	
		Total	2	

Foundation of major: 6 Credits (Students must accumulate at least 6 credits from the following courses)

No.	Course's ID	Course name	Credits	Prerequisite
1.	FTHE124425E	Fundamentals of Heat Transfer	2	
2.	HYPN221129E	Pneumatic & Hydraulic Technology	2	
3.	IFEM231020E	Introduction to the Finite Element Method	3(2+1)	
4.	DEAE324029E	Introduction to Design of Experiments and Statistical Data Analysis	2	
5.	EEMA328229E	Electrical and Electronic Materials	2	
6.	DEAE338129E	Design of Experiments and Statistical Data Analysis	3(2+1)	
7.	TDHT435525E	Thermodynamics and Heat Transfer	3(2+1)	
8.	DYMS332420E	System Dynamics	3(2+1)	
9.		Total	6	

Professional Major: 6 Credits (Choose 2 courses)

1 Specialization in Intelligent Mechatronic Systems

No.	Course's ID	Course name	Credits	Prerequisite
1.	INCN331929E	Industrial Communication Networks	3(2+1)	ELEE220929E DILO221029E MICO231329E COPR130129E DSAL220229E
2.	MAVI332529E	Machine Vision	3(2+1)	INCO321829E COPR130129E DSAL220229E

3.	EMSY337329E	Embedded System	3(2+1)	MICO231329E
4.	IOTM332229E	IoT in Mechatronics	3(2+1)	ELEE220929E DILO221029E MICO231329E COPR130129E DSAL220229E
5.	AUME432329E	Automotive Mechatronics	3(2+1)	
6.	AIME335129E	AI Applications in Mechatronic Systems	3(2+1)	COPR130129E DSAL220229E INCO321829E AUCO230729E
7.	PCSE331229E	Process Control and Instrumentation	3(2+1)	
8.	PRAI438329E	Applied Programming in AI	3(2+1)	
9.	MLDL438429E	Machine Learning and Deep Learning	3(2+1)	
10.	BIME438529E	Biomedical Mechatronics	3(2+1)	

2 Specialization in Robot and AI

No.	Course's ID	Course name	Credits	Prerequisite
1.	MAVI332529E	Machine Vision	3(2+1)	INCO321829E COPR130129E DSAL220229E
2.	IOTM332229E	IoT in Mechatronics	3(2+1)	ELEE220929E DILO221029E MICO231329E COPR130129E DSAL220229E
3.	MALE432629E	Machine Learning	3(2+1)	INCO321829E COPR130129E DSAL220229E
4.	AURO432729E	Autonomous Robot	3(2+1)	ROBO331429E AUCO230729E COPR130129E DSAL220229E SESI230529E

				MICO231329E TMME222123E MCDE232223E
5.	DRON432829E	Drone	3(2+1)	ROBO331429E AUCO230729E COPR130129E DSAL220229E SESI230529E MICO231329E TMME222123E MCDE232223E AFME324020E
6.	EMSY337329E	Embedded System	3(2+1)	MICO231329E COPR130129E DSAL220229E
7.	VIIN432929E	Virtual Reality Interaction	3(2+1)	COPR130129E DSAL220229E APIM324329E IOTM432229E
8.	PRAI438329E	Applied Programming in AI		
9.	MLDL438429E	Machine Learning and Deep Learning		
10.	BIME438529E	Biomedical Mechatronics		

3: Specialization in Controller Design for Intelligent Mechatronic Systems

No.	Course's ID	Course name	Credits	Prerequisite
11.	IOTM332229E	IoT in Mechatronics	3(2+1)	ELEE220929E DILO221029E MICO231329E COPR130129E DSAL220229E
12.	FPGA438629E	FPGA	3(2+1)	
13.	VLSI438729E	VLSI	3(2+1)	
14.	CHIP432420E	Semiconductor Manufacturing Technology	3(2+1)	
15.	EMSY337329E	Embedded System	3(2+1)	

16.	PRAI438329E	Applied Programming in AI	3(2+1)	
17.	MLDL438429E	Machine Learning and Deep Learning	3(2+1)	
18.	BIME438529E	Biomedical Mechatronics	3(2+1)	

C – Interdisciplinary: 6 Credits (*Students may choose 6 interdisciplinary credits to substitute for specialized elective courses. Students should seek further advice from an academic advisor for suitable choices.*)

No.	Course's ID	Course name	Credits	Prerequisite
1.	AMDR221223E	Advanced Mechanical Engineering Drawing	2	
2.	ACCC321325E	Advanced CAD/CAM-CNC	2	
3.	PACC320624E	Practice of Advanced CAD/CAM-CNC	2	
4.	RAPT330724E	Rapid Prototyping and Reverse Engineering	3(2+1)	
5.	WEPR330479E	Web Programming	3(2+1)	
6.	OOPR230279E	Object-Oriented Programming	3(2+1)	
7.	BDES333877E	Big Data Essentials	3(2+1)	
8.	SOEN330679E	Software Engineering	3(2+1)	

D – 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:

8. Training plan

1st Semester

No.	Course's ID	Course name	Credits	Prerequisite	Term 1/2
1.	MATH132401E	Calculus 1	3		1
2.	INME130729E	Introduction to Mechatronic Engineering	3(2+1)		1
3.	PHYS130902E	Physics 1	3		2
4.	GCHE130603E	General Chemistry for Engineers	3		2
5.	COPR134529E	Computer Programing	3(2+1)		2
6.	PHED110513	Giáo dục thể chất 1 (Physical Education 1)	0(1)		2

7.	GELA236939E	General Law	3		1
8.	ACEN340535E	Academic English 1	4		1
9.	LLCT130105E	Philosophy of Marxism and Leninism	3		2
Total			25		

2nd Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term 1/2
1.	MATH132501E	Calculus 2	3		1
2.	PHYS131002E	Physics 2	3		1
3.	MEDR141123E	Mechanical Engineering Drawing	4(3+1)		1
4.	PHYS111202E	Physics - Laboratory 1	1		1
5.	TOMT220225E	Measuring Techniques & Tolerances	2	MEDR141123E	2
6.	ENMA220230E	Materials Science	2	PHYS130902E	2
7.	ENME142020E	Engineering Mechanics	4(3+1)	PHYS130902E	2
8.	ACEN340635E	Academic English 2	4		1
9.		Giáo dục thể chất 2 (tự chọn 1) <i>Physical Education 2 (Elective1)</i>	0(1)	Non-accumulation	2
10.		Giáo dục Quốc phòng <i>National Defence Education</i>	0(4)	Non-accumulation	
Total			23		

3rd Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term 1/2
1.	MATH132601E	Calculus 3	3	MATH13240E MATH132501E	1
2.	ELEN220829E	Electrical Engineering	2	PHYS130902E	1

3.	DSAL220229E	Data Structure and Algorithm	2	COPR134529E	1
4.	MEMA230720E	Mechanics of Materials	3	PHYS130902E ENME142020E	1
5.	AMME231529E	Applied Mathematics in Mechanical Engineering	3(2+1)	MATH132401E MATH132501E	2
6.	MATH132901E	Mathematical Statistics for Engineers	3		2
7.	ELEE220929E	Electronics Engineering	2	PHYS130902E	2
8.	LLCT120205E	Political Economics of Marxism and Leninism	2		1
9.	LLCT120405E	Scientific socialism	2		2
10.	Knowledge of Social Sciences and Humanities		2		2
11.	Giáo dục thể chất 3 (tự chọn 2) <i>Physical Education 3 (Option 2)</i>		0(1)	Non-accumulation	2
Total			24		

4th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term 1/2
1.	SESI230529E	Sensor and Signal Processing Technology	3(2+1)	PHYS131002E ELEE220929E ELEN220829E AMME230329E	1
2.	DITE226829E	Digital Techniques	2	PHYS130902E	1
3.	PDSA214129E	Practice of Data Structure and Algorithm	1	COPR134529E DSAL220229E	1
4.	AUCO230329E	Automatic Control	3(2+1)	PHYS130902E PHYS131002E ELEE220929E ELEN220829E AMME131529E	1

				MMCD240823E	
5.	AFME324020E	Applied Fluid Mechanics	2	PHYS130902E AMME230329E	1
6.	MMCD230323E	Mechanisms and Machine Components Design	3	ENME142020E	2
7.		Elective Foundational Knowledge in the Major	6		2
8.	MHAP110127E	Mechanical Works Practice	1		2
9.	MSLA313129E	Measurement and Sensor Laboratory	1	ELEN220829E ELEE220929E SESI230529E	2
10.	ENTW621038E	English for Thesis Writing	2		2
Total			24		

5th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term 1/2
1.	MICO231329E	Microcontrollers and Microprocessors	3(2+1)	ELEE220929E ELEN220829E DITE226829E POED320429E	2
2.	FMMT330825E	Fundamentals of Machinery Manufacturing Technology	3	MEDR141123E TOMT220225E MCDE232223E BMPR230527E	1
3.	EDLA213529E	Electronic Circuit Design Laboratory	1	ELEN220829E ELEE220929E DITE226829E	2
4.	MCAD218829E	Mechatronic CAD Practice	1		1
5.	MDPR310423E	Projects of Machine Design	1	MCDE232223E MCDE232223E TMME222123E	1

6.	BMPR230227E	Basic Mechanical Practice	3	MCDE232223E TOMT220225E	1
7.	IRBO321429E	Introduction to Robot	2(1+1)	ENME142020E MMCD240823E	1
8.	POED320429E	Power Electronics and Drive	2	PHYS131002E ELEE220929E ELEN220829E	2
9.	INAU220629E	Industrial Automation	2	ELEE220929E ELEN220829E DITE226829E SESI230529E PNHY221129E	2
10.	LLCT120314E	Ho Chi Minh's ideology	2		1
11.	LLCT220514E	History of Vietnamese communist party	2		2
Total			22		

6th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term1 /2
1.	INCO331829E	Intelligent Control	3(2+1)	AUCO230329E COPR134529E DSAL220229E	2
2.	CACC322525E	CAD/CAM-CNC	2	FMMT330825E MEDR141123E	1
3.	MILA313629E	Microcontroller Laboratory	1	MICO231329E	2
4.	IALA323229E	Industrial Automation Laboratory	2	INAU220629E SESI230529E	1
5.	CELA313329E	Control Engineering Laboratory 1	1	MICO231329E POED320429E FUME324020E AUCO230329E INAU220629E COPR134529E DSAL220229E	2

6.	PAEN334329E	Applied Programming in Engineering	3(2+1)	COPR134529E PDSA214129E MICO231329E SESI230529E	1
7.	DEMA331629E	Design of Mechatronic Systems	3(2+1)	ENME142020E TMME222123E FUME324020E PNHY221129E AUCO230329E INAU220629E IRBO321429E	2
8.	PCCC322725E	Practice of CAD/CAM-CNC	2	CACC320225E	2
Total			17		

7th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term1 /2
1.	CELA313729E	Control Engineering Laboratory 2	1	MICO231329 POED320429 FUME324020 AUCO230329 INAU220629 COPR134529 DSAL220229 DEMA331629	1
2.	MDPR412429E	Project of Mechatronic System Design	1		1
3.	MALA313829E	Industrial automation equipment operation and Maintenance Laboratory	1	MAEN321729 ROBO331429	2
4.	MAEN321729E	Maintenance Engineering	2		1
5.	FAIN426029E	Mechatronics Internship	2		2
6.	SEMI310026E	Enterprise Seminar	1	Non-accumulation	2

7.		Elective Professional Courses	6		1
Total			13		

8th Semester:

No.	Course's ID	Course name	Credits	Prerequisite	Term1/2
1.	GRAT405029E	Graduation Thesis	10		1,2
Total			10		

9. Course Descriptions

9.1 GENERAL KNOWLEDGE

1. 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.

2. 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.

3. Introduction to Mechatronic Engineering

Credits: 3 (2+1)

- *Course workload: 3 (2, 1, 6)*
- *Prerequisites:*

Course description: The goal of this course is to provide first-year students a broad outline of engineering, the skills needed to explore different disciplines of engineering and help them decide on a career in engineering.

4. System Thinking

Credits: 2

- *Course workload: 2 (2,0,4)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of systems theory, systems thinking methodology, and creative thinking methods. It aims to cultivate in students the ability to reason and solve problems systematically, logically, and creatively.

5. Planning Skills

Credits: 2

- *Course workload: 2 (2,0,4)*
- *Prerequisites:*

Course description: This course provides learners with fundamental knowledge of planning methodologies. It guides them in developing critical thinking and problem-solving skills to identify solutions that suit their individual circumstances. This empowers learners to create effective short-term and long-term academic plans, personal plans, and career plans. Additionally, the course offers instruction on time management and efficient work organization skills.

6. Research Method

Credits: 2

- *Course workload: 2 (2,0,4)*
- *Prerequisites:*

Course description: During their university education, students don't just acquire knowledge from instructors; they also need to engage in self-study and independent research. Through proactiveness, diligence, and creativity, students will discover new insights to offer deeper explanations or find appropriate solutions – this is essentially scientific research.

The Scientific Research Methods course covers fundamental concepts, processes, and structures related to research. This empowers students to effectively choose research topics, draft proposals, and apply appropriate research methods when gathering and processing information for their scientific endeavors. Students will then be well-prepared to proactively register for university-level research projects and successfully complete their graduation thesis or capstone project in a scientific manner.

7. Electrical Engineering

Credits: 2

- *Course workload: 2(2:0:4)*
- *Prerequisites:*

Course description: This course provides students with the knowledge to solve problems related to electrical circuits and electrical machines. Specifically, students will learn fundamental laws and theorems and apply complex numbers to analyze electrical circuit problems. Furthermore, students will study and analyze circuits, including mutual inductance, for simple electrical circuits and electrical machines as applied in Mechatronic Systems.

8. Computer Programing

Credits: 3(2+1)

- *Course workload: 3(2:1:2)*
- *Prerequisites:*

Course description: This course provides learners with fundamental knowledge of computer programming and the Python programming language. It equips students with the basic knowledge and skills in computer programming, including: identifying problem requirements, developing algorithms (flowcharts), building programs, and compiling them. The course aims to give learners a theoretical foundation and the necessary skills to grasp and utilize programming software for developing control programs for real-world systems. Additionally, the course introduces basic knowledge of databases and SQL.

9. Data Structure and Algorithm

Credits: 2

- *Course workload: 2(2:0:4)*
- *Prerequisites:*

Course description: This course aims to provide learners with fundamental knowledge of **basic data structures and algorithms**. It equips students with the core knowledge and skills in data structures and algorithms, including: analyzing and building data structures, and evaluating the advantages and disadvantages of different data structures to select appropriate structures and algorithms for various problems.

10. Practice of Data Structure and Algorithm

Credits: 1

- *Course workload: 1(0:1:2)*
- *Prerequisites:*

Course description: his course aims to reinforce students' foundational knowledge of basic data structures and algorithms. Given a technical requirement (e.g., finding the maximum CPU temperature to date), learners will independently build a real-world data system and apply algorithms learned in the "Informatics in Engineering" and "Data Structures and Algorithms" theory modules to identify the most suitable algorithm for that specific technical problem.

9.2 FUNDAMENTAL MECHATRONICS ENGINEERING COURSES

1. Mechanical Engineering Drawing

Credits: 4(3+1)

- *Course workload: 4 (3, 1, 8)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of **engineering drawing and descriptive geometry**. Students will learn about:

1. Drawing Standards: International conventions for presenting technical drawings.
2. Geometric Construction Tools: Tools and methods for solving common geometric problems in design and technical drawing.
3. Projection & Orthographic Projection Methods: Principles of projection and the use of orthographic projections in technical drawing to represent objects from various views.
4. Object Representation Standards: Rules and regulations for depicting objects in technical drawings, including detail drawings and assembly drawings.

This course helps students develop skills in reading, interpreting, and creating technical drawings for machine parts and assemblies. It also fosters a scientific work ethic, meticulousness, and a disciplined approach, which are essential qualities for technical professionals.

2. Engineering Mechanics

Credits: 4(3+1)

- *Course workload: 4 (3, 1, 8)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of statics, kinematics, and kinetics of rigid bodies. Specifically:

- Statics covers concepts related to the conditions for static equilibrium of particles and rigid bodies under the action of forces.
- Kinematics focuses on the geometric parameters of planar motion for rigid bodies and points within them.
- Kinetics investigates the motion of rigid bodies under the influence of forces.

Building on this knowledge, students will be able to determine reaction forces in mechanical systems. Using kinematics, they can design mechanisms that satisfy given geometric motion requirements. Finally, kinetics allows students to determine the characteristics of rigid body motion under force. This foundational knowledge prepares students for subsequent courses such as: Strength of Materials, Principles of Machines - Machine Elements, Machine Design Project, Vibrations in Engineering, Robotics Design courses, and the Graduation Project.

Each week, students will have practice sessions in class to review theoretical content. Students will also be guided on how to use Maple software to solve complex calculation problems, applying these skills to related specialized courses, course projects, and their graduation project.

3. Mechanics of Materials

Credits: 3

- *Course workload: 3(3, 0, 6)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge regarding:

- Stress, strain, and the mechanical behavior of materials.
- Methods for calculating the strength, stiffness, and stability of structures and machine components under various loading conditions: tension-compression, bending, torsion, and combined loading.
- Static and dynamic loads. Calculation methods for the strength and stiffness of structures and machine components subjected to both static and dynamic loads.

This course enables students to solve problems related to calculating and verifying the strength, stiffness, and stability of structures and machine components. Subsequently, students will apply the knowledge gained from this course to address machine design problems when undertaking their course projects and graduation projects.

4. Mechanisms and Machine Components Design

Credits: 3

- *Course workload: 3(3,0, 6)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge related to the calculation and design of machines and machine elements. This includes basics of mechanism structures, common machine mechanisms in mechanical engineering, principles for calculating and designing general-purpose machine components, working principles, construction, and design principles for mechanical drives, and common machine connections such as shafts, bearings, couplings, and frequently used mechanical joints like threaded and welded joints.

The course helps students develop a design mindset: designing machines and machine elements based on the operating conditions of the object, such as working modes, component position within assemblies, and loading conditions.

This course also assists students in developing skills in researching and interpreting technical documentation and applying them in technical design work.

7. Fundamentals of Heat Transfer

Credits: 2

- *Phân bố thời gian học tập: 2 (2, 0, 4)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of thermodynamics, covering the first and second laws of thermodynamics. It explores the characteristics, properties, and energy transformations of thermodynamic processes, including the conversion of heat to work in both forward and reverse cycles, as well as the thermal properties of working fluids that maximize the efficiency of these transformations in real-world applications.

For the heat transfer section, the course equips students with essential concepts and knowledge, as well as the laws governing heat exchange, specifically: heat conduction, convective heat transfer, and thermal radiation.

8. Applied Fluid Mechanics

Credits: 2

- *Phân bố thời gian học tập: 2 (2, 0, 4)*
- *Prerequisites:*

Course description: This course introduces fundamental concepts and methods for studying fluid mechanics. It systematically presents basic knowledge of fluid statics, kinematics, and dynamics for application in analyzing various real-world problems. These include: hydrostatic pressure, fluid dynamic forces on loaded surfaces, description of flow fields, derivation of differential equations for ideal/real fluid motion, and problems related to pipelines, lubrication, and fluid dynamic similitude.

Beyond foundational knowledge, the course also presents and guides students through virtual experiments using software. This allows learners to visualize, understand, and deeply grasp abstract concepts in fluid mechanics.

9. Projects of Machine Design

Credits: 1

– *Course workload: 1 (0, 1, 2)*

– *Prerequisites:*

Course description: this course helps students to systematize and apply foundational engineering knowledge (Engineering Mechanics, Strength of Materials, Principles of Machines - Machine Elements, Engineering Drawing) in the calculation and design of mechanical structures. Specifically, students will:

- Understand the basis for selecting mechanical drive options and spatial arrangement of drive components.
- Calculate the technical resistance forces of working parts and the required speed of the working shaft.
- Comprehend the basis for selecting an electric motor based on required power and appropriate speed.
- Perform calculations for various drives (belt, chain, gears), design shafts, and select rolling bearings.
- Design reasonable machine casing structures, cast components, and metal processing techniques.
- Develop design documentation (design calculation reports, assembly drawings, manufacturing drawings).

This course helps students cultivate a design mindset – designing machine components and mechanical structures based on the object's operating conditions, such as working mode, component position within an assembly, and loading conditions.

The course also assists students in developing skills in researching and interpreting technical documentation and applying these skills in technical design work.

Finally, the course helps students develop a scientific work ethic, meticulousness, and a disciplined approach, which are crucial qualities for technical professionals.

10. Measuring Techniques & Tolerances

Credits: 2

– *Course workload: 2 (2, 0, 4)*

– *Prerequisites:*

Course description:

This course provides fundamental knowledge on:

- Interchangeability in Mechanical Manufacturing: Exploring concepts of interchangeability, tolerances, and fits for common mechanical joints like plain cylindrical fits, key and spline fits, and threaded joints. It also covers methods for solving dimensional chain problems and the basic principles for dimensioning detail drawings, along with various measuring instruments and methods for measuring fundamental part parameters.
- Mechanical Metrology Lab: This section focuses on methods for measuring basic parameters of machine-manufactured mechanical components, introducing measuring instruments and equipment, precision, operational procedures, error calculation, and data processing.

11. Materials Science

Credits: 2

- *Course workload:* 2 (2, 0, 4)
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of:

- Common engineering material classifications.
- Concepts such as chemical bonding, crystal lattices, lattice defects, and diffusion.
- Common heat treatment methods.
- Criteria for evaluating mechanical properties and typical failure modes.
- Composition, properties, standard designations, and applications of metals, plastics, ceramic materials, composite materials, and advanced materials.

This course enables students to select appropriate engineering materials for specific applications.

12. Electrical and Electronic Materials

Credits: 2

- *Course workload:* 2(2:0:4)
- *Prerequisites:*

Course description: This course enables students to delve into the fundamental nature of materials that determine their electrical properties, such as conduction, insulation, and controlled current flow within semiconductor layers. It explores the applications of materials in current electrical and electronic engineering and technology.

The course also investigates phenomena related to the conversion of various physical quantities into electrical quantities. Students will study the materials used to construct electrical components, equipment, electrical machinery, and basic electronic components, along with methods for controlling current flow within these materials. Additionally, the course covers new materials with strong applications in the electrical industry, such as superconductors and nanomaterials.

This foundational course serves as a prerequisite, helping students develop a deeper understanding as they progress into specialized subjects.

13. Fundamentals of Machinery Manufacturing Technology

Credits: 3

- *Course workload:* 3 (3, 0, 6)
- *Prerequisites:*

Course description: This subject provides learners with the fundamental principles of metal cutting, the physio-chemico-mechanical phenomena that occur during cutting, and the characteristics and role of the technological system. Learners will gain knowledge of various machining methods, issues related to machining errors, and measures to overcome them to improve machining accuracy and surface quality of products. They will also learn to calculate setup errors during machining, especially datum errors, and to calculate the technological dimension chain during setup.

14. Electronics Engineering

Credits: 2

- *Course workload: 2(2:0:4)*
- *Prerequisites:*

Course description: This subject provides students with fundamental knowledge of semiconductor materials and electronic components such as Diodes, Transistors, Thyristors, optoelectronic components, and Op-Amps. It covers the analysis and design of basic parameters for simple electronic circuits like rectifiers, clipping circuits, DC power supplies, transistor switching circuits, and amplifier circuits using Op-Amps.

15. Digital Techniques

Credits: 2

- *Course workload: 2 (2, 0, 4)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of digital engineering, number systems, and the operating principles and structure of digital systems. It equips students with the knowledge to analyze and design digital integrated circuits. The course content will cover: number systems, Boolean algebra, combinational logic circuits, sequential circuits, memory, arithmetic circuits, and more.

16. Sensor and Signal Processing

Credits: 3(2+1)

- *Course workload: 3 (2,1, 6)*
- *Prerequisites:*

Course description: This course provides students with knowledge of the critical role of sensors and sensor signal processing methods within a control system. It covers sensor concepts and general characteristics of sensors such as transfer function, sensitivity, measuring range, accuracy, hysteresis, nonlinearity, noise, etc. Students will learn about various input and output signal types and the general principles of sensor fabrication, operation, and measurement. This includes operational principles based on changes in resistance, capacitance, inductance, and phenomena like mechanical waves, sound waves, and optics. Students will understand the operation of common sensors like: force sensors, temperature sensors, pressure sensors, capacitive sensors, magnetic sensors, optical sensors, and other types such as radar, lidar, GPS, fingerprint sensors, and touchscreens. This knowledge will equip students with the ability to select appropriate sensors for specific engineering applications in the field of mechatronics

17. Automatic Control

Credits: 3(2+1)

- *Course workload: 3(2:1:6)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of automatic control theory for continuous and discrete linear systems. It equips students with the knowledge and skills to model physical systems, and to apply mathematical tools for analyzing system dynamic characteristics, evaluating system dynamic quality, and designing and tuning control systems. This is a foundational course for the major, helping students build essential knowledge to quickly grasp specific, in-depth applications in production process automation.

18. Pneumatic & Hydraulic Technology

Credits: 2

- *Course workload: 2 (2,0,4)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of:

- The operating principles of pneumatic, electro-pneumatic, hydraulic, and electro-hydraulic systems.
- The basic principles for designing, calculating, and simulating pneumatic and hydraulic systems.

19. Industrial Automation

Credits: 2

- *Course workload: 2 (2, 0, 4)*
- *Prerequisites:*

Course description: This course provides students with knowledge of the structure of an automatic control system. Students will learn how to apply sensors, actuators, and programmable logic controllers (PLCs) to automate production lines. Additionally, this course covers PLC programming methods and the application of PLCs to automate industrial production processes

.9.3SPECIALIZED KNOWLEDGE

1. Microcontrollers and Microprocessors

Credits: 3(2+1)

- *Course workload: 3 (2, 1, 6)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of microcontrollers. It helps students understand the basic structure of a microcontroller and microprocessor, and how to interface microcontrollers with peripherals. The course also equips students with the skills to design an electronic board using a microcontroller and the programming methods to control electromechanical systems.

2. Introduction to Robot

Credits: 2(1+1)

- *Course workload: 3 (2, 1, 6)*
- *Prerequisites:*

Course description: This course provides students with an understanding of robotics and its engineering applications in manufacturing automation, services, and daily life. Based on the knowledge introduced, students will be able to quickly approach and effectively utilize various types of robots, such as industrial, service, and professional service robots, in specific application areas.

3. Process Control and Instrumentation

Credits: 3(2+1)

– *Course workload: 3 (2, 1, 4)*

– *Prerequisites:*

Course description: This course provides Mechatronics Engineering students with fundamental knowledge of process equipment and its control. It focuses on applying automatic control theory and automation devices to manage process parameters such as level, flow, pressure, temperature, and composition within mechatronic systems. Students will also gain skills in using software for simulation, control programming, and designing monitoring interfaces for mechatronic systems related to these process parameters.

4. Design of Mechatronic Systems

Credits: 3(2+1)

– *Course workload: 3 (2, 1, 4)*

– *Prerequisites:*

Course description: This course provides Mechatronics Engineering students with a general understanding of industrial mechatronic systems. It covers drive methods using various types of motors, and delves into kinematic and dynamic analysis to build mathematical models for typical mechanisms. Students will learn to construct general block diagrams of control systems and understand specialized control devices used in this field. The course also teaches how to implement digital PID controllers for controlling the velocity and position of components within mechatronic systems. Additionally, methods for designing motion trajectories and interpolation algorithms for multi-axis mechatronic servo systems are introduced.

5. Power Electronics and Drive

Credits: 2

– *Course workload: 2 (2, 0, 4)*

– *Prerequisites:*

Course description: This course provides students with fundamental knowledge of power electronic components and common rectifiers and inverters found in power electronic converters, as well as DC-AC conversion methods. Simultaneously, this course equips students with the ability to select appropriate power ratings for power electronic components or motor power to suit a specific mechatronic system

6. Machine Vision

Credits: 3(2+1)

– *Course workload: 3(2, 1, 4)*

– *Prerequisites:*

Course description: This course provides Mechatronics Engineering students with knowledge of still and moving image processing techniques. This includes fundamental processing skills such as programmatic image and camera manipulation, blurring, noise reduction, edge detection, and color space conversion, as well as advanced techniques like color and shape recognition, and motion detection. Concurrently, students will learn to apply image processing techniques to create intelligent vision systems for machines (machine vision), used in production lines and daily life.

7. Industrial Communication Networks

Credits: 3(2+1)

– *Course workload: 3(2, 1, 4)*

– *Prerequisites:*

Course description: This course equips students with fundamentals of industrial data transmission. These following topics will be covered: data terminal equipment and communication protocols of common industrial communication network such as: Profibus, Can, DeviceNet, Modbus, Ethernet, AS-i. After the course, students can design a communication network to serve the automation of manufacturing systems in industry. Upon completion, students will be able to design a communication network system for automating production systems in industry and daily life. mạng truyền thông công nghiệp thông dụng và cách sử dụng một số phần mềm SCADA thông dụng để thiết kế giao diện giám sát trạng thái. Sau khi học xong người học có khả năng thiết kế một hệ thống mạng truyền thông phục vụ việc tự động hóa hệ thống sản xuất tự động trong công nghiệp và đời sống

8. Intelligent Control

Credits: 3(2+1)

– *Course workload: 3(2, 1, 4)*

– *Prerequisites:*

Course description: This course provides Mechatronics Engineering students with fundamental knowledge of artificial neural networks, fuzzy systems, and optimization search algorithms like Genetic Algorithm (GA) and Particle Swarm Optimization (PSO). This includes: the structure and training algorithms of neural networks, the structure and representation algorithms of fuzzy systems, and the GA/PSO optimization algorithms. Additionally, students will learn how to design artificial neural networks, fuzzy systems, and GA/PSO algorithms for recognition, forecasting, and control problems within Mechatronics systems.

9. Embedded System

Credits: 3(2+1)

– *Course workload: 3(2, 1, 4)*

– *Prerequisites:*

Course description: This course provides Mechatronics Engineering students with fundamental knowledge of embedded systems, covering hardware design/development and software development for embedded systems. Additionally, students will engage with practical applications and experiments, applying the theoretical knowledge they've learned to real problems.

10. FPGA

Credits: 3(2+1)

– *Course workload: 3(2, 1, 4)*

– *Prerequisites:*

Course description: This course covers the following main topics: FPGA-based control system design, FPGA interfacing techniques, real-time operating systems, and programming mechatronic control systems using FPGAs. The program structure consists of three parts: Part 1: Hardware Controller Design with FPGA This section focuses on designing controllers (hardware) using FPGAs, utilizing Quartus software to design hardware modules. Part 2: Verilog Language Introduction This part introduces the Verilog language, basic techniques for synthesis and simulation, the Verilog language structure for logic gates, and how to build and declare modules. Part 3: FPGA Applications in Mechatronics This final section covers the application of FPGAs in designing control modules such as ADC, DAC, PWM, PID, etc., for controlling mechatronic systems.

11. VLSI

Credits: 3(2+1)

- *Course workload: 3(2, 1, 4)*
- *Prerequisites:*

Course description: This course covers CMOS transistors, CMOS logic cells and circuits, simulation of CMOS transistors and logic circuits, design of combinational and sequential logic circuits using CMOS (at the transistor level), and the design of data path and array subsystems. CMOS processing, fabrication, packaging, and testing of VLSI CMOS chips are also discussed.

13. Autonomous Robot

Credits: 3(2+1)

- *Course workload: 3(2,1,6)*
- *Prerequisites:*

Course description: This course provides students with knowledge of the fundamental principles of autonomous vehicle mechanics, control, and localization. Students will learn how to determine the kinematics and dynamics of autonomous vehicles and the basic principles of perception for intelligent autonomous vehicles, including mapping, decision-making, and autonomous navigation. Additionally, students will understand how to apply intelligent control algorithms to autonomous vehicle control. Furthermore, this course will cover the overall system architecture, chassis, electronic systems, and powertrain systems for autonomous vehicles.

14. Drone

Credits: 3(2+1)

- *Course workload: 3(2,1,6)*
- *Prerequisites:*

Course description: This course provides students with knowledge of the fundamental principles of unmanned aerial vehicle (UAV) flight mechanics. It covers methods for studying the kinematics and dynamics of UAVs under various conditions such as wind speed and payload mass, as well as UAV control and localization methods. Additionally, students will conduct experimental validations on model aircraft.

15. Project of Mechatronic System Design

Credits: 1

- *Course workload: 1(1, 0, 2)*
- *Prerequisites:*

Course description: This course helps students reinforce fundamental knowledge in automatic control and production process automation. Students will learn how to design and select control equipment for mechatronic systems. They will also cover how to simulate and deploy mechanical and control systems for the automation of mechatronic systems. Simultaneously, the course will guide students on how to present and write project reports for course assignments and projects within mechatronic systems.

16. CAD/CAM-CNC

Credits: 2

- *Course workload: 2(1, 1, 4)*
- *Prerequisites:*

Course description: This course provides the theoretical foundation for:

- Overview of CAD/CAM/CNC

- Coordinate systems on CNC machines
- Standard ISO G and M codes for CNC machines
- 3D object creation
- 3D model assembly methods
- Automatic programming - CAM (programming, simulation, editing, NC program output)
- The relationship between CAD-CAM and CNC

17. Enterprise Seminar

Credits: 1

- *Course workload: 1(2,0,2)*
- *Prerequisites:*

Course description: môn học này để triển khai mô hình đào tạo liên kết với doanh nghiệp, cập nhật công nghệ mới từ chuyên gia và tư tưởng “Sáng tạo và khởi nghiệp”. Môn học sẽ được triển khai linh hoạt, phân bố nhiều đợt theo các hình thức sau:

- + Tập trung (5 tiết/1 buổi, 3 buổi = 1 tín chỉ): Khoa và bộ môn sẽ mời chuyên gia từ các doanh nghiệp đến báo cáo và sinh viên đăng ký tham gia.
 - + Gửi sinh viên đến doanh nghiệp để tham dự một chuyên đề, tìm hiểu công nghệ mới.
- Sau mỗi buổi tham dự tại trường hoặc tại doanh nghiệp, sinh viên sẽ viết báo cáo, khoa xác nhận và cử giảng viên chấm điểm.

18. Maintenance Engineering

Credits: 2

- *Course workload: 2(2,0,4)*
- *Prerequisites:*

Course description: This course provides students with the knowledge and skills necessary to perform maintenance and upkeep activities for machinery lines in industrial plants, covering the following topics:

- Overview of current maintenance activities
- Mechanisms of equipment failure modes
- Calculation of reliability $R(t)$ and Overall Equipment Effectiveness (OEE) of equipment lines
- Preparation of daily Autonomous Maintenance (AM) checklists (CIL)
- Preparation of Planned Maintenance (PM) schedules
- Safety procedures in operation and maintenance: Lock Out-Tag Out (LOTO)
- Condition-Based Monitoring (CBM) and Predictive Maintenance (PdM) techniques
- Criteria in the maintenance of joints and drive systems

19. AI Applications in Mechatronic Systems

Credits: 3(2+1)

- *Course workload: 3(2, 1, 4)*
- *Prerequisites:*

Course description: This course is a specialized seminar designed to help students systematize their knowledge of search algorithms, optimization algorithms, and artificial neural networks. The goal is to address intelligent automation problems in mechatronic systems within the

Industry 4.0 era. Furthermore, the course will guide students on how to apply modern technologies incorporating artificial intelligence to design intelligent mechatronic systems.

20. Computer Programming

Credits: 3(2+1)

– *Course workload: 3(2, 1, 4)*

– *Prerequisites:*

Course description: This course aims to provide students with fundamental knowledge of interface programming and the C# programming language. It equips students with basic knowledge and skills in interface programming: identifying problem requirements, designing interfaces, and building interface programs. The course helps students establish a theoretical foundation and the skills necessary to grasp and utilize programming software for developing control programs for real-world systems.

9.4 PRACTICAL TRAINING AND EXPERIMENTS

1. Basic Mechanical Practice

Credits: 3

– *Course workload: 2 (0, 2, 0)*

– *Prerequisites:*

Course description: This practical training course covers fundamental machining exercises in turning and milling. Its purpose is to help students reinforce the theoretical knowledge gained from core subjects, prepare for specialized studies, and equip them with basic turning and milling skills. These skills will serve as a foundation for subsequent specialized theoretical content and practical training.

2. Mechanical Works Practice

Credits: 1

– *Course workload: 1(0:1:0)*

– *Prerequisites:*

Course description:

3. Practice of Data Structure and Algorithm

Credits: 1

– *Course workload: 1(0:1:0)*

– *Prerequisites:*

Course description: This course aims to provide students with fundamental knowledge of **basic data structures and algorithms**. It equips them with the essential knowledge and skills in data structures and algorithms: analyzing and building data structures, and analyzing the advantages and disadvantages of data structures to select appropriate data structures and algorithms.

4. Electronic Circuit Design Laboratory

Credits: 1

– *Course workload: 1(0:1:0)*

– *Prerequisites:*

Course description: This course teaches students to use software for simulating and designing electronic circuits. Students will also get hands-on experience with basic electronic circuits, including rectifier circuits, clipper circuits, DC power supply circuits, transistor switching circuits, sine and square wave oscillator circuits, and control circuits using transistors, photoresistors, and optocouplers. Additionally, students will build several electronic circuits with applications in the field of mechatronics.

5. Control Engineering Laboratory 1

Credits: 1

- *Course workload: 1 (0, 2, 0)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge and skills in: It helps Mechatronics Engineering students gain a deeper understanding of topics covered in the theoretical Automatic Control course. Using Matlab software, students can simulate and verify the results learned in theory. Furthermore, the course includes practical sessions with real-world **systems** such as temperature, level, flow, and pressure control. This gives students a clearer insight into the practical application of theoretical concepts, aiming to design automated devices and automate industrial technological processes.

6. Practice of industrial automation

Credits: 2

- *Course workload: 2 (0, 4, 0)*
- *Prerequisites:*

Course description: This course helps students gain a deeper understanding of the theoretical Industrial Automation subject. It covers the use of elements and devices in automatic control systems such as sensors, motors, pneumatic and hydraulic valves, and electrical components. Students will comprehend the operating principles and circuit design methods for automation control elements. They will also learn to install and program automated production systems with PLCs, including how to interface PLCs with peripherals and declare extended modules. The course also teaches how to draft and write PLC programs using LAD, STL, SCL, and GRAPH programming languages, and how to program simple production processes.

7. Microcontroller Laboratory

Credits: 1

- *Course workload: 1 (0, 1, 2)*
- *Môn học tiên quyết:*

Course description: This course reinforces students' knowledge of digital systems and the integration of algorithms into microcontrollers (or embedded systems) using the C programming language. Students will gain practical experience with the structure and functions of microcontrollers, including: I/O port operations, Analog-to-Digital Converters (ADC), Digital-to-Analog Converters (DAC), Timers, Pulse Width Modulation (PWM), and Universal Asynchronous Receiver-Transmitter (UART). They will also practice interfacing microcontrollers with single LEDs, 7-segment displays, LCDs, and relays. Furthermore, students will engage in practical control applications such as temperature control, pneumatic robotic arms, and autonomous vehicle models, using microcontrollers as common control subjects in mechatronic systems.

9. Control Engineering Laboratory 2

Credits: 1

- *Course workload: 1 (0, 2, 2)*
- *Prerequisites:*

Course description: This course provides Mechatronics Engineering students with the skills to control common motor types, especially servo motors. It applies control theory and devices in electric drive and servo systems. Additionally, students will learn to deploy hardware and program using specialized software for PLCs, microcontrollers, and Matlab to control servo motors or other prevalent industrial servo mechanisms.

10. Industrial automation equipment operation and Maintenance Laboratory Credits: 1

- *Course workload: 1 (0, 2, 2)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge of:

- The operating principles of industrial automation systems, including sensors, PLCs, industrial communication networks, and industrial robots.
- The basic principles for simulating, programming, and operating industrial robots, covering topics such as kinematics, dynamics, and control.
- The methods and tools used for planning maintenance and upkeep of industrial automation systems.

11. Practice of CAD_CAM_CNC

Credits: 2

- *Course workload: 2 (0, 2, 0)*
- *Prerequisites:*

Course description: This course provides students with fundamental knowledge and skills in:

- Manual CNC programming
- Operating CNC milling machines and CNC turning machines
- Automatic programming – CAM (programming, simulation, editing, NC program output)
- Machining on CNC machines

12. Mechatronic CAD Practice

Credits: 1

- *Course workload: 1(0, 1, 4)*
- *Prerequisites:*

Course description: This course introduces students to the technology and engineering principles behind designing, calculating, and simulating electrical and electronic circuits (both 2D and 3D) for control cabinets and control circuits within mechatronic and robotic systems. Additionally, students will gain knowledge and skills in using specialized software such as Altium and Proteus for electrical and electronic circuit design.

9.5 GRADUATION

Graduation Thesis

Credits: 10

Dissertation consists mainly of an industrial or research-based project carried out under the supervision of one or more faculty members. It introduces students to the basic methodology of research in the context of a problem of current research interest.

10. Campus Infrastructure

Follow the Ministry of education and training's regulations

10.1 Workshops and Laboratories:

- Mechanical Measurement Technology Laboratory
- Mechanical Engineering Workshop
- Welding Workshop

- Simulation and Automation Laboratory
- PLC Laboratory
- Pneumatic - Hydraulic Laboratory
- Robotics Laboratory
- Process Control Laboratory
- CAD/CAM/CNC Laboratory
- Microcontroller Laboratory
- Electronic Design Laboratory
- Measurement and Sensor Laboratory
- Industrial Automation Laboratory

10.2. Thư viện, trang Web

- University's Library
- Faculty's Library
- Faculty's Website

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