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

UNDERGRADUATE PROGRAM

Major of

MECHANICAL AND AUTOMATION ENGINEERING TECHNOLOGY

Issued under **Decision No. ……../QĐ-ĐHSPKT dated …….. by the Rector of Ho Chi Minh City University of Technology and Education**)

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: MECHANICAL AND AUTOMATION ENGINEERING TECHNOLOGY

Level: Undergraduate

Major: MECHANICAL ENGINEERING TECHNOLOGY

Major Code: 7510201

Type of Training: FULL-TIME

Graduation Diploma: ENGINEER

(Issued under Decision No. ……/QD-ĐHSPKT dated ……. by the Rector 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. 1727/QD-ĐHSPKT dated 06/9/2021 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. 1727/QD-ĐHSPKT dated 06/9/2021 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 of the program will possess the knowledge, skills, and competencies to:

1. Acquire general education knowledge, a solid foundation in science and engineering, and strong specialized expertise in mechanical engineering, control, and automation.

2. Develop lifelong learning capabilities, problem-solving abilities, and professional skills in mechanical and automation engineering to fulfill social responsibilities and uphold professional ethics.
3. Work effectively in practical, interdisciplinary, and international environments; demonstrate strong communication, teamwork, organizational, and technical project management skills.
4. Conceive ideas, design, operate, and optimize modern industrial systems and production lines to meet the demands of smart manufacturing and global integration.

Program outcomes

Chuẩn đầu ra (Program outcomes)

ELOs	Outcomes	*Competency Level*
ELO1	**Apply basic knowledge of mathematics, natural sciences, and social sciences to solve engineering problems.**	
PI1.1	Apply mathematical knowledge (calculus, algebra, statistics) to model and solve technical problems.	3
PI1.2	Apply physical laws (mechanics, thermodynamics, electricity, etc.) in analyzing mechanical and automation systems.	3
PI1.3	Recognize the role of social sciences and humanities in engineering practice.	2
ELO2	**Analyze and design mechanical and automation systems.**	
PI2.1	Analyze the operating principles of mechanical – control – automation systems.	4
PI2.2	Design components, assemblies, or entire machinery and automated production lines.	5
PI2.3	Integrate mechanical, electrical, and control parts into a complete system.	4
ELO3	**Apply modern technologies in mechanical – automation engineering.**	
PI3.1	Apply CAD/CAM/CAE tools in design, simulation, and manufacturing.	3
PI3.2	Program and control PLC systems.	3
PI3.3	Connect and control devices via IoT networks or industrial robots.	4
ELO4	**Perform technical tasks proficiently and present engineering results.**	

PI4.1	Proficiently use computational, design, and simulation software (Matlab, AutoCAD, SolidWorks, etc.).	3
PI4.2	Safely and accurately operate measuring, control, and industrial testing devices.	3
PI4.3	Write complete and logical technical/experimental reports.	4
ELO5	**Solve engineering problems effectively.**	
PI5.1	Analyze technical problems from multiple perspectives.	4
PI5.2	Propose and select reasonable solutions based on scientific and practical grounds.	5
PI5.3	Evaluate the strengths and weaknesses of proposed solutions.	5
ELO6	**Communicate effectively in engineering environments.**	
PI6.1	Present ideas clearly and logically in technical writing.	3
PI6.2	Communicate effectively in oral technical presentations.	4
PI6.3	Use basic English in professional and technical communication.	3
ELO7	**Work effectively in teams and demonstrate collaborative spirit.**	
PI7.1	Demonstrate teamwork and shared responsibility.	3
PI7.2	Participate actively and contribute ideas in group discussions.	3
PI7.3	Resolve conflicts and build consensus within the team.	4
ELO8	**Comply with professional ethics and social responsibilities.**	
PI8.1	Demonstrate compliance with laws, technical standards, and professional ethics.	3
PI8.2	Recognize engineers' responsibilities to community and environment.	4
PI8.3	Act properly in real working environments.	3
ELO9	**Engage in lifelong learning and professional development.**	
PI9.1	Develop effective personal learning plans.	4
PI9.2	Stay updated with new technological trends.	3
PI9.3	Participate in scientific research, workshops, or seminars for professional growth.	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 >= 5.0 or equivalent** (as per Decisions No. 2146/QĐ-ĐHSPKT dated 05/8/2024 and No. 2930/QĐ-ĐHSPKT dated 12/10/2020) 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 **Communicative English 1**.
- **Sequence of English courses:** Communicative English 1 → Communicative English 2 → Academic English 1 →Academic English 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

Course Title	Credits		
	Total	Compulsory	Elective
Total (I+II+II):	**158**	**140**	**10**
I. General education knowledge	**49**	**47**	**2**
General Politics + Laws	14	14	
Social Sciences and Humanities	2	0	2

Mathematics and Natural Sciences	30	30	0
Introduction to Engineering Technology	3(2+1)	3(2+1)	
II. Foreign Language	**8**	**8**	
III. Professional Courses	**101**	**81**	**20**
Disciplinary and Major Foundation Courses	37	27	10
Major Courses	39	30	9
Experiments and Practice	16	16	0
Industry Internship	2	2	
Graduation thesis	7	7	
IV. Physical and National Defense Education Module	(*Not counted*)		
Physical Education 1	0(1)		
Physical Education 2	0(1)		
Physical Education 3	0(1)		
Military Education	165 hours		

7. Content of Program

A – Compulsory Courses

7.1. General Education Knowledge and Foreign Language (57 credits)

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	LLCT120205E	Political economics of Marxism and Leninism	2	
2.	LLCT130105E	Philosophy of Marxism and Leninism	3	
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.	INME130125E	Introduction to Mechanical Engineering	3(2+1)	
11.	PHYS130902E	Physics 1	3	
12.	PHYS131002E	Physics 2	3	
13.	PHYS111202E	Physics - Laboratory 1	1	
14.	GCHE130603E	General Chemistry for Engineers	3	

15.	AIME135825E	Applied Informatics in Mechanical Engineering	3(2+1)	
16.	FTHE124425E	Foundation of Thermal Engineering	2	
17.	MATH132901E	Mathematical Statistics for Engineers	3	
18.	APME234625E	Applied Mathematics for Mechanical Engineers	3(2+1)	MATH132601E
19.	PHED110513E	Physical Education 1	1	*(Not counted)*
20.		Physical Education 2	1	*(Not counted) Choose two of the following courses: (BASK112339; VOLL112330; PHED110130; TENN112330; FOOT112330; KARA112330; BADM112330)*
21.		Physical Education 3	1	
22.		Military Education	165 hours	*(Not counted)*
23.		Elective - General Knowledge	2	
24.	COEN140135E	Communicative English 1	4	*(Not counted)*
25.	COEN140235E	Communicative English 2	4	*(Not counted)*
26.	ACEN340535E	Academic English 1	4	
27.	ACEN340635E	Academic English 2	4	
Total			**57**	

7.2. Professional Education knowledge

7.2.1. Foundation of major

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	MEDR151123E	Mechanical Engineering Drawing	5(4+1)	
2.	ENME142020E	Engineering Mechanics	4(3+1)	PHYS130920E
3.	MEMA230920E	Material Strength	3	ENME142020E
4.	MMCD240823E	Mechanisms and Machine Components Design	4(3+1)	ENME142020E MEMA230720E
5.	MDPR310423E	Machine Design Project	1	MMCD240823E
6.	ATMT230225E	Assembly Tolerances and Measurement Techniques	3	
7.	MASE231230E	Material Science and Engineering	3	
8.	EMSE211330E	Testing of Material Science and Engineering	1	MASE231230E

9.	AUCO230329E	Automatic Control	3	
10.		***Elective - Foundation Knowledge***	**10**	
Total			**37**	

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

Specialized Knowledge (Theory and Laboratory Courses) (39 credits)

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	METE230130E	Metal Technology	3	ATMT230225E
2.	FMMT330825E	Fundamentals of Machine Manufacturing Technology	3	ATMT230225E
3.	EEEI331925E	Electrical and Electronic Equipment in Industrial Machines	3	
4.	CACC346625E	CAD/CAM-CNC Technology	4(3+1)	FMMT330825E
5.	ROCE438829E	Robotics and Control Engineering	3	AUCO230329E
6.	MTNC340925E	Machines and Numerical Control Systems	4	MMCD240823E
7.	ASMP431825E	Automation of Smart Manufacturing Processes	3	EEEI331925E, AUCO230329E
8.	PPCT338929E	PLC Programming and Control Techniques	3(2+1)	
9.	PMAE316725E	Project in Mechanical – Automation Engineering)	1	
10.	SICN339029E	Sensors and Industrial Communication Networks	3	AUCO230329E
11.		Elective - Expertise Knowledge	**9**	
12.	SEMI310026E	Enterprise Seminar	0 (1)	
Total			**39**	

7.2.2.b Major Practices *18 credits*

Specialized Knowledge (Workshop Practice and Industrial Internship) (18 credits)

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	MHAP110127E	Mechanical Works Practice	1	
2.	WEPR210430E	Welding Practice	1	
3.	MEPR240327E	Mechanical Practice 1	4	

4.	PAAM210325E	Practice of Tolerances and Measuring Techniques	1	ATMT230225E
5.	PCCC336825E	CAD/CAM-CNC Practice	3	CACC332525E
6.	PASM313625E	Practice of Automation of Smart Manufacturing Processes	1	ASMP431825E
7.	PEEI315125E	Practice of Electrical and Electronic Equipment in Industrial Machines	1	EEEI331925E
8.	PSCN319129E	Practice of Sensors and Industrial Communication Networks	1	SICN339029E
9.	PRCE439229E	Practice of Robotics and Control Engineering	1	MOLD331225E
10.	PPPC319329E	Practice of PLC Programming and Control Techniques	1	ROCE438829E
11.	PACT310429E	Practice of Automatic Control	1	AUCO230329E
12.	FAIN422825E	Industry Internship	2	
Total			**18**	

7.2.3. Capstone project

No.	Course code	Course name	Credits	Prerequisite
1.	GRAT475225E	Graduation Thesis	7	MDPR310423E PMMT311625E
Total			**7**	

B – Optional Subjects

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

No.	Mã môn học Course Code	Course Title	Credits	Prerequisite Course Code
1.	PRQU223026E	Production and Quality Management	2	
2.	ITAI126025E	IoT and Artificial Intelligence	2	
3.	REME320690E	Research Methodology	2	
4.	REME435325E	Methodology of Scientific Research	3	CNTĐTĐThS
5.	TEWR123525E	Technical Writing for Engineers	2	
6.	BPLA121808E	Entrepreneurship Planning	2	
7.	SYTH220491E	Systems Thinking	2	
8.	WOPS120390E	Workplace Skills	2	
9.	PLSK120290E	Planning Skills	2	

CNTĐTĐThS – Course recognized as equivalent to master's level

Kiến thức cơ sở nhóm ngành và ngành *(Sinh viên tích lũy ít nhất **10 tín chỉ** trong các môn học sau):*
Fundamental Knowledge of Discipline and Major (Students must accumulate at least 10 credits from the following courses):

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	HPIM336125E	Hydraulic Pneumatic in industrial machines	4(3+1)	
2.	FMCA336925E	Fluid Mechanics and CAE/CFD Analysis	3(2+1)	
3.	RETP337025E	Reverse Engineering and 3D Printing	3(2+1)	
4.	MAMS333825E	Modeling and Analysis of Mechanical Systems	3	MATH132601E
5.	PAEN334329E	Programming Applications for Engineers	3(2+1)	
6.	ENME320124E	English for Mechanical Engineering	2	
7.	WSIE320425E	Occupational Safety and Industrial Environment)	2	
8.	OPTE322925E	Optimization in Engineering	2	
9.	IFEM231020E	Introduction to Finite Element Method	3(2+1)	
10.	MAVI332529E	Machine Vision	3(2+1)	
11.	AIEN329429E	Artificial Intelligence in Engineering	2(1+1)	
12.	MLAS337125E	Machine Learning Applications in Mechanical - Automation Systems	3(2+1)	
13.	ITAT329529E	IoT and AI in Industry 4.0	2(1+1)	
14.	ANNE337225E	Artificial Neural Networks in Mechanical – Automation Engineering	3(2+1)	
15.	ADMA431530E	Advanced Materials	3(2+1)	CNTĐTĐThS
16.	MDSO435723E	Mechanics of Deformable Solids	3(2+1)	CNTĐTĐThS
17.	ENVI435823E	Engineering Oscillator	3(2+1)	CNTĐTĐThS
18.	AMPR435425E	Advanced Machining Processes	3(2+1)	CNTĐTĐThS
19.	TDHT435525E	Thermodynamics and Heat Transfer	3(2+1)	CNTĐTĐThS

CNTĐTĐThS – Course recognized as equivalent to master's level

Specialized Knowledge: Students must accumulate at least 9 credits from the following courses:

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	PCSE331229E	Control of Processes and Equipment	3(2+1)	
2.	CIMS436425E	Computer-Integrated Manufacturing	3(2+1)	
3.	RETP337025E	(Reverse Engineering and 3D Printing	3(2+1)	
4.	MEMS436525E	MEMS and MEMS Technology	3(2+1)	

5.	PRDD330826E	Product Design and Development	3(2+1)	
6.	IMCO437325E	Intelligent Modeling and Control	3(2+1)	
7.	SMMO437425E	Smart Manufacturing Management and Operations	3(2+1)	
8.	DFDT437525E	Digital Factory and Industrial Digital Transformation	3(2+1)	
9.	SISM437625E	Systems Integration in Smart Manufacturing	3(2+1)	
10.	SMFD437725E	Smart Manufacturing Facility Design	3(2+1)	
11.	TEMA531630E	Testing and Evaluation of Materials	3(2+1)	CNTĐTĐThS
12.	HPMA535625E	Precision Machining Technologies	3(2+1)	CNTĐTĐThS
13.	STMT531725E	Surface Treatment Technology	3(2+1)	CNTĐTĐThS
14.	DCME535725E	Diagnostics and Condition Monitoring Engineering	3(2+1)	CNTĐTĐThS
15.	AMDE535923E	Advanced Mechanical Design Engineering	3(2+1)	CNTĐTĐThS

CNTĐTĐThS – Course recognized as equivalent to master's level

C – Interdisciplinary: 6 Credits *(Students may select 6 interdisciplinary credits to replace fundamental and specialized courses. Students are encouraged to seek guidance from the academic advisors for appropriate course selection.)*

No.	Course Code	Course Title	Credits	Prerequisite Course Code
1.	AEPR324329E	Applied Engineering Programming	3(2+1)	
2.	ERMA321025E	Energy and energy management	2	
3.	SERV334029E	Drive Servo Systems	3	
4.	SEAC225929E	Sensors and Actuators	2	
5.	BAFD330726E	Basic of Factory Design	3(2+1)	
6.	NATE322625E	Nanotechnology	2	

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:

No.	Course Code	Course Title	Credits	**MOOC** (đường link đăng ký)

	MATH132401E	Calculus 1	3	Calculus 1B: Integration https://www.edx.org/course/calculus-1b-integration-mitx-18-01-2x-0
	GCHE130603E	General Chemistry for Engineers	3	Advanced chemistry https://www.coursera.org/learn/advanced-chemistry
	PHYS130902E	Physics 1	3	Introduction to Mechanics, Part 1 https://www.edx.org/course/introduction-mechanics-part-1-ricex-phys-101-1x

8. Training plan

1st Semester

No.	Course Code	Course Title	Credits	Prerequisite Course Code	Đợt *Phase*
1.	MATH132401E	Calculus 1	3		2
2.	PHYS130902E	Physics 1	3		2
3.	GCHE130603E	General Chemistry for Engineers	3		2
4.	LLCT130105E	Philosophy of Marxism and Leninism	3		1
5.	INME130125E	Introduction to Mechanical Engineering	3(2+1)		1
6.	PHED110513E	Physical Education 1	(1)		1
7.	MHAP110127E	Mechanical Works Practice	1		1
8.	MASE231230E	Material Science and Engineering)	3		2
9.	ACEN340535E	Academic English 1	4		1
10.	ACEN340635E	Academic English 2	4		1
Total			**27**		

2nd Semester:

No.	Course Code	Course Title	Credits	Prerequisite Course Code	Đợt *Phase*

1.	MATH132501E	Calculus 2	3	MATH132401E	2
2.	PHYS131002E	Physics 2	3	PHYS130902E	1
3.	ENME142020E	Engineering Mechanics	4(3+1)	PHYS130920E	1
4.	MEDR151123E	Mechanical Engineering Drawing	5(4+1)		2
5.	ATMT230225E	Assembly Tolerances and Measurement Techniques	3		1
6.	PHYS111202E	Physics - Laboratory 1	1	PHYS130902E	1
7.	WEPR210430E	Welding Practice	1		2
8.	EMSE211330E	Testing of Material Science and Engineering	1	MASE231230E	2
9.		***General Education Elective (Students enrolled in the integrated Bachelor - Master program must choose a 3-credit course)***	2	*Select course REME435325E*	2
10.		*Physical Education 2*	(1)	*Not counted) Choose two of the following courses: (BASK112339; VOLL112330; PHED110130; TENN112330; FOOT112330; KARA112330; BADM112330)*	2
11.		Military Education	165 hours		
Total			**23**		

3rd Semester:

No.	Course Code	Course Title	Credits	Prerequisite Course Code	Đợt *Phase*
1.	MATH132601E	Calculus 3	3		1
2.	MATH132901E	Mathematical Statistics for Engineers	3		2
3.	MEMA230920E	Material Strength	3	ENME142020E	2
4.	GELA236939E	General Law	3		2
5.	PAAM210325E	Practice of Tolerance and Measuring Techniques	1	ATMT230225E	2
6.	MEPR240327E	Mechanical Practice 1	4		1

7.	LLCT120205E	Political Economics of Marxism and Leninism	2		1
8.	LLCT120405E	Scientific socialism	2		2
9.		*Major Foundation Elective 1 (Students in the integrated Bachelor - Master program must choose courses marked "CNTĐTĐThS" in the Prerequisite Course Code column)*	4		1
10.		Physical Education 3	(1)	*Not counted) Choose two of the following courses: (BASK112339; VOLL112330; PHED110130; TENN112330; FOOT112330; KARA112330; BADM112330)*	2
Total			**25**		

4th Semester:

No.	**Course Code**	**Course Title**	**Credits**	**Prerequisite Course Code**	**~~Đợt~~** *Phase*
1.	AIME135825E	Applied Informatics In Mechanical Engineering	3(2+1)		1
2.	MMCD240823E	Mechanisms and Machine Components Design	4(3+1)	MEMA230920E	1
3.	FTHE124425E	Foundation of Thermal Engineering	2		2
4.	METE230130E	Metal Technology	3	ATMT230225E	1
5.	FMMT330825E	Manufacturing Technology	3	ATMT230225E	2
6.	LLCT120314E	Ho Chi Minh's ideology	2		1
7.		***Major Foundation Elective 2 (Students in the integrated Bachelor - Master program must choose courses marked "CNTĐTĐThS" in the Prerequisite Course Code column)***	6		2
Total			**23**		

5th Semester:

No.	Course Code	Course Title	Credits	Prerequisite Course Code	Đợt *Phase*
1.	APME234625E	Applied Mathematics for Mechanical Engineers	3(2+1)	MATH132601E	1
2.	AUCO230329E	Automatic Control	3		2
3.	MTNC340925E	Machines and Numerical Control Systems	4	MMCD240823E	1
4.	CACC346625E	CAD/CAM-CNC Technology	4(3+1)	FMMT330825E	2
5.	EEEI331925E	Electrical and Electronics for Industrial Machines	3		1
6.	PPCT338929E	PLC Programming and Control Techniques	3(2+1)		2
7.	MDPR310423E	Projects of Mechanical Design	1	MMCD240323E	1
8.	LLCT220514E	History of Vietnamese communist party	2		2
Total			**23**		

6th Semester:

No.	Course Code	Course Title	Credits	Prerequisite Course Code	Đợt *Phase*
1.	SICN339029E	Sensors and Industrial Communication Networks	3	AUCO230329E	1
2.	ROCE438829E	Robotics and Control Engineering)	3	AUCO230329E	1
3.	PACT310429E	Practice of Automatic Control	1	AUCO230329E	1
4.	PCCC336825E	CAD/CAM-CNC Practice	3	CACC346625E	1
5.	PEEI315125E	Practice of Experiments in Electrics and Electronics in Industrial	1	EEEI331925E	1
6.	ASMP431825E	Automation of Smart Manufacturing Processes	3	AUCO230329E	2

7.	PPPC319329E	Practice of PLC Programming and Control Techniques	1	PPCT338929E	2
8.	PMAE316725E	Project in Mechanical – Automation Engineering	1	MDPR310423E	2
9.		***Elective - Expertise Knowledge 1 (Students in the integrated Bachelor's–Master's program, please select courses labeled 'CNTĐTĐThS' in the Course Code column)***	3		2
Total			**19**		

7th Semester:

No.	**Course Code**	**Course Title**	**Credits**	**Prerequisite Course Code**	**Đợt** *Phase*
1.	FAIN422825E	Industry Internship	2		1
2.	PSCN319129E	Practice of Sensors and Industrial Communication Networks	1	SICN339029E	2
3.	PRCE439229E	Practice of Robotics and Control Engineering)	1	ROCE438829E	2
4.	PASM313625E	Practice of Automation of Smart Manufacturing Processes	1	ASMP431825E	2
5.		***Elective - Expertise Knowledge 2 (Students in the integrated Bachelor's–Master's program, please select courses labeled 'CNTĐTĐThS' in the Course Code column)***	6		2
Total			**11**		

8th Semester:

No.	**Course code**	**Course** *Title*	**Credits**	**Prerequisite**	**Term**

1.	GRAT475225E	Graduation Thesis	7	MDPR310423E PMAE316725E	1
Total			**7**		

9. Course Descriptions and Credit Allocations

9.1 General Education Knowledge

1. Philosophy of Marxism and Leninism **Credits:3**

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

This course consists of three chapters, providing students with foundational knowledge as follows:

Chapter 1 introduces the fundamental concepts of philosophy, the philosophy of Marxism-Leninism, and its role in social life.

Chapter 2 explores the core principles of dialectical materialism, including the material and ideological worlds; dialectical materialism methodology; and epistemology in Marxist-Leninist thought.

Chapter 3 focuses on historical materialism, addressing concepts such as socio-economic formations, classes and nations, the state and social revolution, social consciousness, and philosophical perspectives on human beings.

2. Political Economics of Marxism and Leninism **Credits:2**

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

Comprising six chapters, this course introduces the fundamentals of Marxist-Leninist political economy:

Chapter 1 explains the subject matter, research methods, and functions of political economy under Marxist-Leninist theory.

Chapters 2 to 6 cover key topics such as: commodities, markets, and the roles of economic agents; surplus value production in the market economy; competition and monopoly; socialist-oriented market economy and economic interest relations in Vietnam; industrialization, modernization, and Vietnam's international economic integration.

3. Scientific Socialism **Credits:2**

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

Chapter 1 introduces the foundational issues and the evolution of scientific socialism.

Chapters 2 to 7 cover the core contents aligned with the course objectives, including the theoretical basis, values, principles, and developmental paths of socialism from a scientific perspective.

4. Ho Chi Minh's Ideology **Credits:2**

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

This course comprises six chapters and provides students with essential knowledge on: the concept, object, research methods, and significance of studying Ho Chi Minh's ideology; the foundation, formation, and development process of Ho Chi Minh's ideology; Ho Chi Minh's thoughts on national independence and socialism; the Communist Party of Vietnam and the people's state; national solidarity and international unity; culture and human development; and ethics.

5. History of the Communist Party of Vietnam **Credits:2**

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

This course consists of three chapters and equips students with an understanding of the objectives, significance, and methods of studying Party history. It provides systematic and foundational knowledge of the Party's formation (1920–1930), leadership in the revolutionary struggle (1930–1945), direction of resistance wars against French colonialism and American imperialism (1945–1975), and the national unification and socialist-oriented renovation (1975–2018). The course helps affirm achievements, recognize limitations, and draw lessons in Party leadership, enhancing students' political awareness and application of historical knowledge in national development and defense.

6. General Law **Credits:3**

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

This course provides students with fundamental knowledge of the State and law, including: general legal and political theory (origins, nature, functions, and characteristics of the state; sources, forms, and attributes of law); the legal system and legal relationships; legal violations and liabilities; and the fundamental institutions of major branches of law.

7. Calculus 1 **Credits:3**

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

Calculus 1 introduces the fundamental concepts of limits, continuity, and the differential and integral calculus of functions of a single variable.

8. Calculus 2 **Credits:3**

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

This course expands upon Calculus 1 by covering topics including the integral calculus of single-variable functions, infinite series, power series, and vector theory in two- and three-dimensional space.

9. Calculus 3 **Credits:3**

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

This course covers multivariable calculus, including vector functions, partial derivatives, multiple integrals, line and surface integrals, and vector calculus. Applications to real-world mathematical modeling are introduced.

10. Mathematical Statistics for Engineers **Credits:3**

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

Course description: This course includes descriptive statistics, elementary probability, random variables and probability distributions, statistical characteristics of random variables, parameter estimation, hypothesis testing, correlation, and linear regression.

9.11. Physics 1 **Credits:3**

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

Course description: This course provides students with fundamental knowledge of physics, covering mechanics and thermodynamics, as a foundation for specialized subjects in science, engineering, and technology. It equips students with skills for studying motion, energy, and physical phenomena across scales—from molecules to planets.

Content includes Chapters 1–22 from Physics for Scientists and Engineers with Modern Physics, 9th Edition by R.A. Serway and J.W. Jewett.

The course emphasizes scientific methods, basic physical laws, scientific reasoning, and strategies for succeeding in technical studies. It focuses on both conceptual understanding and standard problem-solving skills.

Additionally, students will learn how to construct mathematical models based on experimental data, record and analyze results, and apply models to predict outcomes in other experiments, while understanding their limitations.

12. Physics 2 **Credits:3**

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

Course description: This course covers the fundamentals of electromagnetism and optics, providing a foundation for engineering and technology majors.

Content includes Chapters 23–38 from Physics for Scientists and Engineers with Modern Physics, 9th Edition by R.A. Serway and J.W. Jewett.

It emphasizes understanding physical laws, scientific reasoning, and preparation for advanced studies. Like Physics 1, the course integrates theory with problem-solving.

Students will also practice mathematical modeling, data presentation and analysis, and prediction of experimental outcomes, while recognizing model limitations.

13. Physics Lab 1 **Credits:1**

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

Course description: This lab course includes 9 experiments in kinematics, dynamics of particles and rigid bodies, and thermodynamics. It reinforces physics theory through observation, experimentation, measurement, calculation, and data analysis. The course develops practical skills essential for future engineers.

14. General Chemistry for Engineers **Credits:3**

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

Course description: This course equips students with fundamental chemistry knowledge needed to understand scientific and technical documents in related fields.

Students will:

(i) Understand atomic and molecular structures to explain material properties.

(ii) Develop problem-solving skills involving thermodynamics, chemical kinetics, equilibrium, solution properties, and electrochemical processes.

This foundational course supports advanced study and application in engineering disciplines and beyond.

15. Introduction to Mechanical 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

16. Applied Informatics In Mechanical Engineering **Credits: 3 (2+1)**

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

Course description|: This course aims to provide students with a foundational understanding of MATLAB commands for basic problems, such as vector calculations, numerical integration, differentiation, solving ordinary differential equations, data regression, interpolation, and graphics. The course also equips students with essential MATLAB programming skills: defining problem requirements, building algorithmic flowcharts, and developing, compiling, and executing programs. Additionally, students will be introduced to Simulink and its application in solving common problems in the field of mechanical engineering.

17. Foundation of Thermal Engineering **Credits:2**

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

Course description|: This course provides students with fundamental knowledge of thermodynamics and its two main laws. It covers the characteristics, properties, and energy transformations of various thermodynamic processes. Students will learn about the conversion of heat into work in both forward and reverse cycles, as well as the thermal properties of working fluids that maximize efficiency in real-world applications. The heat transfer section of the course equips students with concepts and principles related to the laws of heat exchange, including conduction, convection, and thermal radiation. The curriculum also includes the skills needed to perform calculations for heat exchangers used in mechanical engineering.

18. Applied Mathematics for Mechanical Engineers **Credits:3**

- Course description|:
- *Prerequisites:*

This course introduces and applies fundamental mathematical concepts to solve mechanical engineering problems including Linear algebra and systems of linear equations, differential equations, approximation and interpolation, variational methods and finite elements. The course also provides students with the foundational knowledge and skills in algorithms, helping them effectively approach and solve problems in specialized subjects and analyze common mechanical systems.

19. English for Mechanical Engineering **Credits:2**

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

This course aims to equip students with the specialized terminology and practical skills necessary for their professional field. The key objectives are:

- Vocabulary and Terminology: To introduce students to specialized terms and professional procedures, enabling them to read and reference technical textbooks, magazines, and industry-specific documentation.
- Reading and Writing Skills: To enhance students' ability to read, understand, and write technical explanations, engineering drawings, reports, manufacturing logs, and welding process instructions in English.
- Communication Skills: To improve students' English communication skills, allowing them to confidently interact with international experts in the workplace

20. Systems Thinking **Credits:2**

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

Course description|: This course equips students with fundamental knowledge of systems, systems thinking methodology, and creative thinking methods. The main topics covered are basic concepts of systems, systems thinking approach, creative thinking methods. This course helps students develop the ability to reason, analyze, and solve problems in a systematic, logical, and creative manner.

21. Workplace Skills **Credits:2**

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

Course description|: This elective course, part of the engineering and technology curriculum, is designed to equip students with essential skills for working in a technical environment. Specifically, the course focuses on skills required to work effectively in multicultural environments, modern workplaces, technologically fast-changing environments

22. Planning Skills **Credits:2**

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

Course description|: This course equips students with the fundamental knowledge of planning methods. Guidance on critical thinking and finding solutions that are appropriate for one's personal circumstances. Helping students develop the skills to create effective study plans, short- and long-term personal plans, and work plans. Instruction on time management and effective work organization skills.

23. Research Methodology **Credits:2**

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

Course description|: Research Methodology course provides students with foundational knowledge about the concepts, processes, and structure of a research project. After completing this course, students will be able to:

- Choose a suitable research topic.
- Draft a detailed research proposal.
- Apply research methods to collect and process information.

This helps students be proactive and successful in carrying out university-level research projects, as well as completing their graduation thesis or capstone project in a scientific manner.

24. Methodology of Scientific Research **Credits:3**

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

Course description|: This course is designed to equip students with the essential knowledge and skills for conducting research. It focuses on the fundamental concepts and logical principles of scientific research.

- Research Fundamentals: Introduction to the nature and logic of scientific research, defining a scientific problem, and formulating a scientific hypothesis.
- Methodology: Methods for building the theoretical framework of a research topic, collecting information, and processing research results.
- Project Management: How to organize and execute a research project.
- Publication and Presentation: Various forms of publishing research findings.

Additionally, the course provides students with practical guidance on writing and presenting a graduation thesis as well as an introduction to the structure and presentation of a master's thesis.

9.2 FUNDAMENTAL MECHANICAL ENGINEERING COURSES

1. Introduction to Mechanical Engineering **Credits: 3**

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

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

Textbook:

1) Moaveni, Saaed. *Engineering Fundamentals: An Introduction to Engineering*. 3rd ed., CL Engineering, 2007.
2) Wickert J., and Lewis K. *An Introduction to Mechanical Engineering*. 3rd ed., CL Engineering, 2012.

2. Mechanical Engineering Drawing **Credits: 5**

Course workload: 5(4, 1, 10)
Prerequisites:

This course provides students with the fundamental theory of engineering drawing, including the engineering drawing standards, the basic drawing skills and principles, the methods of representation and orthographic projection. It also cultivates the abilities of writing and reading the engineering drawing.

Textbooks:

1) Madsen, David A., and David P. Madsen. *Engineering Drawing and Design*. 6th ed., Cengage Learning, 2016.
2) Narayana, K. L., P. Kannaiah, and K. Venkata Reddy. *Machine Drawing*. 3rd ed., New Age International Publishers, 2008.

3. Engineering Mechanics **Credits: 4**

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

This course provides fundamental knowledge of mechanical engineering. In this course, the following topics will be covered: *statics* (statics axioms, force, connection, reaction, system analysis); *kinematics* (study the motion of points, objects, translation and rotation, kinematic analysis); and *dynamics* (physical laws, theorems of dynamics, D'Alambert principles, Lagrange equations).

Textbook:

1) Hibbeler, Russell C. *Engineering Mechanics*. 13th ed., Prentice Hall, 2012.
2) Meriam, J. L., and L. G. Kraige. *Engineering Mechanics*. 7th ed., John Wiley & Sons Inc., 2006.

4. Material Strength **Credits: 3**

Prerequisite: Engineering Mechanics
Course Description:

This course introduces students to fundamental knowledge of strength of materials, methods of calculating the stress, strain in mechanical components, structural members under loading, load capacity, and deformations.

Textbook:

1) Beer, Ferdinand P., and E. Russell Johnston. *Mechanics of Materials*. McGraw-Hill, 1992
2) Hibbeler, Russell C. *Mechanics of Materials*. 9th ed., Prentice Hall, 2013.

5. Mechanisms and Machine Components Design **Credits: 4**

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

This course provides students with knowledge relating to structures, working principles and calculating methods of kinematics, dynamic designs of machines and mechanisms, and standard mechanical joints and components. By the end of the course, students will be able to independently solve calculating problems and machine design problems.

Textbooks:

1) Michels, W. J., C. E. Wilson, and A. D. Deutschman. *Machine Design: Theory and Practice.* Macmillan, 1975.
2) Mott, Robert L. *Machine Elements in Mechanical Design*. 5th ed., Pearson, 2013.

In this course, students will apply the knowledge gained in the course "Theory of Machine and Machine Design" for the purposes of designing a machine or a module of a machine. The application of this knowledge includes kinematics, dynamic designs of machines and mechanisms, standard

mechanical joints and components. By the end of the course, students will be able to independently solve calculating problems and machine design problems .

Textbooks:

1) Michels, W. J., C. E. Wilson, and A. D. Deutschman. *Machine Design: Theory and Practice.* Macmillan, 1975.
2) Mott, Robert L. *Machine Elements in Mechanical Design*. 5th ed., Pearson, 2013.

7. Assembly Tolerances and Measurement Techniques **Credits: 3**

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

This course provides the learner with fundamental knowledge about tolerance and assembly of common joints in machine manufacturing industry, such as smooth cylindrical joints, key joints, flower joints, threaded joints, methods of solving size sequence problems, and basic principles for recording dimensions on detailed drawings, some types of measuring instruments, and methods of measuring the basic parameters of the parts.

Textbooks:

1) Henzold, Georg. *Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection: A Handbook for Geometrical Product Specification Using ISO and ASME Standards*. 2nd ed., Butterworth-Heinemann, 2006.
2) Narayana, K. L., P. Kannaiah, and K. Venkata Reddy. *Machine Drawing*. 3rd ed., New Age International Publishers, 2008.

8. Material Science and Engineering **Credits: 3**

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

This course introduces the learner with the properties of metal and metallic alloy, metallic materials in manufacturing, heat treating to manipulate mechanical properties of metallic materials, fundamentals of structure, and properties of polymer, composite materials, rubber, etc.

Textbook:

1) Callister, William D. Jr., and David G. Rethwisch. *Materials Science and Engineering: An Introduction*. 8th ed., John Wiley & Sons Inc., 2010.

9. CAD/CAM-CNC Technology **Credits: 4**

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

This course equips students with foundations of CAD in mechanical engineering, develops the ability to create and read technical drawings, and outlines the first step for students to use computer technology for design.

Textbook:

1) Onwubolu, Godfrey C. *Computer-Aided Engineering Design with SolidWorks*. Imperial College Press, 2013.
2) Planchard, David. *Engineering Graphics with SOLIDWORKS 2015*. SDC Publications, 2014.
3) Shih, H. *Autodesk Inventor 2015 and Engineering Graphics*. SDC Publications, 2014.

10. Foundation of Thermal Engineering **Credits: 2**

Prerequisite: None

Course Description:
This course provides students with some basic concepts of technical thermodynamics, the Laws of 1 and 2, the cycles of labor and consumption, and how to calculate the heat and labor for the cycles. The heat transfer section helps students grasp some related concepts as well as the laws of heat exchange: heat conduction, convection heat transfer, heat radiation. It also introduces students to common thermal instruments such as dryer/dehydrator, steam boiler, or heat exchanger.
Textbook:
1) Moran, Michael J., et al. *Introduction to Thermal Systems Engineering: Thermodynamics, Fluid Mechanics, and Heat Transfer*. 2nd ed., Wiley, 2002.

11. Electrical and Electronic Equipment in Industrial Machines Credits: 3

Course workload: 3(3, 0, 6)
Prerequisites:
This course equips students with knowledge of electrical circuits, circuit design, 1-phase, and 3-phase AC circuits. The students will also be introduced to working principles and calculation methods of current regulator, synchronous motor, asynchronous motor, DC motor, as well as working principles and calculation methods of basic electrical and electronic components such as a diode, transistor BJT, MOSFET, SCR, TRIAC, Opamp.
Textbook:
1) Herman, Stephen. *Industrial Motor Control*. Delmar Cengage Learning, 2014.
2) Theraja, B. L. and A. K. Theraja. *A Textbook of Electrical Technology, Vol 1: Basic Electrical Engineering*. S Chand & Co, 1999.
3) Theraja, B. L. and A. K. Theraja. *A Textbook of Electrical Technology,Vol 4: Electronic Devices and Circuits.* 23rd ed., S Chand & Co, 2006.

12. Fundamentals of Machinery Manufacturing Technology Credits: 3

Course workload: 3(3, 0, 6)
Prerequisites:
This course provides the theoretical basis of metal cutting and machining methods, processing accuracy and surface quality of workpieces, influencing factors and remedial directions, selecting the standard and set when processing, features cutting and machining processes on universal, specialized machines, etc.
Textbooks:
1) El-Hofy, Hassan Abdel-Gawad. *Fundamentals of Machining Processes: Conventional and Nonconventional*. CRC Press, 2013.
2) Juneja, B. L. *Fundamentals of Metal Cutting and Machine Tools*. New Age International, 2003.
3) Knight, Winston A. *Fundamentals of Metal Machining and Machine Tools*. 3rd ed., Taylor and Francis, 2016.

13. Artificial Neural Networks in Mechanical - Automation Engineering Credits: 03
- *Study Time Allocation: 3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course equips students with fundamental knowledge and practical skills in applying artificial neural networks (ANNs) to solve problems in mechanical–automation engineering. Topics include: an overview of biological and artificial neurons, network architectures (Perceptron, MLP, CNN, RNN, LSTM), training algorithms (Backpropagation, Gradient Descent), model optimization, and

practical applications such as image recognition, equipment state prediction, intelligent control, and predictive maintenance. Students will practice programming and deploying ANNs using Python, MATLAB, and libraries such as TensorFlow, Keras, and PyTorch.

9.3 ADVANCED MECHANICAL ENGINEERING COURSES

1. Robotics and Control Engineering **Credits: 03**

- *Study Time Allocation:* *3 (3, 0, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides fundamental knowledge and applications related to the structure, operation, and control of industrial robots. Topics include: classification and architecture of robots; actuators and sensors; robot kinematics and dynamics; motion control algorithms; programming and integration of robots in automated production lines. Students will engage in hands-on practice through simulation software and experimental robotic systems.

2. Practice of Robotics and Control Engineering **Credits: 01**

- *Study Time Allocation:* *1 (0, 1, 2)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides hands-on experience in programming, controlling, and operating industrial robots. Topics include: point-to-point and continuous motion programming; robot and peripheral calibration; sensor integration; sequence control; simulation and control using dedicated software; implementation of pick-and-place, trajectory tracking, and multi-axis coordination tasks. Students will engage in individual and group lab exercises on physical robots or advanced 3D simulation platforms.

3. PLC Programming and Control Techniques **Credits: 03**

- *Study Time Allocation:* *3 (3, 0, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides fundamental knowledge and practical skills in programming and applying Programmable Logic Controllers (PLCs) in industrial automation systems. Topics include: hardware structure and operating principles of PLCs; common programming languages such as LAD, FBD, and STL; control algorithm design; peripheral device interfacing (sensors, actuators, HMI); and applications of PLCs, PLC network in sequence control and process monitoring. Students will engage in hands-on PLC programming, simulation, and real-world implementation.

4. Practice PLC Programming and Control Techniques **Credits: 01**

- *Study Time Allocation:* *1 (0, 1, 2)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides practical skills in programming and implementing automation control using Programmable Logic Controllers (PLCs). Lab content includes: using LAD/FBD languages to control end devices; developing sequential and conditional control algorithms; connecting sensors, actuators, and HMI panels; testing and troubleshooting systems; and operating and evaluating control programs on real or simulated models. Students work individually or in groups to solve industry-relevant automation tasks.

5. Automation of Smart Manufacturing Processes **Credits: 03**

- *Study Time Allocation:* *3 (3, 0, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides an overview of concepts, technologies, and solutions in smart manufacturing automation, including smart factory architecture, integration of mechatronic and information systems, industrial networks, IIoT, SCADA, MES, and real-time data connectivity. Students will explore flexible manufacturing models, mass customization, and advanced control and monitoring techniques used in Industry 4.0. The course combines theoretical foundations with simulation-based or hands-on implementation on smart manufacturing models.

6. Practice of Automation of Smart Manufacturing Processes **Credits: 01**

- *Study Time Allocation:* *1 (0, 3, 2)*
- *Prerequisite:*
- *Course Description Summary:*

Course focuses on hands-on skills for implementing automation solutions in smart manufacturing environments. Practical activities include: setting up SCADA systems to monitor production lines; configuring and interfacing industrial devices via communication networks; collecting and processing sensor data; integrating PLC-based control with HMI interfaces; and programming real-time responses and process monitoring. Students will perform experiments on actual smart manufacturing models or advanced simulation platforms.

7. Material Science and Engineering **Credits: 03**

- *Study Time Allocation:* *3 (3, 0, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides fundamental knowledge on the structure, properties, and applications of engineering materials in mechanical and automation fields. Topics include: classification of metallic, non-metallic, plastic/composite, wood-based, and electrical materials, as well as an introduction to advanced materials; microstructure and crystallography; mechanical, physical, and chemical properties of materials; material processing and structural transformation; and material selection for mechanical components and industrial equipment. The course enables students to understand the relationship between structure–property–performance in material design and application for manufacturing.

8. Testing of Material Science and Engineering **Credits: 01**

- *Study Time Allocation:* *1 (0, 3, 2)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides practical skills in basic testing methods to determine properties and assess the quality of engineering materials. Topics include: tensile, compression, bending, and impact tests; hardness measurement; microstructural observation; chemical composition analysis; corrosion evaluation and other physical–mechanical property assessments. Students will conduct experiments on common materials such as metals, plastics, and composites, and write technical reports to draw conclusions on the structure–property relationship of materials.

9. Sensors and Industrial Communication Networks **Credits: 03**

- *Study Time Allocation:* *3 (3, 0, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides an overview of industrial sensors and methods for connecting and transmitting sensor data via modern industrial communication networks. Topics include: operating principles of

common industrial sensors; signal processing and interface methods; physical interfaces and communication protocols such as Modbus, Profibus, Profinet, CAN, EtherCAT, and IO-Link; network architectures in SCADA/PLC/HMI systems; and sensor data integration in industrial control and monitoring. Students will engage in simulation and hands-on practice on real or emulated systems.

10. Practice of Sensors and Industrial Communication Networks (PSCN319129E)Credits: 01

- *Study Time Allocation: 1 (0, 3, 2)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides practical training in connecting, configuring, and operating sensors within industrial communication systems. Students will perform hands-on tasks such as wiring analog and digital sensors, establishing communication with PLCs, and configuring common industrial protocols like Modbus, Profibus, Profinet, EtherCAT, and IO-Link. Practice includes programming PLCs for data acquisition, processing, and visualization via HMI and SCADA systems. The course familiarizes students with real-world industrial network setups and enhances their ability to troubleshoot and integrate sensor systems in automated environments.

11. MEMS and MEMS Technology Credits: 03

- *Study Time Allocation: 3 (3, 0, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides fundamental knowledge of Micro-Electro-Mechanical Systems (MEMS), including structures, operating principles, and fabrication technologies. Topics include: classification and applications of MEMS; microsensor and actuator structures; MEMS materials; microfabrication processes such as photolithography, etching, deposition, packaging; MEMS design and simulation; and MEMS applications in sensing, biomedical, microcontrollers, and embedded systems. Students will gain exposure to MEMS simulation software and basic modeling tools.

12. Project in Mechanical – Automation Engineering Credits: 03

- *Study Time Allocation: 1 (0, 1, 2)*
- *Prerequisite:*
- *Course Description Summary:*

Course is a capstone project integrating knowledge from mechanical and automation engineering subjects to solve a specific technical problem. Students carry out key steps including problem definition, mechanical system and control design, component selection and calculation, modeling or simulation, and final presentation. The course develops students' skills in system integration, teamwork, technical reporting, and oral presentation.

13. Reverse Engineering and 3D Printing Credits: 03

- *Study Time Allocation: 3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course equips students with foundational knowledge and skills in reverse engineering and 3D printing technologies applied in mechanical–automation engineering. Topics include 3D scanning principles and devices; geometric data processing and CAD reconstruction; design analysis and

optimization; 3D printing processes and materials. Students will complete the full workflow: sample acquisition – reverse modeling – 3D printing.

14. Artificial Intelligence in Engineering **Credits: 03**

- *Study Time Allocation:* *2 (1, 1, 4)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides fundamental knowledge and applications of Artificial Intelligence (AI) in engineering fields. Topics include: an overview of AI, Machine Learning, Deep Learning, technical data processing, Computer Vision, and AI applications in design, simulation, control, and optimization of engineering systems. Students will gain hands-on experience using popular software platforms such as Python, TensorFlow, and MATLAB, thereby developing skills to design and implement AI-based solutions for real-world engineering problems.

15. Machine Learning Applications in Mechanical – Automation Systems **Credits: 03**

- *Study Time Allocation:* *3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides knowledge and skills for applying machine learning algorithms to solve problems in the field of mechanical and automation engineering. Topics include: an overview of machine learning, sensor data processing, pattern recognition, process prediction and optimization, predictive maintenance, and intelligent control. Students will gain hands-on experience with Python, MATLAB, and popular machine learning libraries such as Scikit-learn, TensorFlow, and Keras, developing the ability to design and implement machine learning solutions for real-world mechanical–automation systems.

16. IoT and AI in Industry 4.0 **Credits: 02**

- *Study Time Allocation:* *1 (1, 1, 4)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides an overview and practical skills in applying the Internet of Things (IoT) and Artificial Intelligence (AI) in the context of Industry 4.0. Topics include: IoT architecture and technologies, sensor data acquisition and transmission, big data processing, AI integration for intelligent analytics and decision-making, applications in smart manufacturing, predictive maintenance, supply chain optimization, and energy management. Students will gain hands-on experience deploying IoT–AI systems using platforms such as Arduino, Raspberry Pi, Node-RED, and TensorFlow through simulation and real-world projects.

17. Intelligent Modeling and Control **Credits: 03**

- *Study Time Allocation:* *3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides knowledge and skills in modeling mechanical–automation systems combined with intelligent control techniques. Topics include: mathematical modeling and dynamic system simulation; system identification techniques; fuzzy control, neural network control, hybrid control; control optimization; and applications in robotics, smart manufacturing systems, and mechatronics.

Students will practice using MATLAB/Simulink and AI tools to build models, design controllers, and evaluate performance.

18. Smart Manufacturing Management and Operations **Credits: 03**

- *Study Time Allocation:* *3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides knowledge and skills in managing, planning, operating, and optimizing production in smart manufacturing environments aligned with Industry 4.0. Topics include: concepts and principles of smart manufacturing; integration of manufacturing systems with IoT, AI, and big data; digital supply chain management; production scheduling and optimization; predictive maintenance; key performance indicators (KPIs, OEE); and total quality management. Students will gain hands-on experience using manufacturing management software and smart operations simulation tools.

19. Digital Factory and Industrial Digital Transformation **Credits: 03**

- *Study Time Allocation:* *3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides knowledge on the concepts, structure, and technologies of the digital factory, as well as solutions and strategies for industrial digital transformation. Topics include: digital modeling and simulation for factories; integrated manufacturing systems; industrial IoT and big data; cloud computing and data analytics; digital value chain; industrial communication standards and protocols; cybersecurity in manufacturing; and digital transformation roadmaps and strategies. Students will gain hands-on experience with digital factory simulation and management software and develop a digital transformation model for a specific manufacturing process..

20. Systems Integration in Smart Manufacturing **Credits: 03**

- *Study Time Allocation:* *3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides knowledge and skills in integrating systems within a smart manufacturing environment, including connections between equipment, machinery, control systems, manufacturing management software, and data analytics platforms. Topics include: principles and architectures of system integration; industrial communication protocols and standards; industrial IoT integration; connecting MES, ERP, and other production support systems; real-time data synchronization; cybersecurity in system integration; and simulation and testing tools for integration. Students will gain hands-on experience in building and operating an integrated system model for smart manufacturing.

21. Smart Manufacturing Facility Design **Credits: 03**

- *Study Time Allocation:* *3 (2, 1, 6)*
- *Prerequisite:*
- *Course Description Summary:*

Course provides knowledge and skills for designing a complete smart manufacturing facility, including production requirements analysis, master planning, facility layout, equipment selection and integration, control systems, IoT, AI, and digital solutions. Students will use design and

simulation software to create optimized factory models that meet the performance, flexibility, and sustainability criteria of smart manufacturing.

9.4 PRACTICAL TRAINING AND EXPERIMENTS

1. Mechanical Works Practice **Credits: 1**

- *Prerequisite: None*

Course Description:

This course provides basic knowledge and skills in metalworking with hand tools and basic equipment such as punchers, chisels, files, drills, and measuring equipment.

Textbooks:

1) El-Hofy, Hassan Abdel-Gawad. *Fundamentals of Machining Processes: Conventional and Nonconventional*. CRC Press, 2013.
2) Juneja, B. L. *Fundamentals of Metal Cutting and Machine Tools*. New Age International, 2003.
3) Knight, Winston A. *Fundamentals of Metal Machining and Machine Tools*. 3rd ed., CRC Mechanical Engineering, Taylor and Francis, 2016.
4) Krar, Steve. *Machine Tool and Manufacturing Technology*. Willey, 1997.
5) Rao, P. N. *Manufacturing Technology: Metal Cutting and Machine Tools*. Tata McGraw-Hill Education, 2000.

2.Welding Practice **Credits: 1**

Prerequisite: None

Course Description:

This course introduces students to concepts and operating principles of arc welding, welding sticks, and operating principles of TIG and MIG systems.

Textbook:

1) Jeffus, Larry. *Welding: Principles and Applications*. 7th ed., *Cengage Learning*, 2011.

3. Mechanical Practice 1 **Credits: 4**

Prerequisite:

Course Description:

This course provides basic knowledge and skills in turning and grinding.

Textbooks:

1) El-Hofy, Hassan Abdel-Gawad. *Fundamentals of Machining Processes: Conventional and Nonconventional*. CRC Press, 2013.
2) Juneja, B. L. *Fundamentals of Metal Cutting and Machine Tools*. New Age International, 2003.
3) Knight, Winston A. *Fundamentals of Metal Machining and Machine Tools*. 3rd ed., CRC Mechanical Engineering, Taylor and Francis, 2016.
4) Krar, Steve. *Machine Tool and Manufacturing Technology*. Willey, 1997.
5) Rao, P. N. *Manufacturing Technology: Metal Cutting and Machine Tools*. Tata McGraw-Hill Education, 2000.

4. Practice of Electrical and Electronic Equipment in Industrial Machines Credits: 1

Course workload: 1(0, 1, 2)

Prerequisites:

This course equips students with knowledge of electrical devices and electronic components while enhancing the ability to use and select electrical devices, install a residential and industrial electrical system, assemble a circuit, and measure basic electrical parameters.

Textbook:

1) Herman, Stephen. *Industrial Motor Control*. Cengage Learning, 2014.

5. Practice of Automatic Control Credits: 1

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

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

It helps 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 CAD_CAM_CNC Credits: 3

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

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 Labaratory
- Industrial Automation Labaratory

10.2. Thư viện, trang Web

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

11. Program Implementation Guidelines

a. 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 hours of laboratory work or practical exercises
- **1 credit** = 45 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.

b. Foreign language output standards are determined by the university's Academic Council at the beginning of each admission intake. During their studies, the university will monitor students' foreign language proficiency development each academic year to decide the number of course credits students are allowed to register for per semester. Students may self-study or enroll in the foreign language competency development program according to the university's plan.

Ho Chi Minh City, Date of Review: ,2025

RECTOR	**DEAN**
Assoc. Prof. Dr. Le Hieu Giang	**Assoc. Prof. Dr. Truong Dinh Nhon**