

# ACADEMIC TRAINING PROGRAM

(Issued under Decision No: 2254 /QĐ-DCT dated 18 April 2024, by the Rector of Ho Chi Minh City University of Industry and Trade)

- Program Name (Vietnamese): **KỸ THUẬT CƠ KHÍ**
- Program Name (English): **MECHANICAL ENGINEERING**
- Training Level: **Master's Degree**
- Major: Mechanical Engineering
- Major Code: **8520103**
- Field of Study: Engineering
- Mode of Study: Full-time
- Information on Quality Accreditation: The Master's training program in Mechanical Engineering of the University has met the educational quality standards issued by the Minister of Education and Training (MOET) since 2023.

## 1. Training Objectives

### 1.1 General Objectives

This program aims to train, develop, and provide high-quality technical human resources characterized by professional ethics, technological creativity, and the capability for research and technology transfer to serve society's needs. Learners will acquire expert professional skills, critical thinking methods, and strong abilities in organization and problem-solving for scientific and technical issues within the field of Mechanical Engineering. Furthermore, learners will possess the capacity for international integration, self-directed learning, and the foundation to pursue higher levels of study and research.

### 1.2 Specific Objectives

#### 1.2.1 Training Objectives (For Research-Oriented Master's Programs)

### **Regarding Knowledge:**

Masters of Mechanical Engineering are equipped with:

- a. Fundamental mechanical engineering knowledge as a basis for self-training and updating new technical and technological information in line with the scientific and technological advancements of the Industry 4.0 era.
- b. Systematized and updated specialized, in-depth mechanical knowledge, practical insights, along with tools for computation, simulation, and data analysis to design, improve, and innovate products, as well as mechanical engineering systems, processes, and production.
- c. Information technology knowledge and fundamental management skills to participate in leading scientific research groups.

### **Regarding Skills:**

Masters of Mechanical Engineering are equipped with:

- d. Critical thinking and problem-solving skills in scientific research.
- e. Effective communication and international integration skills within their professional field.

### **Regarding Autonomy and Responsibility:**

- f. Masters of Mechanical Engineering can self-orient their research to create knowledge, solve urgent issues, and adhere to scientific integrity to serve the sustainable development of society.

### **1.2.2 Training Objectives (For Application-Oriented Master's Programs)**

### **Regarding Knowledge:**

Masters of Mechanical Engineering are equipped with:

- a. Fundamental mechanical engineering knowledge as a basis for self-training and updating new technical and technological information in line with the scientific and technological advancements of the Industry 4.0 era.
- b. Systematized and updated specialized, in-depth mechanical knowledge, practical insights, along with tools for computation, simulation, and data analysis to design, improve, and innovate products, as well as mechanical engineering systems, processes, and production.
- c. Information technology knowledge and fundamental management skills to participate in leading project teams and applied research groups.

### **Regarding Skills:**

Masters of Mechanical Engineering are equipped with:

- d. Critical thinking and problem-solving skills in applied research.
- e. Effective communication and international integration skills within their professional field.

### **Regarding Autonomy and Responsibility:**

- f. Masters of Mechanical Engineering are capable of self-orienting research toward practical applications, solving urgent issues, and adhering to scientific integrity to serve the sustainable development of society.

## **2. Program Learning Outcomes (PLOs)**

## **2.1 Program Learning Outcomes for Research-Oriented Master's Programs**

### **Knowledge**

- P1. Apply general knowledge of information technology and management to plan and organize research projects within the field of mechanical engineering.
- P2. Synthesize systematized technical knowledge, specialized expertise, and practical insights in mechanical engineering to research mechanical or interdisciplinary issues.

### **Personal Skills and Qualities**

- P3. Coordinate experimental design and data analysis to adjust, innovate, and develop research directions in mechanical engineering.
- P4. Coordinate the searching and filtering of information related to research topics, and organize information into a systematic literature review for mechanical engineering research.
- P5. Adapt to scientific integrity, copyright laws, and professional ethics in research.

### **Interaction Skills**

- P6. Proficiently apply communication and foreign language skills in mechanical engineering research.

### **Professional Practice Capabilities (Autonomy and Responsibility)**

- P7. Combine critical thinking, creative thinking, and technical-technological knowledge to conduct scientific research that addresses urgent issues, such as developing technology, innovating products in mechanical or interdisciplinary fields, or advancing academic knowledge.
- P8. Demonstrate effective leadership in governing (building teams, establishing evaluation regulations, and assigning tasks) and managing (operating workflows,

organizing discussions, and evaluations) research groups in the field of mechanical engineering.

## **2.2 Program Learning Outcomes for Application-Oriented Master's Program**

### **Knowledge**

- P1. Use general knowledge of information technology and management to plan and organize the implementation of product development designs or applied research in the field of mechanical engineering.
- P2. Synthesize systematized technical knowledge, in-depth expertise, and practical insights in mechanical engineering to design product developments or conduct applied research on mechanical or interdisciplinary issues.

### **Personal Skills and Qualities**

- P3. Coordinate experimental design and data analysis to adjust, innovate, and develop applied research directions in the field of mechanical engineering.
- P4. Coordinate the searching and filtering of information related to research problems, and organize this information into a systematic literature review for mechanical engineering research.
- P5. Adapt to scientific integrity, copyright laws, and professional ethics in product development design and applied research.

### **Interaction Skills**

- P6. Proficiently apply communication and foreign language skills in mechanical engineering research.

### **Professional Practice Capabilities (Autonomy)**

- P7. Combine critical thinking, creative thinking, and technical-technological knowledge to conduct scientific research that addresses urgent issues, such as developing technology or products in mechanical or interdisciplinary fields.
- P8. Demonstrate effective leadership in governing (building teams, establishing evaluation regulations, and assigning tasks) and managing (operating workflows, organizing discussions, and evaluations) project teams and applied research groups within the field of mechanical engineering.

### 3. Academic Workload

#### 3.1. Research-Oriented Master’s Program

No.	Components	Credits	Percentage (%)
1	Philosophy	3 credits	5%
2	Major-specific courses	30 credits	50%
3	Research topics & Internship	12 credits	20%
4	Master's Thesis	15 credits	25%
<b>Total</b>	<b>Total Cumulative Credits</b>	<b>60 credits</b>	<b>100%</b>

#### 3.2. Application-Oriented Master’s Program

No.	Components	Credits	Percentage (%)
1	Philosophy	3 credits	5%
2	Major courses, Projects & Topics	41 credits	68.34%
3	Internship	8 credits	13.33%
4	Graduation Capstone Project	8 credits	13.33%
<b>Total</b>	<b>Total Cumulative Credits</b>	<b>60 credits</b>	<b>100%</b>

#### 4. Training Duration

- **Standard Duration:** 1.5 years.
- **Maximum Duration:** Includes the standard duration plus any permitted extensions as specified in the Postgraduate Training Regulations (issued under Decision No. 1279/QD-DCT dated April 26, 2024).

#### 5. Degree Awarded

A **Master's Degree** is awarded upon completion of the training program, accumulation of the required credits, and fulfillment of all graduation requirements set by the University.

#### 6. Admission Requirements

Applicants must hold a Bachelor's degree (or equivalent) and meet the university's entrance examination or admission criteria.

- **Identical/Relevant Majors:** Eligible for immediate admission.
- **Close Majors:** Must complete supplementary courses before admission.
- **Other Engineering/Technology Majors:** Admission decisions are made by the Admission Council based on the applicant's transcript.

#### Major Classification Table

Category	Majors	Supplementary Courses
<b>Identical Relevant Majors</b>	/ Mechanical Engineering, Mechatronics, Thermal Engineering, Automotive Engineering, Machine Manufacturing, Maintenance, etc.	None

Category	Majors	Supplementary Courses
<b>Close Majors</b>	Engineering Mechanics, Aerospace Engineering, Naval Architecture, etc.	1. Manufacturing Processes (3 credits)  2. Theory of Machines (2 credits)  3. CAD/CAM/CNC Technology (2 credits)

**Note:** The specific list of supplementary courses is determined based on the applicant's academic transcript.

### 7. Assessment Methods

Conducted in accordance with the Postgraduate Training Regulations and the University's Assessment and Examination Policies.

### 8. Graduation Requirements

- **Graduation Review:** According to Decision No. 1279/QD-DCT.
- **Foreign Language Proficiency:** Must meet the University's English exit standards (Decision No. 1281/QD-DCT).

- **IT Proficiency:** Must meet the Information Technology skill standards (Decision No. 3297/QD-DCT).

## 9. Career Opportunities

Graduates with a Master's in Mechanical Engineering are qualified for:

- **Academia:** Teaching and research at Universities, Colleges, and Research Institutes.
- **Industry:** Product R&D, machine design, and production management.
- **Consultancy:** Technical experts for NGOs or independent auditing/assessment organizations.
- **Management:** Corporate leadership or positions within state management agencies (Departments, Ministries) after additional economic management training.

## 10. Further Education

Graduates are fully eligible to pursue **Doctoral (Ph.D.) degrees** in Mechanical Engineering or related technical fields.

## 11. Academic Training Program

### 11.1 Academic Training Program for Research-Oriented Master's Programs

No	Course code	Internal code	Course title	Credits
<b>I. Core courses</b>				<b>18</b>
1	0310100408	11100012	Philosophy	3 (3,0)
2	0311101421	03100006	System dynamics	3 (3,0)
3	0311100602	03100002	Advanced computational methods	3 (3,0)
4	0311100616	03100012	Advanced Thermodynamics	3 (3,0)
5	0311101428	03100017	Research design	3 (3,0)

No	Course code	Internal code	Course title	Credits
6	0311103078	03100611	Operation management	3 (3,0)
<b>II. Elective courses (<i>Select at least 15 credits</i>)</b>				<b>15</b>
1	0311100606	03100015	Design for X	3 (3,0)
2	0311101419	03100003	Smart manufacturing systems	3 (3,0)
3	0311101425	03100013	Lean systems	3 (3,0)
4	0311101427	03100016	Advanced mechanical measurement	3 (3,0)
5	0311101423	03100008	Rapid prototyping and 3D printing technologies	3 (3,0)
6	0311101420	03100004	Mould design	3 (3,0)
7	0311100614	03100009	Product design and development	3 (3,0)
8	0311102341	03100020	Smart materials and structures	3 (3,0)
9	0311101431	03100021	Metal forming: fundamentals and technologies	3 (3,0)
10	0311103067	03100607	Vibration and vibration analysis	3 (3,0)
11	0311103068	03100608	Process control	3 (3,0)
12	0311100609	03100005	Advanced CAD/CAM	3 (3,0)
13	0311101422	03100007	Design and analysis of production systems	3 (3,0)
14	0311101430	03100019	CAE in mechanical design	3 (3,0)
15	0311101426	03100014	Factory design	3 (3,0)
16	0311101424	03100011	New and renewable energy	3 (3,0)
17	0311100607	03100022	Advanced fluid dynamics	3 (3,0)
18	0311103079	03100610	Advanced mechanism analysis and synthesis	3 (3,0)
19	0311103069	03100606	Micro and nano systems	3 (3,0)
20	0311103080	03100609	Analysis and design of flexure mechanisms	3 (3,0)
21	0311103081	03100612	Design of precision machines	3 (3,0)
22	0311102984	03100603	Modeling of heat and mass transfer	3(3,0)
23	0311102985	03100604	Effective exploitation of energy	2(2,0)
24	0311102986	03100605	Industrial ventilation engineering	2(2,0)
25	0311102987	03100606	Electric devices in HVAC	3(3,0)
26	0311102988	03100607	Automation in HVAC	3(3,0)
27	0311102989	03101608	Software for designing aircondition system	2(0,2)

No	Course code	Internal code	Course title	Credits
28	0311102394	03100609	Industrial robotics and control programming	2(2,0)
29	0311102990	03100610	System modeling and simulation	2(2,0)
30	0311102991	03100611	Servo control system	3(3,0)
31	0311102992	03100612	Industrial mechatronic system	3(3,0)
32	0311102993	03100613	Automatic production system	3(3,0)
33	0311102994	03100614	Optimization in mechanical engineering	3(3,0)
<b>III. Internship and research topics</b>				<b>12</b>
1	0311102995	03104615	Internship for research	3(0,3)
2	0311102996	03107616	Research topic 1	3 (0,3)
3	0311102997	03107617	Research topic 2	3 (0,3)
4	0311102998	03107618	Research topic 3	3 (0,3)
<b>IV. Thesis</b>				<b>15</b>
1	0311103004	03106624	Master thesis	15 (0,15)
<b>Total number of credits</b>				<b>60</b>

### 11.2 Academic Training Program for Application-Oriented Master's Program

No	Course code	Internal code	Course title	Credits
<b>I. Compulsory Courses</b>				<b>21</b>
1	0310100408	11100012	Philosophy	3 (3,0)
2	0312101421	03100006	System dynamics	3 (3,0)
3	0312100602	03100002	Advanced computational methods	3 (3,0)
4	0312100616	03100012	Advanced Thermodynamics	3 (3,0)
5	0312101428	03100017	Research design	3 (3,0)
6	0311103078	03100611	Operation management	3 (3,0)
7	0312102999	03107619	Thematic: contemporary technology and its application	3(3,0)
<b>II. Elective courses (select at least 23 credits)</b>				<b>23</b>

No	Course code	Internal code	Course title	Credits
1	0312100606	03100015	Design for X	3 (3,0)
2	0312101419	03100003	Smart manufacturing systems	3 (3,0)
3	0312101425	03100013	Lean systems	3 (3,0)
4	0312101427	03100016	Advanced mechanical measurement	3 (3,0)
5	0312101423	03100008	Rapid prototyping and 3D printing technologies)	3 (3,0)
6	0312101420	03100004	Mould design	3 (3,0)
7	0312100614	03100009	Product design and development	3 (3,0)
8	0312102341	03100020	Smart materials and structures	3 (3,0)
9	0312101431	03100021	Metal forming: fundamentals and technologies	3 (3,0)
10	0312103067	03100607	Vibration and vibration analysis	3 (3,0)
11	0312103068	03100608	Process control	3 (3,0)
12	0312100609	03100005	Advanced CAD/CAM)	3 (3,0)
13	0312101422	03100007	Design and analysis of production systems	3 (3,0)
14	0312101430	03100019	CAE in mechanical design	3 (3,0)
15	0312101426	03100014	Factory design	3 (3,0)
16	0312101424	03100011	New and renewable energy	3 (3,0)
17	0312100607	03100022	Advanced fluid dynamics	3 (3,0)
18	0312103079	03100610	Advanced mechanism analysis and synthesis	3 (3,0)
19	0312103069	03100606	Micro and nano systems	3 (3,0)
20	0312103080	03100609	Analysis and design of flexure mechanisms	3 (3,0)
21	0312103081	03100612	Design of precision machines	3 (3,0)
22	0312102984	03100603	Modeling of heat and mass transfer	3(3,0)
23	0312102985	03100604	Effective exploitation of energy	2(2,0)
24	0312102986	03100605	Industrial ventilation engineering	2(2,0)
25	0312102987	03100606	Electric devices in HVAC	3(3,0)
26	0312102988	03100607	Automation in HVAC	3(3,0)
27	0312102989	03101608	Software for designing air-condition system	2(0,2)
28	0312102394	03100609	Industrial robotics and control programming	2(2,0)
29	0312102990	03100610	System modeling and simulation	2(2,0)

No	Course code	Internal code	Course title	Credits
30	0312102991	03100611	Servo control system	3(3,0)
31	0312102992	03100612	Industrial mechatronic system	3(3,0)
32	0312102993	03100613	Automatic production system	3(3,0)
33	0312102994	03100614	Optimization in mechanical engineering	3(3,0)
34	0312103000	03103620	Design project of heating or cooling system	1(0,1)
35	0312103001	03107621	Thematic: Automation in production	2(1,1)
36	0312103002	03107622	Thematic: 3D printing technology	2(1,1)
<b>III. Internship</b>				<b>8</b>
1	0312103003	03104623	Internship for applied research	8(0,8)
<b>IV. Project</b>				<b>8</b>
1	0312103005	03106625	Master of engineering project	8(0,8)
<b>Total number of credits</b>				<b>60</b>