ĐẠI HỌC THÁI NGUYÊN

TRƯỜNG ĐẠI HỌC KỸ THUẬT CÔNG NGHIỆP

CHƯƠNG TRÌNH

ĐÀO TẠO ĐẠI HỌC

THEO HỆ THỐNG TÍN CHỈ

NGÀNH KỸ THUẬT CƠ KHÍ – CHƯƠNG TRÌNH TIÊN TIẾN

THÁI NGUYÊN NĂM 2023

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Chương trình khung Kỹ thuật Cơ khí - CTTT này đã được Hội đồng Khoa học và Đào tạo trường Đại học Kỹ thuật Công nghiệp thông qua và nghiệm thu

CHỦ TỊCH HỘI ĐỒNG KH & ĐT

HIỆU TRƯỞNG

TS. Đỗ Trung Hải

THÁI NGUYÊN NĂM 2023

MỤC LỤC

THAI NGUYEN UNIVERSITY OF TECHNOLOGY
FACULTY OF INTERNATIONAL TRAINING

SOCIALIST REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

MECHANICAL ENGINEERING IN ADVANCED PROGRAM

I. GENERAL INFORMATION ABOUT THE TRAINING PROGRAM

1. Genaral information

Major*: Advanced Program in Mechanical engineering (APM)*

Code: 7905218

Specialization: Mechatronics Engineering.

Degree of training: Undergraduate **Form of training:** Full-time

Time of training: 4 years; 4.5 years **Diploma:** Bachelor, Engineer

Diploma name: Bachelor of Mechanical Engineering/Engineer of Mechanical Engineering.

Degree - granting institutions: Thai Nguyen University of Technology

Teaching Institutions: Thai Nguyen University of Technology

Faculty: Faculty of International Training (FIT)

2. The duration of the training program

- Bachelor Degree:

+ The total amount of knowledge: 135 credits, excluding the knowledge of Physical Education (2 credits) and Military Education (5 credits).

+ Formal training period: 4 years (maximum study period is 8 years), each academic year has 3 main semesters and 1 sub-term (each main semester consists of 10 weeks of practical study and 2 weeks of exam; Extra semester includes 4 to 8 weeks of practical study and 1 week of exam, extra semester to create conditions for students to re-learn and improve).

+ Study plan: The training program is 12 semesters.

- Engineer Degree

+ The amount of knowledge of the whole course: 155 credits, excluding the knowledge of Physical Education (2 credits) and Military Education (5 credits).

+ Formal training period: 4.5 years (maximum study time is 9.0 years), each academic year has 3 main semesters and 1 sub-term (each main semester consists of 10 weeks of

practical study and 2 weeks of study time). exams; sub-semester consists of 4 to 8 weeks of practical study and 1 week of exam, an auxiliary semester to help students relearn and improve).

+ Study plan: The training program is 13 semesters.

3. Admission Information

- **Admission information**: Posted on the University's website under the following link: http://ts.tnut.edu.vn/
- **Scope of admission**: Enrollment nationwide
- **Eligibility**: Candidates who have graduated from high school or equivalent.
- **Admission method**:

+ Consider the scores of the National High School Exam for both National and International candidates.

+ Consider high school results (Academic transcripts) for both National and International candidates.

+ Admission according to the capacity assessment of Vietnam National University, Hanoi for Vietnamese candidates.

- The exam blocks are considered:

+ Block A00 (Math, Physics, Chemistry)
+ Block A01 (Math, Physics, English)
+ Block D01 (Language, Math, English)
+ Block D07 (Math, Chemistry, English)

4. Graduation conditions

Graduation conditions are clearly stated in the Decision No. 1515/QD-ĐHKTCN dated August 17, 2014 of the Rector of Thai Nguyen University of Technology on the promulgation of the Regulation on formal university training according to the credit system at Thai Nguyen University of Technology. Students of APM will be recognized for graduation after meeting the following conditions:

- Up to the time of graduation, not being prosecuted for criminal responsibility or not being disciplined at the level of academic suspension;
- Accumulate a sufficient number of courses specified in the training program;
- The cumulative GPA of the whole course is 2.00 or higher;
- Satisfy a number of requirements on learning results for the group of subjects in the main training discipline as prescribed by the Rector;
- Have a certificate of military education and physical education;
- Meet the English output standards (level 4/6 of the Vietnamese language competency framework) according to the University's regulations.

5. Mission, vision and cultural values of TNUT

5.1 Mission

Thai Nguyen University of Technology - Thai Nguyen University is a university that trains high-quality human resources; scientific research; consulting, applying and transferring technology to meet the requirements of sustainable development of the country and international integration.

5.2 Vision

Thai Nguyen University of Technology - Thai Nguyen University has become an application-oriented national and regional standard university in the field of science, engineering and technology; is a prestigious center for research, application and technology transfer in the country and in the region; is an address providing high-quality human resources to serve the community, making an important contribution to the socio-economic development of the country.

5.3 Cultural values

Inheritance - Creativity - Quality - Efficiency - Integration.

(The training program is issued according to Decision No. 1848 /QD-ĐHKTCN dated July 12, 2022 of the Rector of Thai Nguyen University of Technology).

II. OBJECTIVES OF THE TRAINING PROGRAM

1. Genaral information

1.1. Goal

- Students will be capable of working in the field of industrial product design and manufacturing, ensuring both the technical functions and aesthetic requirements of the products.

- The training aims to cultivate students with political integrity, ethics, a sense of serving the people, and physical fitness, meeting the requirements for nation-building and defense.

- Students will be equipped with fundamental knowledge for comprehensive development, the ability to apply basic engineering principles, high practical skills, and technical skills necessary for the job of Mechanical Engineering Engineer (Bachelor). They will possess sufficient self-learning and research abilities to continue studying at a higher level and the capacity to work in an international environment.

1.1.2. Objectives

Symbols	Specific objectives of the training program	Objects of application
MT1	Provide a broad foundation of basic mathematics and	Bachelor

	science knowledge, core technical engineering fundamentals, and specialized knowledge in the field of Mechanical Engineering for comprehensive development.	Engineer
MT2	Develop the ability to explore knowledge, systematic thinking skills, problem-solving skills, and professional skills in the field of Mechanical Engineering to fulfill social responsibilities and professional ethics.	Bachelor Engineer
MT3	Develop communication skills, information technology skills, and teamwork skills; entrepreneurial abilities and adaptability to diverse, multicultural work environments in the context of globalization.	Bachelor Engineer
MT4	Develop the capacity to conceive, design, implement, and operate mechanical production systems, automated production systems in the industry.	Bachelor Engineer

III. PROGRAM LEARNING OUTCOMES (PLOs)

Table 1.1. PLOs of training program

Sign	PLOs		Degree	
	CDIO	**Contents**	**Bachelor**	**Engineer**
PLO1	1.1	Apply fundamental knowledge of natural sciences, social sciences, and language and computer tools to absorb specialized knowledge and enhance learning abilities at a higher level.	**3**	**3**
PLO2	1.2	Apply core knowledge of mechanics, electricity, electronics, and control to understand and solve specialized problems in the field of mechanical engineering and related areas.	**3**	**3**
PLO3	1.3	Utilize in-depth knowledge and specialization to address technical issues in the professional activities of Bachelor's/Engineers in Mechanical Engineering.	**3**	**3**
PLO4	2.1	Analyze and propose solutions to address in-depth issues in the field of mechanical engineering and	**3.5**	**4**

Sign	PLOs		Degree	
	CDIO	Contents	Bachelor	Engineer
		related areas.		
PLO5	2.2	Classify, test, experiment hypotheses to solve technical problems and proficiently perform specialized skills in the field of mechanical engineering and related areas.	**4**	**4**
PLO6	2.3	Have systematic problem-solving skills in the field of mechanical engineering and related areas.	**3.5**	**3.5**
PLO7	2.4	Have lifelong learning abilities to enhance professional skills and succeed in careers.	**3**	**3**
PLO8	2.5	Be self-aware, respect corporate culture, and know how to work in an international environment; fulfill social responsibilities and professional ethics.	**3**	**3.5**
PLO9	3.1	Have the ability to work independently and effectively in teams.	**3**	**3**
PLO10	3.2	Communicate effectively in various forms: written communication, electronic communication, graphics, and presentations.	**3.5**	**3.5**
PLO11	3.3	Master English for international communication, research technical documents, and texts.	**4.5**	**4.5**
PLO12	4.1	Generate ideas, establish requirements, identify functional components, and model mechanical systems.	**3**	**3.5**
PLO13	4.2	Design detailed mechanical components and systems, proficiently using specialized mechanical design software.	**3.5**	**4.5**
PLO14	4.3	Organize, implement manufacturing of products and mechanical equipment.	**3.5**	**4.0**
PLO15	4.4	Manage, operate, and maintain mechanical systems and precision machining systems.	**3.5**	**4.5**
PLO16	4.5	Apply synthesized knowledge and skills to start-up and business ventures in the field of mechanical engineering and related areas.	**3.5**	**4.5**

Table 1.2. Competency scales

Table 1.2.1. Competency scales (Knowledge)

Competency		Brief description
$0.0 \leq \text{TDNL} < 1.0$	Foundation	Memorability: Students remember/recognize/recall knowledge through actions such as: describing definitions, recalling, listing, identifying,

Competency		Brief description
		determining...
1.0 < TDNL ≤ 2.0	Qualified	Understanding: Students can create knowledge from materials and information through actions such as explaining, classifying, illustrating, reasoning...
2.0 < TDNL ≤ 3.0		Application: Students apply knowledge to create products such as models, real objects, simulations, reports,..
3.0 < TDNL ≤ 4.0	Competently	Analyze: Students analyze documents/knowledge into details/parts and identify their relationships; specifically through actions such as analysis, classification, comparison, synthesis...
4.0 < TDNL ≤ 5.0		Evaluation: Students provide assessments, predictions about knowledge/information according to standards, criteria, and measured indicators evaluated through actions such as comments, critiques, proposals...
5.0 < TĐNL ≤ 6.0	Excellent	Creativity: Students construct /arrange /organize /design /generalize details/ parts in a different/ new way to create new structures/models/products

Table 1.2.2. Competency scales (Skills)

Competency	Brief description
0.0 ≤ TDNL ≤ 1.0	**Imitation:** observing and repeating a certain skill
1.0 < TDNL ≤ 2.0	**Self-completion** of a skill (not necessarily completely accurate) according to instructions, no longer imitating
2.0 < TDNL ≤ 3.0	**Repetition of a certain skill** in an accurate, rhythmic, and correct manner, often done independently without instruction.
3.0 < TDNL ≤ 4.0	**Combining multiple skills** in a smooth and stable manner according to a predetermined order.
4.0 < TDNL ≤ 5.0	**Completing one or many skills** easily and becoming natural, without requiring mental or physical exertion. Or: Mastering skills in different situations

Table 1.2.3. Competency scales (Attitude)

Competency	Brief description

$0.0 \leq TDNL \leq 1.0$	**Reception or Attention:** sensing the existence of an object - with open-hearted acceptance - controlling or focusing on it.
$1.0 < TDNL \leq 2.0$	It is possible to respond with the appropriate attitude to different events and situations.
$2.0 < TDNL \leq 3.0$	the ability to correctly assess the meaning and value of things, situations, and attitudes.
$3.0 < TDNL \leq 4.0$	Developing a sense of self-awareness about attitude.
$4.0 < TDNL \leq 5.0$	Cultivating attitude and awareness to become one's own style and essence

IV. CORRELATION MATRIX OF OBJECTIVES - PLOs

Table 1.3. Correlation matrix of objectives - standard output

Objective / PLOs	Objective 1	Objective 2	Objective 3	Objective 4
1.1	**X**	**X**	**X**	
1.2	**X**	**X**	**X**	
1.3	**X**	**X**	**X**	
2.1		**X**		**X**
2.2		**X**	**X**	**X**
2.3		**X**	**X**	**X**
2.4		**X**	**X**	**X**
2.5		**X**	**X**	**X**
3.1		**X**	**X**	**X**
3.2		**X**	**X**	**X**
3.3		**X**	**X**	**X**
4.1		**X**		**X**
4.2		**X**		**X**
4.3		**X**		**X**
4.4		**X**		**X**
4.5		**X**	**X**	**X**

V. JOB POSITION OF GRADUATES

After graduation, Bachelor's and Engineer's degree holders in Mechatronics can:

After graduation, students in APM can:

1. Working in positions: Designing new products, deploying technology, planning production, managing product quality and operating CNC machining systems in production and mechanical manufacturing.

2. Do research and teaching in research institutes, training establishments (colleges and universities), and vocational training.

3. Work as a state management expert in the Departments of Industry and Departments of Science and Technology of the provinces related to the field of mechanical engineering.

4. Work in management, design, and operation in foreign joint venture companies, facilities with modern production lines, and mechanical systems that automate mechanical production.

5. Work at research institutes, centers, and research agencies of ministries and branches.

6. Can work as a consultant and do commercial business in the fields of mechanical engineering.

7. Work at multinational corporations or internationally affiliated companies.

VI. LEARNING AND IMPROVEMENT OF STUDENTS AFTER GRADUATION

- After graduation, Bachelor's and Engineer's degree holders in APM are capable of self-studying and improving their knowledge based on the fundamental principles they have learned during their training.

- Meet the requirements to study for a second university degree in related fields.

- Have the ability to continue studying at the postgraduate level (master's, doctoral) in mechanical engineering, mechatronics, electronics and automation at educational institutions both domestically and internationally.

VII. DESCRIPTION OF TRAINING PROGRAM STRUCTURE

1. Training program framework

1.1 Allocation of knowledge blocks

Table 1.4. Allocation of knowledge blocks

Distribution of knowledge blocks	Bachelor's degree				Engineer's degree			
	Number of credits			Rate (%)	Number of credits			Rate (%)
	Total	Required	Elective		Total	Required	Elective	
Basic Science Knowledge	**53**	**50**	**3**	**39.3**	**53**	**50**	**3**	**34.2**
Political theory + General law	13	13	0	9.6	13	13	0	8.4
Social and Environmental Sciences	3	0	3	2.2	3	0	3	1.9
Math and Natural Science	27	27	0	20.0	27	27	0	17.4
Introduction to Mechanical Engineering	3	3	0	2.2	3	3	0	1.9
English	7	7	0	5.2	7	7	0	4.5
Specialized knowledge	**82**	**67**	**15**	**60.7**	**102**	**69**	**33**	**65.8**
Interdisciplinary and specialized fundamentals	45	36	9	33.3	45	36	9	29.0
Specialized knowledge	27	21	6	20.0	45	21	24	29.0
Experiment, practice, workshop	200	110	90	-	380	110	270	-
Graduate internship	4	4	0	3.0	6	6	0	3.9
Graduation thesis	6	6	0	4.4	6	6	0	3.9
Total number of credits	**135**	**117**	**18**	**-**	**155**	**119**	**36**	-

1.2. Content of the training program

Table 1.5. Training program framework

N0.	Code	Name of course	Credit numbers	Number of periods		Condition of precedent (Code of Courses)			Executing Department/ Center
				Theory	Practice/ Lab	precedent	Previous Subjects	parallel	
A	**GENERAL EDUCATION KNOWLEDGE**		**53**						
I	**Mandatory knowledge**		**50**						
1	BAS110	Ho Chi Minh Ideology *	2	x					
2	BAS123	Marx - Lenin Philosophy *	3	x					
3	BAS215	Political Economics of Marxism and Leninism *	2	x					
4	BAS217	History of The Communist Party of Vietnam *	2	x					
5	BAS305	Scientific Socialism *	2	x					

6	FIM207	Introduction of Laws *	2	x					
7	GMA001	Engineering Principles	3	x					
8	ENG104A	English for Academic Purposes	4	x					
9	ENG106A	English for Engineering	3	x					
10	CHE101	General Chemistry	3	x	x				
11	MAT001	Introductory Linear Algebra	3	x					
12	MAT102	Calculus 1	3	x					
13	MAT103	Calculus 2	3	x					
14	MAT004	Calculus 3	4	x					
15	MAT005	Differential Equations	3	x					
16	PHY001	Physics 1	4	x					
17	PHY002	Physics 2	3	x					
18	PHY003	Physics Laboratory	1		x				
19	BAS0109	Obligatory Physical Education	(1)		x				
20	TCV004	National defence education	(5)						
II	**Selective physical education**		**(2)**						
21.1	B103BC1	Elective Physical Education 1	(1)		x				
21.2	B103BĐ1	Elective Physical Education 2	(1)		x				
22.1	B103BR1	Elective Physical Education 3	(1)		x				
22.2	B103CL1	Elective Physical Education 4	(1)		x				
III	**Elective supplementary courses**		**3**						

23	MAE052	Industrial Environment and Sustainable Development	3	x					
24	GMA007	Principles of Communication	3	x					
25	MAE051	Engineering Impact on Society	3	x					
B	**SPECIALIZED KNOWLEDGE**								
I	**Interdisciplinary and specialized fundamentals**		**45**						
I.1	**Elective interdisciplinary knowledge**		**3**						
26.1	GEE001	Electrical Science	3	x					
26.2	MAE053	Quality Management	3	x					
26.3	MAE049	Industrial Enterprises Management	3	x					
26.4	MAE025	Industrial Maintenance Engineering and Management	3	x					
I.2	**Specialized fundamentals**		**18**						
I.2.1	***Required courses***		***15***						
27	GMA004	Introduction to ME Practice	3	x	x				
28	GMA002	Introduction to Engineering Drawing and CAD	3	x	x				
29	MAT106	Applied Math for MAE	3	x					
30	TTV101	Machining Workshop	0		x				
31	MAE029	MAE Laboratory	3		x				
32	MAE006	Engineering Materials	3	x	x				

I.2.2	**Elective Specialized fundamentals**		***3***						
33.1	MAE042	Mechatronics	3	x	x				
33.2	MAE044	Automotive Vehicle Dynamics	3	x	x				
33.3	MAE014	Instrumentation and Computer	3	x	x				
I.3	**Specialized fundamental knowledge**		**24**						
I.3.1	***Requred courses***		***21***						
34	MAE001	Statics	3	x					
35	MAE002	Dynamics	3	x					
36	MAE005	Mechanics of Solids	3	x					
37	MAE008	Thermodynamics	3	x					
38	MAE109	Fluid Mechanics	2	x					
39	MAE017	Product Design with CAD	3	x	x				
40	MAE115	Manufacturing Processes	4	x	x				
I.3.2	***Kiến thức cơ sở ngành tự chọn (chọn 1 học phần)***		***3***						
41.1	GMA006	Higher level language	3	x	x				
41.2	MAE045	Introduction to Finite Element Analysis	3	x	x				
41.3	MAE010	Heat Transfer	3	x	x				
41.4	MAE054	Engineering Computations	3	x	x				
I	**Specialized knowledge (Bachelor degree)**		**27**						
I.1	**Required courses**		**21**						
42	EEC010	Systems Analysis	3	x					
43	GEE002	Engineering Economics	3	x					

44	MAE122	Design Project in Mechanical Engineering	2						
45	MAE007	Material Laboratory	1		x				
46	MAE104	Design of Machine Elements	3	x	x				
47	MAE016	Design Process and Methods	3	x					
48	MAE003	Theory Of Machines and Mechanisms	3	x	x				
49	MAE027	Product Design in CAE Environment	3	x	x				
I.2	**Selective Specialized knowledge (6 credits)**		**6**						
50.1	MAE032	Geometric dimensioning and Tolerance	3	x	x				
50.2	MAE018	Manufacturing Automation	3	x	x				
50.3	MAE043	Materials Selection in Mechanical Design	3	x	x				
51.1	MAE482	Composite Materials	3	x	x				
51.2	MAE048	Introduction to Industrial Automation	3	x	x				
I.3	**Graduation internship and graduation thesis (Bachelor degree)**		**10**						
52	TTV302	Bachelor Internship	4		x				
53	MAE320	Bachelor Graduation Project	6		x				
C	**SPECIAL IN-DEPTH KNOWLEDGE OF ENGINEER'S DEGREE**		**30**						
I	**Elective courses (selecting 18**		**18**						

	credits)								
54.1	EE0020	Control Systems	3	x					
54.2	MAE026	Hydraulic and Pneumatic Systems	3	x	x				
55.1	MAE030	Electrical & Electronic Equipment for Industrial Machinery	3	x	x				
55.2	MAE031	Machining Technology	3	x	x				
56.1	MAE033	CAD/CAM-CNC	3	x	x				
56.2	MAE034	CAD/CAM/CNC Laboratory	3	x	x				
57.1	MAE035	Design of jigs and fixtures	3	x	x				
57.2	MAE037	Additive Manufacturing	3	x	x				
58.1	MAE038	Injection Molding Design	3	x	x				
58.2	MAE039	Industrial System Design	3	x	x				
59.1	MAE041	Advanced CAD/CAE	3	x	x				
II	**Graduation internship and graduation thesis**		**12**						
60	TTV002	Internship in Industry	6		x				
61	MAE020	Graduation Project	6		x				

Khối kiến thức thay thế học phần LLCT

N0.	Code	Name of course	Credit numbers	Number of periods		Condition of precedent (Code of Courses)			Executing Department/ Center
				Theory	Practice/ Lab	precedent	Previous Subjects	parallel	
1	MAE060	Ethics in engineering	3	x			x		
2	EE0003	Solid State Electronic Devices	3	x	x	x			
3	EE0017	Introduction to Digital Signal Processing	3	x	x	x			
4	GEE011	Energy Conversion	3	x	x	x			
5	GEE004	Experimental Methods 1	1		x	x			
6	GEE003	Electromagnetic fields	3	x		x			
7	EE0006	Digital logic design	3	x		x			
8	GEE015	Minor Independent Project	1						

2. Correlation diagram between the courses in the training program

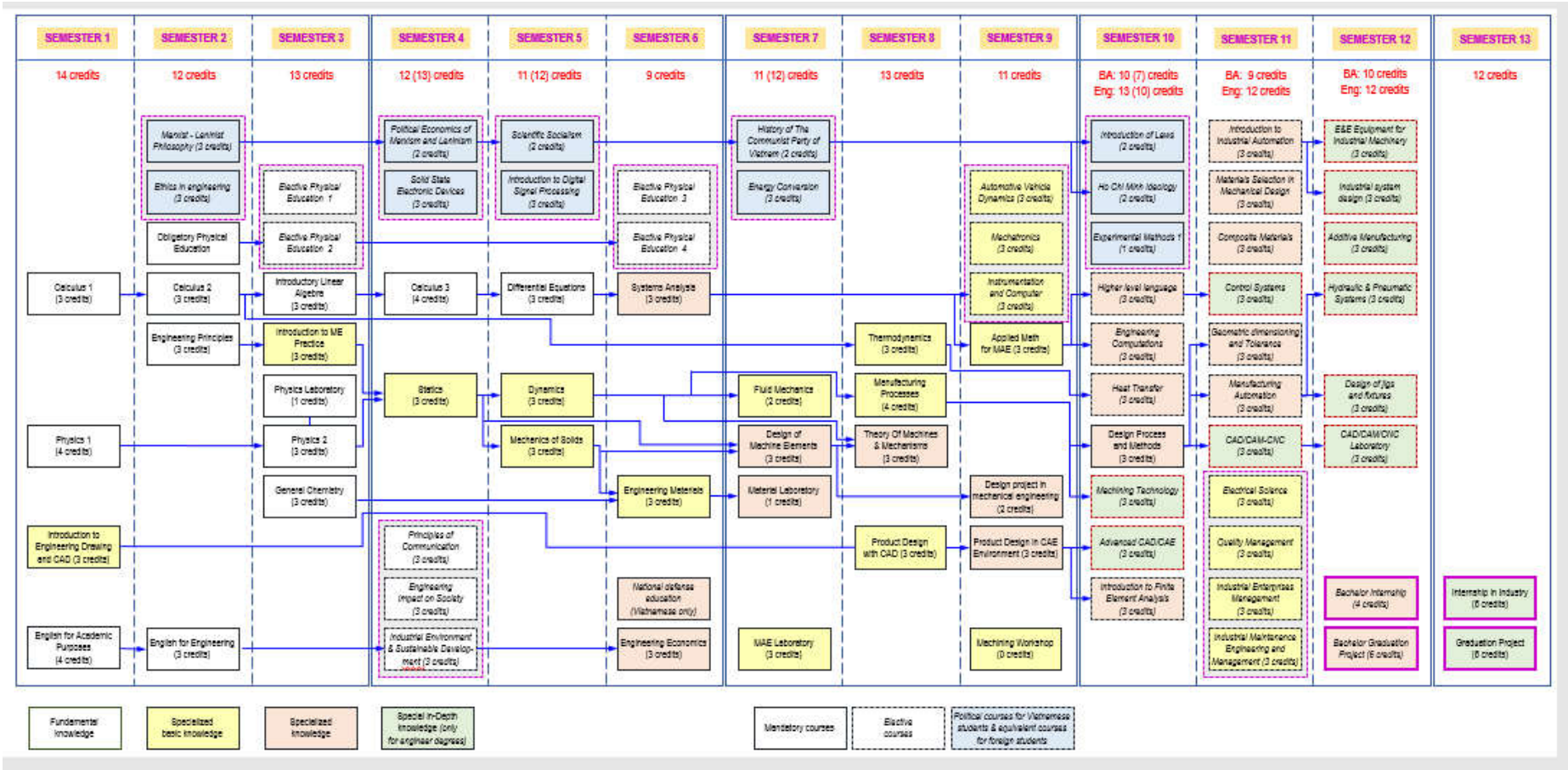

Figure 1: Mechanical Engineering progression tree

VIII. MATRIX OF KNOWLEDGE AND SKILLS

Table 1.7. Correlation Matrix

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PLO13	PLO14	PLO15	PLO16
	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	4.1	4.2	4.3	4.4	4.5
Học kỳ 1	**2**	**2**	**1.5**	**2**		**2**	**2**		**2**	**2**	**3**					
MAT102 - Calculus 1	2		1	2			2		2							
PHY001 - Physics 1	2		2	2			2		2							
GMA002 - Introduction to Engineering Drawing and CAD		2				2	2		2	2						
ENG104A - English for Academic Purposes		2					2		2		3					
Học kỳ 2	**2.6**		**2**	**2**		**2**	**2**	**2**	**2**	**2.3**	**4**					
GMA001 - Engineering Principles	2		2	2					2	2						
MAT103 - Calculus 2	3		2	2		2										
ENG106A - English for Engineering							2		2	2	4					
BAS0109 - Obligatory Physical Education																
BAS123 - Marx - Lenin Philosophy	3						2	2	2							
MAE060 - Ethics in			2					2	2	3						

engineering																
Học kỳ 3	**2.5**	**2**	**2**	**2**	**3**	**2**	**2.5**		**2.5**	**2.5**						
MAT001 - Introductory Linear Algebra	3		3	2		2										
GMA004 - Introduction to ME Practice		2			3		3		3	2						
PHY002 - Physics 2	2		3			2				2						
PHY003 - Physics laboratory	3		2		3				2	3						
CHE101 - General Chemistry	2		2		3	2										
B103BC1 - Elective Physical Education 1																
B103BĐ1 - Elective Physical Education 2																
Học kỳ 4	**2.6**	**3**	**2.2**	**2**	**2**	**2**	**3**	**2.3**	**2.5**	**2**						
MAT004 - Calculus 3	2		3	2		2										
MAE001 - Statics	3	3	2			2				2						
BAS215 - Political economics of marxism and leninism	3		1				3	3	2							
EE0003 - Solid State Electronic Devices				2	2	2				2						
MAE051 - Engineering Impact on Society			2	2			3	2								
MAE052 - Industrial environment and			2	2			3	2								

sustainable development																
GMA007 - Principles of communication			2				3		3	2						
Học kỳ 5	**3**	**3**	**2.6**	**2.3**	**3**	**2.5**	**3**	**3**	**2.5**	**2.5**						
MAE005 - Mechanics of Solids		3	2	2			3			3						
MAE002 - Dynamics		3	3	3		2	3									
MAT005 - Differential Equations	3		3	3		2										
BAS305 - Scientific socialism	3						3	3	2							
EE0017 - Introduction to Digital Signal Processing		2		2	3					2						
Học kỳ 6		**2.3**	**2.3**	**2.5**	**3**	**3**	**3**	**3**								
EEC010 - Systems Analysis		2	2	2		2										
MAE006 - Engineering Materials		3	3	3	3	2										
GEE002 - Engineering Economics		2	2				2	3								
B103BR1 - Elective Physical Education 3																
B103CL1 - Elective Physical Education 4																
Học kỳ 7	**3**	**2.6**	**3**	**2.5**	**2.7**	**3**	**3**	**3**	**2.5**	**2.8**						
MAE029 - MAE		3			3				3	3						

Laboratory																
MAE007 - Material Laboratory		3			3	1			2	3						
MAE104 - Design of Machine Elements		3		3	3			3		3						
MAE109 - Fluid Mechanics		2	3	3						2						
BAS217 - History of The Communist Party of Vietnam *	3						3	3	3							
GEE011 - Energy Conversion		2		2	2				2							
Học kỳ 8		**3**	**2.8**	**2.7**	**3.3**	**3**	**3**		**3.2**	**3**		**3**	**3**			
MAE008 - Thermodynamics		3	2		3					3						
MAE115 - Manufacturing Processes		3	3	2	3											
MAE003 - Theory Of Machines and Mechanisms	3	3		3	3								3			
MAE017 - Product Design with CAD	3				4				3	3						
Học kỳ 9	**3**		**2.5**	**2.8**	**3.7**	**3**	**3**	**3**	**3**	**3.5**		**2.8**		**3**	**3**	
MAT106 - Applied Math for MAE	3		3			3			3							
MAE122 - Design Project in Mechanical			3	3		3			3	4		3				

Engineering																
MAE027 - Product Design in CAE Environment				3	3				3	4						
TTV101 - Machining Workshop				3	3									3	3	
BAS110 - Ho Chi Minh Ideology	3						3	3	3							
GEE004 - Experimental Methods 1			2	2	3				2							
FIM207 - Introduction of Laws			2				3	3								
Học kỳ 10 (kỹ sư)			**2.6**	**3.4**	**4**	**3.5**			**3.3**	**3.3**		**3.1**	**3.3**	**3.4**	**3.3**	
MAE016 - Design Process and Methods			3	4		4						3	3	4		
MAE042 - Mechatronics			3	3	4							3	3		3	
MAE044 - Automotive Vehicle Dynamics			3	3	4							3			3	
MAE014 - Instrumentation and Computer			2	3	4							3		3	4	
GMA006 - Higher level language			2		4	3				3						
MAE045 - Introduction to Finite Element Analysis			3		4				3			3	3			
MAE010 - Heat Transfer			2		4				3	3		3				
MAE054 - Engineering			3		4					3		3				

Computations																
MAE031 - Machining Technology					4				4			3	3	4		
MAE041 - Advanced CAD/CAE				4	4					4		4				
Học kỳ 11 (kỹ sư)			**3.2**	**3.2**	**3.7**		**3**	**3**	**3**	**3.5**		**3.5**	**4**	**4**	**3.6**	**3.3**
GEE001 - Electrical Science			3	3	3				3							
MAE053 - Quality Management				3			3	3								3
MAE049 - Industrial Enterprises Management				3			3	3								3
MAE025 - Industrial Maintenance Engineering and Management				3			3	3								4
MAE048 - Introduction to Industrial Automation				4	4				3						3	
MAE043 - Materials Selection in Mechanical Design			3	3	4					4				4		
MAE482 - Composite Materials			3		4				3							
MAE032 - Geometric dimensioning and Tolerance			3		4				3	3						
MAE018 - Manufacturing Automation			3	3								3		4	4	

EE0020 - Control Systems			3		3					4					4	
MAE033 - CAD/CAM-CNC			4		4							4	4	4		
Học kỳ 12 (kỹ sư)				**4**	**3.3**				**3**			**3.3**			**4**	**3.5**
MAE030 - Electrical & Electronic Equipment for Industrial Machinery				4	3				3			3			4	3
MAE039 - Industrial System Design				4	3							4			4	3
MAE037 - Additive Manufacturing				3	4							3			4	
MAE026 - Hydraulic and Pneumatic Systems				4	3				3			4			4	4
MAE035 - Design of jigs and fixtures				4	4				3			3				
MAE034 - CAD/CAM/CNC Laboratory					3				3			3			4	4
Học kỳ 13 (kỹ sư)			**3**	**4**	**4**	**3.5**	**3**	**3.5**	**3**	**3.5**		**3.5**	**4.5**	**4**	**4.5**	**4.5**
TTV002 - Internship in Industry				4	4	3	3	4	3	3		3	4	4	4	4
MAE020 - Graduation project			3	4	4	4		3	3	4		4	5	4	5	5
Kiến thức-Kỹ năng-Thái độ của CTĐT (Kỹ sư)	***3.0***	***3.0***	***3.0***	***4.0***	***4.0***	***3.5***	***3.0***	***3.5***	***3.0***	***3.5***	***4***	***3.5***	***4.5***	***4.0***	***4.5***	***4.5***

COURSE DESCRIPTIONS OF THE APM PROGRAM

I. GENERAL KNOWLEDGE

1.1Compulsory Courses

1. Philosophy of marxism and Leninism (BAS123 - 3 Credits)

- *Allocate studying time:*
  - Lecture in class : 43 periods
  - Sefl-study : 90 periods
  - Process Test : 02 periods
- *Pre-requisite:*
- *Course description:* Philosophy of marxism and Leninism course is the first compulsory module in the political theory modules system in training program. The module content include 03 chapters which is studying the laws of motion, the most common development of the nature, society and thought; building the worldview, scientific methodology, revolution then applying to cognitive science revolution practice.

2. Political Economy Marxisim Leninism (BAS215 -2 Credits)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Sefl-study : 60 periods
  - Process Test : 02 periods
- *Pre-requisite: Philosophy of marxism and Leninism*
- *Course description:* This module content presents the theory of Marxist-Leninist political economy and some problems of Vietnam economy, such as: Market economy in socialist orientation; industrialization; modernization and International economic integration of Vietnam economy in current.

3. Scientific Socialism (BAS305 - 2 Credits)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Sefl-study : 60 periods
  - Process Test : 02 periods
- *Pre-requisite: Political Economy Marxism Leninism*
- *Course description:* This course presents the basic contents of Scientific Socialism such as: Historical mission of labouring caste; Socialism and the transition period to Socialism; Socialist democracy and the socialist government; social

structure-caste system and caste alliances, caste during the transition period to socialism; ethnic, religious and family issues in the transition period to socialism.

4. History of the Vienamese Communist Party (BAS217 - 2 Credits)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Sefl-study : 60 periods
  - Process Test : 02 periods
- *Pre-requisite:* Scientific Socialism
- *Course description:* This course provides for student the knowledge about the formation of the Vietnamese Communist Party, the leadership process of the Vietnamese Communist Party throughout the revolutionary period from 1930 to present. Thereby confirming the successes, summarizing the experience of the Party's leadership in the revolution in order to improve the students awareness and belief in the Party, then able to apply the learned knowledge to work and contributing to the construction and defense of the Vietnam Country.

5. Ho Chi Minh' Ideology (BAS110 - 2 Credits)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Sefl-study : 60 periods
  - Process Test : 02 periods
- *Pre-requisite:* History of the Vietnamese Communist Party
- *Course description:* Ho Chi Minh' Ideology is the compulsory module in the training program of college and university students in which non-speciallist of Marxism Leninism or Ho Chi Minh' Ideology major. This module aims to equip for students with Ho Chi Minh's viewpoint system about the basic issues of the Vietnamese revolution.

6. Introduction to Laws (FIM207 - 2 Credits)

- *Allocate studying time:*
  - Lecture in class : 28 periods
  - Sefl-study : 60 periods
  - Process Test : 02 periods
- *Pre-requisite:*
- *Course description:* Introduction to Laws is the compulsory module in the general education which is present about the overview of Government and Law; the Law system; constitutional law; administrative law; civil law; criminal law; marriage and family law; anti-corruption law. This knowledge help students understand the basic of

Vietnamese law and able to apply in practice, improve the legal awareness, evaluate and direct their own behavior and the other people according to legal standards, respect and implement the law.

7. Engineering Principles (GMA001 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

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

8. English for Academic Purposes (ENG104-4CREDITS)

- *Allocate studying time:* 4/0/0/120 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

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

9. English for Engineering (ENG106-3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

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

10. General chemistry (CHE001 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* non

- *Course description:* General Chemistry course is core science course serving as the first step towards an undergraduate chemistry degree, also laying the foundation for students to pursue more specialized studies in other fields of science and engineering. This course provides a firm basis for understanding the fundamental

principles and laws of chemistry such as: states of matter, atomic and molecular structure, stoichiometry, thermochemistry, periodictable, chemical equilibrium, chemical kinetics and quantum mechanics. Upon completion, students should be able to demonstrate an understanding of chemical concepts as needed to pursue further study in chemistry and related professional fields.

11. Introductory Linear Algebra (MAT001-3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Introductory Linear Algebra is an introduction to the theory and applications of systems of linear equations and linear operations, focusing on these on finite dimension spaces. Applying widely of this theory, especially in engineering, is very useful for the developing of the model technology. Topics covered include matrices, determinants, linear systems, vector spaces, linear transformation, eigenvalues and diagonalization of matrices.

12. Calculus 1 (MAT002-4CREDITS)

- *Allocate studying time:* 4/0/0/120 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Calculus I is concerned with change and motion, it deals with quantities that approach other quantities. This is the first part of a three-semester sequence in calculus for students of mathematics, natural sciences, and engineering. Topics covered include functions and models; limits and derivatives; differentiation rules; and application of differentiation.

13. Calculus 2 (MAT003-3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Calculus II is the second part of a three-semester sequence in calculus intended for techology, biology, computer science, economics for students of mathematics, natural sciences, and engineering. Topics covered include integration techniques, applications of Integrations, Parametric Equations and Polar Coordinates, and Infinite Squences and Series.

14. Calculus 3 (MAT004 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* The course is the most important pattern in the block of general education of the curriculum. The subjects in the course covered a large part of the training program which seem to appear in almost all applied science fields and in physics. Two fundamental calculations of calculus including the differentiation and the integration are constructed as the heart of the classic multivariate calculus. They are developed with the intensive presence of the vector fields, the oriented objects in spatial time.

The extension of the differentiation in a high dimension space introduces the concept of the partial derivatives, the directional derivatives, the gradient vector, and the rules of differentiation, their applications in the optimization problems and in the study of a geometric object such as a space curve, a surface, an orbit of a motion in three dimension space with respect the time. The big stones for the differentiation to be applied on many domains of the natural sciences are built up on these foundations such as Jacobian, Hessian, Lagrange multipliers. These achievements bring a great success of calculus to many applied science fields. The introduction of the multivariate integrals, line integrals, surface integrals, and flux provides extremely useful tools in study the natural phenomena appearing in any domain, especially in physics and engineering fields. These fields in turn create a lot of concepts, ideas to calculus in highly abstract ways and the approaches in dealing with a particular problem that reveals from the inside the fields. This makes the great achievement nowadays of mathematics in common and of calculus in particular. Throughout the course, this relationship is unveiled with the introduction to the applications of these tools to many applied science fields. This connection is necessary in providing and persuading students a scientific vision to a natural phenomenon or an applied science problem. With the help of great discoveries in computer science, mathematical software is plentiful and useful for learners. The ability of using these tools should be equipped to students to make the facilities in the method of teaching and learning. Therefore, this course also provides the students the ability of understanding and practicing the calculation constructed on a particular mathematical software such as Maple, or Matlab. This aim also inspires the creation inside students.

15. Differential equations (MAT005-3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Ordinary differential equations (ODE) are a fundamental part of the mathematical vocabulary used to describe natural phenomena. The course emphasizes classical methods for finding exact solution formulas. The course covers a rich number of subjects relating to an ODE, especially the case of the initial value problems (IVPs). The basic concepts of the solutions including the exact solution, the

integral curve, and the vector field of the DE are introduced as the foundation of the theory of ODE. The analytic setting of the IVP for the existence and uniqueness of the solution, the superposition principle are the crucial knowledge needed to be equipped for students whose majors are natural sciences and engineering. Following these foundations, the various types of basic ODE are presented with analytic methods in solving their exact solution under the consideration of its existence and uniqueness. In bridging the fields of engineering and calculus, Laplace Transforms also presented as the important part of the analytic methods for finding the solution of an IVP. The population of this tool in studying other scientific courses of the curriculum provides a fertile material for learners to present the creation in their engineering or scientific fields.

Today, with the help of great discoveries in computer science, mathematical software is plentiful and useful for learners. The ability of using these tools should be equipped to students to make the facilities in the method of teaching and learning. Therefore, this course also provides the students the ability of understanding and practicing the calculation constructed on a particular mathematical software such as Maple, or Matlab. This aim also inspires the creation inside students.

16. General Physics 1 (PHY001-4CREDITS)

- *Allocate studying time:* 4/0/0/120 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

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

17. Physics 2 (PHY002-3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

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

18. Physic laboratory (PHY003-1CREDITS)

- *Allocate studying time: 0*/0/1/30 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* support student learning in the processes of scientific investigation. The process of doing science involves creating and using models to predict and explain measurements of physical quantities. As a group of teaching professionals working in the laboratory, our emphasis is to help students learn to make and interpret measurements, compare data to model predictions, and use the results of their analysis to revise models.

19. National defence education (CREDITSV104)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:* Nội dung ban hành theo quyết định số 81/2007/GĐ – BGDĐT, ngày 24/12/2007 của bộ trưởng bộ giáo dục và đào tạo.

20.1. Elective Physical Education 1 (B103BC1)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:* Giáo dục thể chất tự chọn (Bóng chuyền 1) là môn học tự chọn đối với sinh viên hệ chính quy trong toàn trường. Học phần trang bị cho sinh viên những kiến thức, kỹ năng, kỹ thuật cơ bản trong môn Bóng chuyền. Qua đó sinh viên vận dụng vào trong tập luyện và thi đấu để nâng cao sức khỏe và phát triển các tố chất thể lực; hình thành nhân cách và lối sống lành mạnh;…. đáp ứng nhu cầu phát triển toàn diện cho sinh viên.

20.2. Elective Physical Education 2 (B103BĐ1)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:* Học phần Bóng đá 1 là học phần tự chọn. Học phần này cung cấp cho sinh viên kiến thức, kỹ thuật động tác cơ bản trong môn Bóng đá. Qua đó sinh viên vận dụng vào trong tập luyện và thi đấu để nâng cao sức khỏe và phát triển các tố chất thể lực; hình thành nhân cách và lối sống lành mạnh;…. đáp ứng nhu cầu phát triển toàn diện cho sinh viên

20.3. Elective Physical Education 3 (B103BR1)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:* Giáo dục thể chất tự chọn (Bóng rổ 1) là môn học tự chọn đối với sinh viên hệ chính quy trong toàn trường. Học phần trang bị cho sinh viên những kiến thức, kỹ năng, kỹ thuật cơ bản trong môn Bóng rổ. Qua đó sinh viên vận dụng vào trong tập luyện và thi đấu để nâng cao sức khỏe và phát triển các tố chất thể

lực; hình thành nhân cách và lối sống lành mạnh;…. đáp ứng nhu cầu phát triển toàn diện cho sinh viên

I. Elective supplementary courses

21. Practical experience (GMA002 - 3CREDITS)

- Allocate studying time:

- Prerequisites:

- Course description:

22. Industrial environment and sustainable development (GMA006 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Industrial environment and sustainable development is an elective course in the general education knowledge block for engineering students. This module provides students with basic knowledge about the environment and systems, the relationship between humans and natural resources, environmental pollution in general, pollution in industries today. On that basis, this course helps students to have the ability to analyze the role of the environment existence, existence and natural resources in human and development; be able to analyze the causes and consequences of resource degradation and environmental pollution; have the ability to take action to contribute to environmental protection. In addition, students can work in groups and present problems, improving presentation skills

23. Principles of Communication (GMA007 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

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

24. Engineering Impact on Society (GMA003 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* This course, a one-credit freshman seminar course, aims at broadening students' vision of engineering problem solving, and elucidating how engineers can make a difference in meeting key societal needs. The course focus is the National Academy of Engineering's 'Grand Challenges' for the future. It includes a series of interactive presentations by engineering faculties who are experts in these areas, offering an understanding of both problems and engineering approaches to solving them. Students also explore a self-selected area of personal interest as a step toward identifying possible niches for their own career path.

B. SPECIALIZED KNOWLEDGE

I. Elective supplementary knowledge

25.1. Electrical Science (GEE001 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Electrical Engineering Concepts for Non-Majors introduces the basic concepts and methodologies that are widely used in theoretical and applied electric circuits. Basic laws such as Ohm's and Kirchhoff's laws, methods of analysis like nodal and mesh analysis, and circuit theory, e.g., Thevenin's and Norton's theorems will be included. The circuit theory and technique applied to AC circuits will be covered

25.2. Quality Management (GEE003 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Political Economy Mac-Lenin

- *Course description:* Quality Management course is an elective course for engineering students, including the following contents: Introduction to general quality management issues (positions, roles, principles and methods) quality management); a number of statistical techniques and tools in quality management; quality assurance tools. The module equips students with the initial knowledge of quality management in industrial production to apply to product quality management.

25.3. Industrial enterprises management (GEE004 - 3CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Industrial enterprises management, is an elective course for engineering students, including the following topics: some principles of economics and how the economy works through supply-balance- bridge; industry and characteristics of industrial enterprises; administrators and administrative functions;

Some specific areas of management in industrial enterprises. This module will help students better understand socio-economic issues as well as be equipped with more knowledge and skills to integrate and develop in the working environment after graduation

25.4. Industrial maintenance Engineering and Management (MAE025 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Industrial maintenance Engineering and Management, is the course that provides basic knowledge in organization and maintenance management; Understanding the importance and benefits of maintenance and then choose preventive maintenance solutions suitable for each business model

II. Interdisciplinary and specialized fundamentals

2.1 Required courses

26. Introduction to ME Practice (GMA004 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

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

27. Introduction to engineering drawing and CAD (GMA102 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* Engineering drawing is a basic course for all undergraduate Engineering program. This course is introduced to provide the basic understanding of the fundamentals of engineering drawings, mainly visualization, graphics theory, standards and conventions of drawing, the tools of drawing including computer software (AutoCAD) and the use of drawings in engineering applications

28. Applied Math for MAE (MAT106 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Introductory Linear Algebra (MAT001), Calculus I-II-III (MAT002-003-004), Ordinary Differential Equation (MAT005)

- *Course description:* Considering the solution of engineering problems using computational methods, this course emphasizes the development of numerical algorithms to provide solutions to common problems formulated in engineering in particular, and in science as well. The primary objective of the course is to develop basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand the guaranteed accuracy that various methods provided, the efficiency and scalability for large-scale systems, and the issues of stability.

An important component of numerical analysis is the computational implementation of algorithms that are developed in the course in order to observe at first hand the issues of accuracy, computational work effort, and stability. Exercises will include computational experiments in a programming language of the student's choice. One class lecture will be devoted to a high-level pseudo-code type programming language (MATLAB) which will suffice in case students have not had prior programming experience.

29. Machining workshop (TTV001 - 0 CREDITS)

- *Allocate studying time:* 0/90/0/0 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:*

N0	**1.5 credits of mechanical internship**		**1.5 credits of electrical internship**	
1.	Turning	15 hours	Measurement – electrical instruments	18 hours
2.	Milling	15 hours	Electric equipment	18 hours
3.	Planer machine	15 hours	Electric machine	18 hours
4.	Grinding	15 hours	Electronic	18 hours
5.	Welding	15 hours	Power supply	18 hours
6.	Forging	15 hours		
Total		**90 hours**		**90 hours**

The basic internship module equips students with the knowledge:

- Industrial safety and hygiene techniques during internship.

- Steps for manipulating and operating equipment at vocational departments.

- Understand the processing process according to technical requirements according to designs and drawings.

Understand the operating principles of some basic electrical circuits.

30. MAE Laboratory (MAE029 - 3 CREDITS)

- *Allocate studying time: 0*/0/3/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* MAE 340, EAS 209

- *Course description:* Introduces digital data acquisition systems as A/D converters, and amplifiers, error analysis, transducers for mechanical and electrical measurements, static and dynamic response of electrical and mechanical elements and systems, modifying dynamic response using feedback control.

31. Engineering Materials (MAE006 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Physics, Chemistry

- *Course description:* Engineering Materials is an interdisciplinary field concerned with inventing new materials and improving existing materials by developing a deep understanding of the microstructure-composition-processing relationship. The course is designed to cover the following subjects: classification of materials, atomic structure, periodic table, molecular structure, bonding in solid materials, structure of crystalline solids, mechanical properties of the materials, phase diagrams, thermal processing of metal alloys, corrosion, properties and introduction to ceramics, glasses and composites.

2.2 Elective specialized fundamental knowledge

32.1 Mechatronics (MAE042 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

- *Course description:* Studies the theory and practice of hardware and software interfacing of microprocessors with analog and digital sensor/actuators to realize Mehanicalsystems. Coverage includes microprocessor architectures, programming, digital and analog circuits, sensors, actuators, communication protocols, and real-time and operator interface issues as applicable to the design and implementation of simple Mehanicalsubsystems.

32.2. Automotive Vehicle Dynamics (MAE044 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

- *Course description:* Covers the forces and torques generated by tires (under both traction and braking) and by the relative wind; two-wheel and four-wheel models of a vehicle; simplified stability and control of transients; steady-state response to external disturbances; effects of the roll degree of freedom; equations of motion in body-fixed coordinates; lateral load transfer; force-moment analysis; and applications of feedback-control theory to the design of subsystems for improved performance.

32.3. Instrumentation and Computer (MAE014 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

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

III. Specialized fundamental knowledge

3.1. Required courses

33. Statics (MAE001 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Physics 2 (PHY002), Calculus 3 (MAT004)

- *Course description:* This course is designed to give you an introduction to engineering mechanics in static systems. Statics deals with two- and three-dimensional systems of particles and rigid bodies in static equilibrium. Additional topics include concentrated and distributed forces, centers of gravity and centroids, and moments of inertia. Special attention is devoted to forces in frames, structures, beams, and cables. For many of you, this will be your first engineering course. In fields such as mechanical or civil engineering, statics is indispensable in the design and analysis of structures that must hold their shape while bearing a load or performing a task where dynamic forces (forces arising from acceleration of the system) are absent or negligible.

34. Dynamics (MAE002 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* This course is an introduction to the dynamics of mechanical systems. Topics covered include kinematics and kinetics of particles as well as rigid bodies in planar motion, work-energy concepts, momentum and Lagrange's equations for multi-degree of freedom models of mechanical systems.

35. Mechanics of Solids (MAE005 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Statics

- *Course description:* In this course, we will build on the knowledge gained in Statics to determine the internal forces in structures due to applied external loads. We will then see how these internal forces are distributed in terms of stresses. The emphasis of this course will be on understanding how solid bodies deform when subjected to these internal forces, and thus a key objective is to understand the mechanical behavior of materials. Emphasis will be on understanding basic concepts and applying them to solve engineering problems. These concepts are important in future engineering studies and in practice because many of the equations in engineering design codes are based on fundamental concepts that will be covered in this course.

36. Thermodynamics (MAE008 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Calculus 3 (MAT004)

- *Course description:* Thermodynamics is a required course for mechanical engineering students. It is a branch of physics concerned with heat and temperature and their relation to energy and work. The behavior of these quantities is governed by the laws of thermodynamics, irrespective of the composition or specific properties of the material or system in question. Its application is emphasized in different states of substances to solve a lot of problems in engineering.

37. Fluid Mechanics (MAE009 - 2 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Calculus 3, Physics 2 , Statics, Dynamics

- *Course description:* After studying the course of Fluid Mechanics, students will obtain:

• The basic principles and equations of Fluid Mechanics.

• Understanding the nature of fluid mechanics through lectures and self-studying.

Moreover, the students will be able to understand examples in the textbook and know how to do the textbook's exercises as well as their applications in the future in the real world of engineering, especially in the field of Mechanical and Aerospace

Engineering.

• Be able to develop an intuitive understanding of fluid mechanics for their future careers and lives.

Moreover, specific learning objectives for each chapter are clarified, as are means by which achievement of the objectives may be assessed. The summary of each chapter highlights key terminology and concepts developed in the chapter and poses questions designed to test and enhance student comprehension.

38. Design Product with CAD (MAE017 - 3 CREDITS)

- *Allocate studying time:* 2/1/0 (Lecture hours/Practice hours/Laboratory hours

- *Prerequisites:* Engineering Drawing and CAD (GMA002), Theory of machines and mechanisms (MAE003), Design of machine elements (MAE004)

- *Course description:* The course "Product Design with CAD" provides the students the knowledge and skills of utilizing computer aided software (CAD) to design and analysis mechanical products according to functionalities, appearance, and manufacturing costs of the products.

39. Manufacturing Processes (MAE115 - 4 CREDITS)

- *Allocate studying time: 3*/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Statics (MAE001), Dynamics (MAE002), Engineering Drawing and CAD (GMA002), Product Design with CAD (MAE017)

- *Course description:* The course "Manufacturing processes" is a professional course for undergraduate Mechanical Engineering training. This course will introduce the Mechanical engineering students to manufacturing processes and prepare them for an entry-level career in any industrial set up. Students learn basics of Engineering Metrology & Tolerance, Casting, Forming, Metal Removal processes, Powder Metallurgy, Surface Processes, Assembly Technology and solving manufacturing engineering problems with special emphasis on Mechanical Engineering issues such as design and manufacturing.

3.2. Elective specialized fundamental knowledge (chosing 02 courses)

40.1. Higher level language (MAE047 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

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

40.2. Introduction to Finite Element Analysis (MAE045 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

- *Course description:* The objective of this course is to enable you to perform basic analysis of physical systems using the finite element method. At the end of this course you should have a clear understanding of the fundamentals of the method, the underlying mathematics and its application to several problems of interest. As a second level class, the focus will be on developing a deeper understanding of the method, as needed for applying it to more complex problems.

40.3. Heat Transfer (MAE010 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* Heat transfer, is a required course for mechanical engineering students. The course presents the three modes of heat transfer: conduction, convection, and radiation. One dimensional steady states of heat conduction are studied for planar, cylindrical, and spherical coordinatesA two-dimensional steady state is also studied in the general form for heat conduction relations. Convection heat transfer is studied and in details mainly in external flows and two-phase transport. Radiation heat transfer is studied by considering both the general characteristics of radiation as well as the properties of radiating surfaces and radiation heat transfer process.

40.4. Engineering Computations (MAE024 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* This is a first course in computer programming that develops programming concepts using MATLAB with application to engineering problems. Topics include data structures, arithmetic expressions, I/O, plotting, branching and loop structures, debugging, and user-defined functions. These concepts will be illustrated and emphasized through applications in chemical process mass balances, transport processes, truss structures, data fitting, principal component analysis in fluid and solid mechanics, and modal analysis in dynamics

Specialized knowledge (Bachelor degree)

1. Required courses

41. System Analysis (EEC010 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

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

42. Engineering Economy (GEE002 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Calculus 1

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

43. Design project in mechanical engineering (MAE122 - 2 CREDITS)

- *Allocate studying time:* 0/1/0/45 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Engineering Drawing and CAD (GMA002), Design of Machines and Elements (MAE004), Mechanics of Solid (MAE005)

- *Course description:* In this design project, students are asked to design a reduction gearbox that will take power from the shaft of an electric motor and deliver it to a machine that is to operate a specific task. Project main topics focus on gear transmission design, shaft calculation and bearing selection.

44. Engineering materials LAB (MAE007 - 1 CREDITS)

- *Allocate studying time:* 0/0/1/15 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Engineering principles

- *Course description:* Involves experiments designed to illustrate the relationships among the processing, internal structure and properties of engineering materials, emphasizing metals and their heat treatment, microstructure and mechanical properties, includes laboratory report writing and work in groups.

This course plays a role as providing students with hands-on experiences in metallography, heat treatment and mechanical testing, in order to help students obtain deep understandings about engineering materials and develop their engineering analysis and research skills.

45. Design of machine elements (MAE004 - 4 CREDITS)

- *Allocate studying time:* 4/0/0/120 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Statics (MAE001), Mechanic of Solid (MAE005)

- *Course description:* The course is a basic introduction to the design, function and analysis of mechanical components. The primary focus is analysis from a failure perspective. The course is spent understanding failure of these components under static and dynamic loading and learning about the basic functionality and behavioral modeling of common mechanical components and analyzing those components under the learned failure theories.

46. Design Process and Methods (MAE016 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Manufacturing processes

- *Course description:* Discusses the fundamental concepts and activities of design processes. Investigates domain-independent topics of design processes. These topics include idea conception, teamwork, quality, experimental design, optimization, and technical communication. In addition, discusses fundamental methods of design, including decision making, conceptual design, cost evaluation, ethics issues, and intellectual property issues, which are investigated through interactive lectures and individual and group exercises.

47. Theory Of Machines and Mechanisms (MAE003 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* : Physics 2 (PHY002005), Statics (MAE001), Dynamics (MAE002)

- *Course description:* This course is the field of engineering theory, analysis, design and practice in which mechanisms, kinematics and dynamics of machines are studied in general. The primary focus is supplying and developing a basic understanding of structure, kinematics and dynamics of mechanisms and machines. The course is spent knowing the principle of building up structure of mechanisms and machines, analyzing kinematics and dynamics of mechanisms and machines, synthesis of some simple mechanisms.

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* : Physics 2 (PHY002005), Statics (MAE001), Dynamics (MAE002)

- *Course description:* This course is the field of engineering theory, analysis, design and practice in which mechanisms, kinematics and dynamics of machines are studied in general. The primary focus is supplying and developing a basic

understanding of structure, kinematics and dynamics of mechanisms and machines. The course is spent knowing the principle of building up structure of mechanisms and machines, analyzing kinematics and dynamics of mechanisms and machines, synthesis of some simple mechanisms.

48. Product Design in CAE Enviroment (MAE027 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* This course examines detailed mechanical design of functional, pragmatic products, including topics in computer-aided-design (CAD), finite element analysis (FEA), and geometric dimensioning & tolerancing (GD&T). The lab portion of the course will focus on learning CAE software for modeling, analysis, documentation.

2. Elective courses 2 (Chosing 02 courses)

49.1. Geometric dimensioning and Tolerance (MAE032 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

- *Course description:* This course provides basic knowledge of tolerance, assembly and engineering metrology in designing engineering systems.

49.2. Manufacturing Automation (MAE018 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Machines and Mechanisms 1, Machines and Mechanisms 2, Manufacturing Processes, Process Design with CAD

- *Course description:* The course is an introduction to the fundamentals of production systems that are used to manufacture products and the parts assembled into those products. Topics covered in the course include automation and control technology, main components in an automation system, sensors and vision systems, NC technology, Programmable Logic Control PLC, robotics, Material Handling System and Flexible Manufacturing System FMS.

49.3. Materials selection in mechanical design (MAE043 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

- *Course description:* The course focuses on the selection of materials in design, research methods on engineering materials and their properties; use standards,

systems, and information sources for material selection; how to select materials that meet technical requirements and in applications.

50.1 Introduction to Composite Materials (MAE046 - 3 CREDITS)

- *Allocate studying time:* 2/0/0/60 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Design of injection molding

- *Course description:* Provides a basic understanding of composite materials (manufacturing and mechanical properties). Examines behavior of unidirectional and short-fiber composites; analysis of laminated composites; performance of composites, including fracture, fatigue, and creep under various conditions; fracture modes of composites; manufacturing and micro-structural characterization of composites; experimental characterization and statistical analysis; and polymeric, metallic, and ceramic composites.

50.2 . Introduction to Industrial Automation (MAE048 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* With the current developments in the field of Industry 4.0, industrial automation has becoming more and more important in industry in terms of improving productivity and quality. The course provides students with basic concepts of industrial automation and an in-depth overview of the industrial automation field, with a strong connection to real-life applications and that will provide a constant inspiration for the problems that are commonly found in an industrial environment. In the adopted teaching approach with many practical examples of industrial applications, the course enables students with independent and outside-the-box creative thinking for automation engineers, in order to produce functional solutions to difficult problems.

3. Graduation internship and graduation thesis (Bachelor degree)

51. Internship in Industry (TTV002 - 6 CREDITS)

- *Allocate studying time:*

- *Prerequisites:* All fundamental and specialized courses of the program

- *Course description:* The course is an important part of the CAD/CAM technology major in order to equip final year students before graduation with the following sections:

- Review and improve knowledge about mold designing and manufacturing that students learned from the program; pactice the ability to setup, simulate and manufacture molds with CAD/CAM/CNC software and operate equipment in industry

- Initially apply specialized knowledge of molds to solve problems in industry (assigned tasks during the intership period).

- Train abilities to analyze, synthesize, propose and solve mold design and processing problems

- Practice the skills of an engineer, build working styles and methods of a mechanical engineer in professional activities.

- Learn the trends of mold technology in industrial production.

52. Graduation project (MAE020 - 6 CREDITS)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:*

+ The course is an important step to examine the knowledge of learners.

+ Strengthen and improve the knowledge of learners. Initially apply specialized knowledge to solve practical issues in production and social life.

+ Practice engineer skills, build the style and working method of the CAD/CAM technology engineer in career activities.

+ Train the ability to analyze, synthesize, propose and solve technical problems in the field of CAD/CAM technology.

+ Train the necessary soft skills.

SPECIAL IN-DEPTH KNOWLEDGE OF ENGINEER'S DEGREE

I. Elective courses

53.1 Control Systems (EE0020 - 3 CREDITS)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:* This course focuses on design in the laboratory and in the homework. The problems are relatively unspecified and the student is challenged to complete the problem specifications, propose a design strategy and complete the iterative steps required to select the "best" set of parameters. The student is required to continually use computer-aided design software and for two systems to actually verify the results of the designing using a constructed system with actual components.

53.2 Hydraulic and Pneumatic Systems (MAE026 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:* Theory of Machinery and Mechanisms, Design Of Machine Elements, Control Theory for Automation

- *Course description:* The module covers basic knowledge and skills on operating principles, elements and functions, control and adjustment of hydraulic and pneumatic systems

54.1 Electrical & Electronic Equipment for Industrial Machinery (MAE030 - 3 CREDITS)

- *Allocate studying time:* 2/0/1/90 (Lecture hours/Practice hours/Laboratory hours

- *Prerequisites:*

- *Course description:* The course aims to equip mechanical students with the basic knowledge, concepts and principles to analyze, select and use electrical and electronic devices and instruments found in industrial machines. Structure, operating principles, technical parameters of electric - electronic - digital electronic tools, electric motors. Analysis of control and dynamic circuits in industrial machines from basic circuits.

54.2 Machining technology (MAE031 - 3 CREDITS)

- *Allocate studying time:* 2.5/0/0.5/90 (Lecture hours/Practice hours/Laboratory hours/Self-study)

- *Prerequisites:*

- *Course description:* This course provides students with basic knowledge about principles of metal cutting processes such as geometrical parameters of cutting tools, the relative motions in metal cutting, chip formation and chip breaking mechanisms; the basic machining processes such as turning, milling, drilling, grinding; cutting tool manufacturing technology; General knowledge about common CNC machine tools such as lathes, milling machines, machining centers. In addition, the basic knowledge of the equipment used for fixing workpieces (jigs and fixtures) in machining is also introduced in the course

55.1 CAD/CAM-CNC (MAE033 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Metal cutting, Fundamental of manufacturing technology

- *Course description:* CAD/CAM- CNC course provides basic knowledge and skills on CNC concepts, CAD/CAM-CNC technology; CNC system; CNC programming techniques; CNC programming skills.

55.2 CAD/CAM-CNC Lab (MAE034 - 3 CREDITS)

- *Allocate studying time:* 1/1/1 (Lecture hours/Practice hours/Laboratory hours)

- *Prerequisites:* GMA004 Introduction to MAE practice (Giới thiệu về thực hành cơ khí); GMA102 Engineering drawing and CAD (Vẽ kỹ thuật và CAD); MAE017 Product design with CAD (Thiết kế sảnphẩm bằng CAD); MAE004 Design of machine elements (Chi tiết máy); MAE018 Manufacturing automation (Tự động hóa gia công)

- *Course description:* This Laboratory module helps students apply the knowledge that they have been equipped to make real products from design step to manufacture step with the help of computers, as well as to acquire skills in operating industrial CNC machines.

56.1 Design of jigs and fixtures (MAE035 - 3 CREDITS)

- *Allocate studying time:* 2/0/0 (Lecture hours/Practice hours/Laboratory hours)

- *Prerequisites:* Machines and Mechanisms 1, Machines and Mechanisms 2, Manufacturing Processes, Process Design with CAD.

- *Course description:* The course provides students the knowledge and skills of design and set up production devices for mass production aiming at high productivity to reduce unit cost and interchangeability to facilitated easy assembly. Working principles and applications of the jigs and fixtures in general machining processes will be introduced in the course.

56.2 Additive Manufacturing (MAE037 - 3 CREDITS)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Engineering Drawing and CAD, Product Design-CAE Environment

- *Course description:* 3D printing (3DP), also known as additive manufacturing (AM) and rapid prototyping (RP), is a technology that takes information from a computer-aided design and “prints” it on a 3D printer, which creates a solid object by building up successive layers of material. The primary purpose of this course is to present the technology, applications, and selection of 3D printer as it relates to the world of concept development, design, and manufacturing. The course can also be used as a supplement to computer graphics text and manufacturing texts that are currently being used. Moreover, this course provides necessary knowledge about 3D printing to students for applying in their projects

57.1 Injection Moulding Design (MAE038 - 3 CREDITS)

- *Allocate studying time:* (2/1/0/90) (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* The course "Injection moulding design" is part of a specialist knowledge block that covers the fundamentals of plastic injection moulds,

such as equipment categorization, general mould structure, production materials, raw materials, and so on. This module also mentions through the structure of a few individual pieces (pusher assembly, undercut, threaded hole, eCredits.). The mould structure of several popular product types is explained through illustrative examples, assisting students in comprehending and understanding the process of designing and producing a complete set of plastic injection moulds.

57.2 Industrial system design (MAE039 - 3 CREDITS)

- *Allocate studying time:* 3/0/6 (Lecture hours/Practice hours/Laboratory hours/self-study

- *Prerequisites:*

- *Course description:* The course concretizes the design methodologies of functionally integrated systems, indicating the most appropriate design rules so that the constituent fields support each other to accomplish design goals.

58.1 Advanced CAD/CAE (MAE041 - 3 CREDITS)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:* This course provides advanced skills in industrial design and simulation (CAD/CAE) as a critical step in the product design and manufacturing processes as simulation model, meshing type, meshing method, simulation result. Based on simulation results, it is possible to provide solutions to overcome defects, errors or product improvement plans.

At the end of this course, students will be able to analyze and identify situations that may occur. Students can apply theoretical knowledge learned in previous subjects such as Theory of Machinery and Mechanisms, Design Of Machine Elements, Thermodynamic. to analyze and interpret simulation results. Students can then give improvement and optimization options.

This is an advanced design course applied in product research and development which gives students a new tool to enhance the company's design capabilities as well as optimize current machining processes

Graduation internship and graduation thesis (Engineer degree)

59. Internship in Industry (TTV002 - 6 CREDITS)

- *Allocate studying time:*

- *Prerequisites:* All fundamental and specialized courses of the program

- *Course description:* The course is an important part of the CAD/CAM technology major in order to equip final year students before graduation with the following sections:

- Review and improve knowledge about mold designing and manufacturing that students learned from the program; pactice the ability to setup, simulate and manufacture molds with CAD/CAM/CNC software and operate equipment in industry

- Initially apply specialized knowledge of molds to solve problems in industry (assigned tasks during the intership period).

- Train abilities to analyze, synthesize, propose and solve mold design and processing problems

- Practice the skills of an engineer, build working styles and methods of a mechanical engineer in professional activities.

- Learn the trends of mold technology in industrial production.

60. Graduation project (MAE020 - 6 CREDITS)

- *Allocate studying time:*

- *Prerequisites:*

- *Course description:*

+ The course is an important step to examine the knowledge of learners.

+ Strengthen and improve the knowledge of learners. Initially apply specialized knowledge to solve practical issues in production and social life.

+ Practice engineer skills, build the style and working method of the CAD/CAM technology engineer in career activities.

+ Train the ability to analyze, synthesize, propose and solve technical problems in the field of CAD/CAM technology.

+ Train the necessary soft skills.

KHỐI KIẾN THỨC THAY THẾ NHÓM MÔN LLCT

61. Ethics in engineering (MAE060 - 3 TC)

- *Allocate studying time:* 3/0/0/90 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:* Engineers and computer scientists can impact thousands of lives and are often put in difficult situations, such as those involving internal pressures and constraints surrounding deadlines and budgets. This is why it's essential for them to develop a habit of considering the ethical implications of their choices, as even seemingly small, everyday decisions can have unintended consequences. This course will introduce students to engineering and computing ethics by teaching them to identify ethical issues in engineering and computer science practice and acquire ways to think about them. Students will become familiar with ethical theories, professional ethics, and the ethical codes of their particular field. Through analyzing and discussing

case studies, they will develop skills in critical thinking, communication, and reflection.

62. Solid State Electronic Devices (EE0003 – 3 Credits)

Allocate studying time: 45/0/0/0 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Electronic Devices and Applications

- *Course description:*

Solid state physics basis of modern electronic devices. Introductory quantum mechanics. Energy bands in solids. Electronic properties of semiconductors. Junction diodes. Bipolar transistors. Field effect transistor.

63. Introduction to Digital Signal Processing (EE0017 – 3 Credits)

Allocate studying time: 45/0/0/0 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:*

- *Course description:*

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

64. Energy Conversion (EE0011 – 3 Credits)

Allocate studying time: 45/0/0/0 (Lecture hours/Practice hours/Laboratory hours/self-study)

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

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

65. Experimental Methods I (EE004 – 3 Credits)

Allocate studying time: 0/0/15/0 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* Electrical Sciences; Network Analysis

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

66. Electromagnetic Fields (EE003 – 3 Credits)

Allocate studying time: 45/0/0/0 (Lecture hours/Practice hours/Laboratory hours/self-study)

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

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

67. Digital Logic Design (EE006 – 3 Credits)

Allocate studying time: 45/0/0/0 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* None

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

68. Minor Independent Project (EE015 – 1 Credits)

Allocate studying time: 0/0/0/15 (Lecture hours/Practice hours/Laboratory hours/self-study)

- *Prerequisites:* None

- *Course description*

PART III. QUALITY GUARANTEE CONDITIONS

I. Employee resources, infrastructure for training of mechatronics engineering major

1. Teaching staff

The training program in APM has the participation of most of the specialized faculties in our university: Faculty of Fundamental and Applied Sciences, Faculty of International Training. In which, the lecturers of the APM Department participate in the management and main teaching for students of the APM major.

Table 3.1. List of lecturers in the Department of APM teaching specialized knowledge blocks

No.	*Academic Title/Degree*	*Full name*	*Position*
1	Assoc. Prof. Dr.	Nguyen Dinh Ngoc	Head of Department
2	Assoc. Prof. Dr.	Nguyen Thi Thanh Nga	Lecturer
3	Dr.	Dang Anh Tuan	Lecturer
4	Dr.	Vu Quoc Viet	Lecturer
5	MSc.	Nguyen Thi Bich Ngoc	Lecturer
6	MSc.	Phan Thanh Dat	Lecturer
7	Dr.	Nguyen Thi Quoc Dung	Lecturer
8	Dr.	Nguye Tien Hung	Lecturer
9	MSc.	Hoang Thi Tham	Lecturer
10	Dr.	Phung Thi Thu Ha	Lecturer
11	Dr.	Hoang Huong Ly	Lecturer
12	Assoc. Prof. Dr.	Nguyen Van Du	Lecturer
13	Assoc. Prof. Dr.	Vu Ngoc Pi	Lecturer
14	Engineer.	Nguyen Ngoc Thieu	Lecturer

2. Facilities and equipments

Workshops, laboratories and important laboratory equipment systems

- Physics Laboratory
- Chemistry Laboratory
- Mechatronics Laboratory
- Mechanical Engineering Laboratory

- Materials Mechanics Laboratory

- Principle - Machine Details Laboratory

- Automation Laboratory (PLC, Inverter, Power Electronics, Process Control...)

- Electrical Engineering Laboratory

- Control Engineering Laboratory

- Industrial Informatics Laboratory

- Automation Laboratory – Mitsubishi Electric

- Automation Laboratory - Pneumatic transmission (SMC)

- Mechanical Workshop - Experiment Center

- Electrical Workshop - Experiment Center

3. System of Information Technology and Library

- Library Information Center (Thai Nguyen University of Technology – Thai Nguyen University); http://it.tnut.edu.vn/

- Learning Resources Center (ThaiNguyen University); http://www.lrc.tnu.edu.vn/

Table 3.2. List of Learning Materials for Core Courses

N0	Course name	Textbook/References	Library Information Center	Learning Resources Center
1	BAS110 - Ho Chi Minh's Ideology	[1] Bộ Giáo dục và Đào tạo, Giáo trình Tư tưởng Hồ Chí Minh, Nxb Chính trị Quốc gia - Hà Nội, 2021	x	
		[2] Hồ Chí Minh, Toàn tập, Nxb Chính trị quốc gia - Hà Nội, 2011.	x	
		[3] Hồ Chí Minh biên niên tiểu sử, Nxb Chính trị quốc gia - Hà Nội, 2008.	x	
		[4] Hồ Chí Minh - Nhà tư tưởng lỗi lạc, GS. Song Thành, Nxb Lý luận chính trị - Hà Nội, 2005.	x	
		[5] Đảng Cộng sản Việt Nam, Văn kiện Đảng toàn tập, Nxb Chính trị quốc gia - Hà Nội, 1997-2010	x	
2	BAS123 - Marxist - Leninist Philosophy	[2]. Bộ Giáo dục và Đào tạo; Giáo trình Triết học Mác – Lênin; Nxb Chính trị quốc gia, Hà Nội; 2006.	x	
		[3]. Khoa Triết học – Học viện Chính trị Quốc gia Hồ Chí Minh; Giáo trình Chủ nghĩa duy vật biện chứng; Nxb Chính trị quốc gia; Hà Nội; 2004.	x	
		[4]. Khoa Triết học – Học viện Chính trị Quốc gia Hồ Chí Minh; Giáo trình Chủ nghĩa duy vật lịch sử; Nxb Chính trị quốc gia; Hà Nội; 2004.	x	
		[5]. Một số vấn đề về chủ nghĩa Mác - Lênin trong thời đại hiện nay; Nxb Chính trị quốc gia; Hà Nội; 2000.	x	
3	BAS215 - Marxist - Leninist Political Economy	[2]. Bộ Giáo dục và Đào tạo; Giáo trình Kinh tế chính trị Mác – Lênin; Nxb Chính trị quốc gia, Hà Nội; 2006.	x	
		[3]. C.Mác và Ph. Ăngghen: Toàn tập, Nxb Chính trị quốc gia; Hà Nội; 2002, t.4,8,12,13,18,20,23,25,46.	x	
		[4]. V.I.Lênin: Toàn tập, Nxb Chính trị quốc gia; Hà Nội; 2005, t.3,27,45.	x	
		[5]. . Jeremy Rifkin (2014) Cuộc cách mạng công nghiệp lần thứ ba, bản dịch tiếng Việt, Nxb Lao động xã hội, Hà Nội.	x	
		[6]. Manfred B Steger (2011), Toàn cầu hóa, Nxb Tri thức, Hà Nội.	x	
		[7]. Klaus Schwab (2015), Cách mạng công nghiệp lần thứ tư, (Bộ ngoại giao dịch và hiệu đính), Nxb Chính trị quốc gia - Sự thật, 2018, Hà Nội.	x	

4	BAS217 - History of Vietnamese Communist Party	[2] Văn kiện Đại hội Đảng thời kỳ đổi mới, NXB Chính trị quốc gia, H. 2005	x	
		[3] Văn kiện Đại hội Đại biểu toàn quốc Đảng Cộng sản Việt Nam lần thứ XI, NXB Chính trị quốc gia, H. 2011	x	
		[4] Văn kiện Đại hội Đại biểu toàn quốc Đảng Cộng sản Việt Nam lần thứ XI, NXB Chính trị quốc gia, H. 2016.	x	
		[5] Văn kiện Đảng toàn tập, NXB Chính trị quốc gia, H. 2005	x	
5	BAS305 - Scientific Socialism	[2]. Bộ Giáo dục và Đào tạo; Giáo trình Chủ nghĩa xã hội khoa học; Nxb Chính trị quốc gia, Hà Nội; 2006.	x	
		[3]. C.Mác và Ph. Ăngghen: Toàn tập, Nxb Chính trị quốc gia; Hà Nội; 2002, t.1,4,6,23,31,33,36,38,39.	x	
		[4]. V.I.Lênin: Toàn tập, Nxb Chính trị quốc gia; Hà Nội; 2005, t.4,6,7,9,12.	x	
		[5]. Đảng Cộng sản Việt Nam, Văn kiện Đảng toàn tập, Nxb Chính trị quốc gia; Hà Nội; 2007, t.2,47,51,52,65,67,69.	x	
6	FIM207 - Introduction of Laws	[1]. Trường Đại học Kinh tế quốc dân, Giáo trình pháp luật đại cương, Nhà xuất bản Đại học Kinh tế quốc dân, 2017.	x	
		[2]. Trường Đại học Luật Hà Nội; Giáo trình Lý luận chung về Nhà nước và pháp luật; Nhà xuất bản công an nhân dân; 2013.	x	
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7	GEE004 - Experiment Methods 1*	[1] Laboratory manual.	x	
		[2] Charles K. Alexander, Matthew N. O. Sadiku, Kenneth C. Smith. Fundamentals of Electrical Circuit. 5th Edition	x	
8	GEE011 - Energy Conversion*	[1] Z. Yamayaa and J. Bala. Electromechanical Energy Devices and Power Systems. John Wiley	x	
9	MAE060 - Ethics in Engineering	[1]. Engineering Ethics: Concepts and Cases, 6th Edition Charles E. Harris, Jr., Michael S. Pritchard, Michael J. Rabins, Ray W. James, P.E., Elaine E. Englehardt	x	
		[2]. Center for Taiwan Academic Research Ethics Education, https://ethics.moe.edu.tw/	x	
10	EE0003 - Solid State Electronic Devices*	Neamen. Semiconductor physics and devices. 3rd edition, McGraw-Hill	x	
11	EE0017 - Introduction to Digital Signal Processing*	Ludeman. Fundamentals of Digital Signal Processing, John Wiley	x	
12	BAS0109 - Obligatory Physical Education	[1]. Nguyễn Xuân Sinh, Thể dục, Nhà xuất bản TDTT, 2009.	x	
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		2. Barbara Akre, Jean Brainard, Hugues Goosse, Michelle Rogers-Estable, Robert Stewart, Introduction to Environmental Science, CK-12 Foundation, 2012	x	
13	B103BĐ1 - Elective Physical Education 2	[1]. Bộ môn Giáo dục thể chất; Bài giảng môn học Giáo dục thể chất tự chọn (Bóng đá 1), năm 2018.	x	
		[2]. Trần Đức Dũng; Giáo trình Bóng đá; NXB Thể dục thể thao; 2007.	x	
		[3]. Ủy ban Thể dục thể thao; Luật thi đấu Bóng đá; NXB Thể dục thể thao; 2007	x	
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		2. Hướng dẫn tập luyện kỹ chiến thuật môn bóng đá, NXB Thể dục thể thao, 2010	x	
14	B103BR1 - Elective Physical Education 3	[1]. Bộ môn Giáo dục thể chất; Bài giảng môn học Giáo dục thể chất tự chọn (Bóng rổ 1), năm 2018.	x	
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		[3]. Ủy ban TDTT, Luật Bóng rổ, NXB Thể dục thể thao, 2010	x	
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		1. Bộ môn cầu lông Trường ĐH TDTT I, Giáo trình giảng dạy cầu lông, 2008.	x	
		2. Lê Thanh Sang, Tập đánh cầu lông, NXB Thể dục thể thao, năm 2010.	x	
16	TCV004 - National Defence Education	Không có sách tham khảo	x	
17	ENG104A - English for Academic Purposes	[1] Carolyn Westbrook, Unlock - Reading & Writing, Cambridge University Press, 2014	x	
		[2] Margot F. Gramer, Colin S.Ward, Q:Skills for Success - Reading and Writing, Oxford University Press, 2011	x	
		[3] Stuart Redman, Vocabulary in Use- Pre-intermediate & Intermediate, Cambridge University Press, 1997	x	
		[4] Keith S. Folse, Elene Vestri, David Clabeaux, Great Writing 3, Student's Book National Geographic Learning, 5th ed., 2020	x	
18	ENG106A - English for Engineering	[1] Glendinning, E. & Glendinning, N. Oxford English for Electrical and Mechanical Engineering, Oxford University Press, 1995	x	
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		[2] John E.Mc Murry , Robert C.Fay (2011), Chemistry, Prentice Hall; 5th Edition	x	
		[3]. Leo J Malone (2012), Basic Concepts of Chemistry, Wiley, 9th Edition	x	
		[4] Kenneth W.Whiten, Raymond E.Davis, M.Larry Peck, George G. Staney (2007), David Harris, General Chemistry, 8th Edition.	x	
20	PHY001 - Physics 1	[1] Serway and Jewett. Physics for Scientists and Engineers. 8th edition, Brooks/Cole, ISBN 13: 978-1439048542	x	
		[2] Paul A. Tipler and Gene Mosca. Physics for Scientists and Engineers. 6th edition, Newyork. McGraw Hill Company, ISBN-13: 978-1429201247	x	
		[3] Fishbane Gasiorowiz and Thornton. Physics for Scientists and Engineers. 3rd edition, Pearson hall, ISBN-13: 978-0131420946	x	
		[4] David Halliday, Robert Resnick, Jearl Walker. Fundamentals of physics. 9th edition, USA. McGraw Hill Companies, ISBN-13: 978-0470556535	x	
21	PHY002 - Physics 2	[1] Serway and Jewett. Physics for Scientists and Engineers. 8th edition, Brooks/Cole, ISBN-13: 978-1439048542	x	
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22	PHY003 - Physics Laboratory	[1] Serway and Jewett. Physics for Scientists and Engineers. 8th edition, Brooks/Cole, ISBN-13: 978-1439048542	x	
		[2] Paul A. Tipler and Gene Mosca. Physics for Scientists and Engineers. 6th edition, Newyork. McGraw Hill Company, ISBN-13: 978-1429201247	x	
23	MAT001 - Introductory Linear Algebra	[1] Larson, Ewards, Falvo, Elementary Linear Algebra, 6th edition, Copyright © 2009 by Houghton Mifflin Harcourt Publishing Company.	x	
		[2] Gilbert Strang, Linear Algebra and Its Applications, 4th edition,Brook/cole.	x	
		[3] Howard Anton, Elementary Linear Algebra, 4th edition, Wiley and Sons.	x	
24	MAT102 - Calculus 1	[1] James Stewart; Single Variable Calculus: Early Transcendentals;Brooks Cole, 7th Ed	x	
		[2] Daniel Anderson, Jeffery A. Cole, Daniel Drucker; Student Solutions Manual for Stewart's Single Variable Calculus, , Brooks/Cole Pub Co; 6th Ed .	x	
		[3] Richard St. Andre; Stewart's Single Variable Calculus; Thomson Learning; 5th Ed.	x	
25	MAT103 - Calculus 2	[1] James Stewart; Single Variable Calculus: Early Transcendentals;Brooks Cole, 7th	x	

		Ed		
		[2] Daniel Anderson, Jeffery A. Cole, Daniel Drucker; Student Solutions Manual for Stewart's Single Variable Calculus, , Brooks/Cole Pub Co; 6th Ed	x	
26	MAT004 - Calculus 3	[1] James Stewart, Daniel K. Clegg, Saleem Watson. Calculus: Early Transcendentals, 9th Edition (2020), Cengage Learning.	x	
		[2] Thomas, Weir and Haas. Early Transcendentals, 12th Edition, Addison Wesley, Inc.	x	
		[3] https://www.maplesoft.com/support/help/Maple/view.aspx?path=ProgrammingGuide/Contents, Maplesoft, Waterloo Maple Inc	x	
27	MAT005 - Differential Equations	[1] Dennis G. Zill, Michael R. Cullen. Differential Equations with Boundary-Value Problems. 7th Edition, Cengage Learning, Brook Cole.	x	
		[2] William E. Boyce, Richard C. DiPrima. Elementary differential equations and boundary value problems. 9th Edition, WileyPLUS.	x	
		[3] https://www.maplesoft.com/support/help/Maple/view.aspx?path=ProgrammingGuide/Contents, Maplesoft, Waterloo Maple Inc.	x	
		[4] https://www.mathworks.com/help/matlab/ordinary-differential-equations.html, Matlab, the MathWorks, Inc.	x	
28	MAT106 - Applied Math for MAE	[1] Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, 4th Ed, McGraw-Hill, 2017.	x	
		[2] Richard L. Burden, J. Douglas Faires, A. M. Burden, Numerical Analysis, 10th Ed, Cengage learning, 2017.	x	
		[3] Edward B. Magrab, An Engineers Guide to Matlab with Applications from Mechanical, Aerospace, Electrical, Civil, and Biological Systems Engineering, 3rd Ed, Pearson Pentice Hall, 2011	x	
29	GEE002 - Engineering Economics	[1] Gregory N. Mankiw. Essentials of Economics. 5th Edition, SouthWestern Cengate Learning, 2008	x	
		[2] Roberth H. Frank, Ben S. Bernanke. Principles of Economics. 2nd Edition, Mc Graw Hill, 2003	x	
		[3] Arthur R. Begen and Vijay Vittal. Power Systems Analysis. Prentice Hall, 2000	x	
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30	GEE001 - Electrical Science*	[1] Charles K. Alexander, Matthew N. O. Sadiku, Fundamental of Electric Circuits, 5th Edition, Mc Graw Hill, 2013.	x	
		[2] James W. Nilsson, Susan A. Riedel, Electric Circuits, 9th Edition, Prentice Hall, 2011	x	
31	EEC020 - Control Systems	[1] Richard C. Dorf and Robert H. Bishop. Modern Control Systems. 12th edition	x	

		Prentice Hall, 2010		
		[2] Katsuhiko Ogata. System Dynamics. Pearson, Prentice Hall, New Jersey, 2004	x	
		[3] M. Sami Fadali and A. Visioli. Digital Control Engineering. Academic Press, Burlington, MA, 2013	x	
		[4] Luenberger. Introduction to dynamic systems. Wiley, 1979	x	
		[5] Goodwin, Graebe, Salgado. Control system design. Prentice Hall, 2001	x	
32	EEC010 - System Analysis	[1] J. L. Shearer and B.T. Kulakowski. Dynamic Modeling and Control of Engineering Systems. Macmillan Publishing Company, New York, 1990	x	
		[2] Katsuhiko Ogata. System Dynamics. Pearson, Prentice Hall, New Jersey, 2004	x	
33	GMA001 - Engineering Principles	[1] Engineering Fundamentals: An Introduction to Engineering, 3rd Ed., Saeed Moaven, 2007.	x	
		[2] Introduction To Engineering Design and Problem Solving, 2nd Ed., Arvid Eide , Roland Jenison , Larry Northup, Lane Mashaw, 2001	x	
		[3] Introduction to Engineering: Modeling and Problem Solving, Jay Brockman, 2008	x	
34	GMA002 - Introduction to Engineering Drawing and CAD	[1] K.L. Narayana, P.Kannaiah, K. Venkata Reddy, Machine Drawing 2nd Edition, New Age International Publishers	x	
		[2] AutoCAD software manual, User's Guide - Support and learning – Autodesk Company	x	
35	GMA004 - Introduction to ME Practice	[1] Mechanical and Aerospace Engineering Practice, Prof. Kemper Lewis, University at Buffalo, 2007	x	
		[2] An Introduction to Mechanical Engineering, Jonathan Wickert, Kemper Lewis, 2016, Cengage Learning.	x	
		[2] Systems Engineering Principles and Practice, Alexander Kossiakoff, William N. Sweet, Sam Seymour, Steven M. Biemer, 2011.	x	
		[3] Introduction to Engineering: Modeling and Problem Solving, Jay Brockman, 2008	x	
36	GMA006 - Higher Level Language*	G. Bronson. C++ for Engineers and Scientists 3rd edition. Cengage, 2010.	x	
		Deitel. C++: How to Program. 6th edition, Prentice Hall	x	
		Lippman and Lajoie. C++ Primer. 3rd edition, Addison Wesley	x	
		Eckel. Thinking in C++. Vol. 1 & 2, Prentice Hall	x	
		Stroustrup. The C++ Programming Language. Addison Wesley	x	
		Ivor Horton. Beginning C++: The Complete Language. WROX	x	
		Davidson. C++ Program Design. McGraw Hill	x	
		D'Orazio. Programming in C++: Lessons and Applications. McGraw Hill	x	
		Kernighan and Ritchie. The C Programming Language. Prentice Hall	x	

37	GMA007 - Principles of Communication	[1]. John, X . Wang. What every engineer should know about Business Communication. CRC Press, Taylor & Francis group, 2008, ISBN-13: 978-0-8493-8396-0	x	
		[2]. M. Markel. Technical Communication. 9th Ed. Boston: Bedford/St. Martin's,2010	x	
		[3]. John Harley et al. Reading and writing. New York, Holt, Rinehart and Winston, 1962	x	
38	MAE001 - Statics	[1]. Ferdinand Beer and E. Russell Johnston, "Vector Mechanics for Engineers: Statics", 7th edition, Mc-Graw-Hill, New York, 2009	x	
		[2]. Russell C. Hibbeler, "Engineering Mechanics: Statics", 12th edition, Prentice Hall, 2008.	x	
		[3]. Dietmar Gross · Werner Hauger Jörg Schröder · Wolfgang A. Wall 123 Nimal Rajapakse Engineering Mechanics 1 Statics, Springer-Verlag Berlin Heidelberg 2009	x	
39	MAE002 - Dynamics	[1]. Ferdinand Beer, Jr., E. Russell Johnston, J ohn DeWolf, and David Mazurek. 2015, "Vector Mechanics for Engineers: Statics and Dynamics", 11th edition, McGraw-Hill.	x	
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40	MAE003 - Theory of Machines and Mechanisms	[1]. Robert L. Norton, Design of machinery, Mc Graw Hill, 2004.	x	
		[2]. John J. Dicker, Jr., Gordon R. Pennock., Joseph E. Shigley, Theory of machines and mechanism, Oxford University Press, Inc, 2003	x	
		[3]. David H. Myszka, Machines and Mechanisms – Applied kinematic analysis, Prentice Hall, 2012	x	
41	MAE104 - Design of Machine Elements	[1]. Richard G. Budynas, J. Keith Nisbett, Shigley's Mechanical Engineering Design, Mc Graw-Hill, 2008.	x	
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42	MAE005 - Mechanics of Solids	[1] Russell C . Hibbeler. Mechanics of Materials. 8th edition, Prentice Hall, 2010	x	
		[2] Ferdi nand Beer and E.Russell Johnston. Mechanics of Materials. 7th edition, Mc-Graw-Hill, New York, 2012	x	
		[3] Roy R.Craig. Mechanics of Materials. 3rd edition, John Wiley & Sons, 2011	x	

43	MAE006 - Engineering Materials	[1] Fundamentals of Materials Science and Engineering, Callister and Rethwisch, 4th Ed., Wiley, 2012	x	
		[2] William F. Smith, Foundations of Materials Science and Engineering, 3rd Ed., McGraw-Hill, 2004.	x	
		[3] James F. Shackelford, Introduction to Materials Science for Engineers, 5th Ed., Prentice Hall, 2000.	x	
44	MAE007 - Material Laboratory	[1] Callister and Rethwisch. Fundamentals of Materials Science and Engineering. 4th Ed., Wiley, 2012	x	
		[2] Reporting Results. A Practical Guide for Engineers and Scientists, 1st edition, Cambridge University Press, 2008	x	
45	MAE008* - Thermodynamics	[1] Yunus A. Cengel and Michael A. Boles. Thermodynamics – an Engineering approach, 8th Edition, McGraw-Hill, 2015	x	
		[2] Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey. Fundamentals of Engineering Thermodynamics. 8th, Wiley, 2014	x	
46	MAE109 - Fluid mechanics	[1] Yunus A . Cengel and John M. Cimbala. Fluid Mechanics, Fundamentals and Applications. Third edition, The Mc Graw-Hill Companies, ISBN: 978-0-07-338032-2	x	
		[2] John D. Anderson Jr. Fundamental of Aerodynamics. Mc Graw-Hill Higher Education, 2001, Professional, ISBN 0-27-237335-0	x	
		[3] Ji yuan Tu, Guan-Heng Yeoh and Chaoqun Liu. Computational Fluid Dynamics, a Practical Approach. Elsevier, USA, 2013, ISBN 978-0-08-098243-4	x	
47	MAE010 - Heat Transfer	[1] Yunus A. Cengel. Heat transfer. A Practical Approach. 2nd Edition, Mcgraw-Hill, ISBN-13: 978-0072458930	x	
		[2] Myer Kutz. Heat Transfer Calculations. McGraw-Hill Professional, ISBN-10: 0071410414, ISBN-13: 978-0071410410	x	
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48	MAE014 - Instrumentation and Computer	[1] R.S. Figliola and D.E. Beasley. Theory and Design for Mechanical Measurements. John Wiley and Sons, NY, Third Edition, 2000	x	
		[2] Jacob Fraden. Handbook of modern sensors. 2OO4, ISBN: 0-387-00750-4	x	
49	MAE015 - Manufacturing Processes	[1] Groover M.P, Fundermentals of Modern Manufacturing, John Wiley & Sons, Inc. Wiley; 2010.	x	
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		[3]. Kalpakjian S. and Schmid S.R., "Manufacturing Engineering and Technology," Pearson Prentice Hall, 2009.	x	
50	MAE016 - Design Process and Methods	[1] D. Ul l man. The Mechanical Design Process. 4th Ed., McGraw-Hill, NY, 2009	x	

		[2] G. Di eter and L . Schmi dt. Engineering Design. 4th Ed., McGraw-Hill, NY, 2009	x	
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51	MAE017 - Design Product with CAD	[1] Kuang-Hua Chang, Product Design Modeling using CAD/CAE, The Computer Aided Engineering Design Series (2014, Academic Press)	x	
		[2] Chang Kuang-Hua, Product Performance Evaluation using CAD/CAE, The Computer Aided Engineering Design Series (2015, Academic Press)	x	
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52	MAE018 - Manufacturing Automation	[1] Automation,Production Systems, and Computer-Integrated Manufacturing, Mikell P. Groover, Global edition, Pearson Publisher, 2014	x	
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53	mAE122 - Design Project in Mechanical Engineering	[1]. Richard G. Budynas, J. Keith Nisbett, Shigley's Mechanical Engineering Design, Mc Graw-Hill, 2008.	x	
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57	MAE029 - MAE Laboratory	Introduction to Industrial Automation, Stamatios Manesis and George Nikolakopoulos, Taylor and Francis Press, 2018	x	
		[1] Automation, Production Systems, and Computer-Integrated Manufacturing, Groover, M. P. (2008), 3 rd Ed. Pearson Education. ISBN 0-13-239321-2.	x	
		[2] Industrial Automation: Hands On, Frank Lamb, McGraw Hill Professional, Jul 22, 2013	x	
58	MAE030 - Electrical & Electronic Equipment for Industrial Machinery	Tony R. Kuphaldt, Lessons In Electric Circuits, Volume II - AC, Design Science License	x	
		[1] 5th Edition, 2004.	x	
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61	MAE033 - CAD/CAM-CNC	[1]. Lecture notes of CAD/CAM- CNC.	x	
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62	MAE034 - CAD/CAM/CNC laboratory	[1]. CAD/CAM : Computer-Aided Design and Manufacturing 1st Edition (English, Paperback, E. Zimmers, M. Groover)	x	
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63	MAE035 - Design of Jigs	[1] P H Joshi, Jigs and Fixtures, third edition, Tata McGraw Hill Press, 2014	x	

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64	MAE037 - Additive Manufacturing	1. Rafid Noorani, 3D printing: technology, applications, and selection, CRC Press, Taylo & Francis group.	x	
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67	MAE041 - Advanced CAD/CAE	[1] Documents from the Department of Industrial Systems	x	
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68	MAE042 – Mechatronics*	1. Sabri Cetinkunt, Mechatronics, Wiley, 2006..	x	
		2. Musa Jouaneh, Fundamentals of Mechatronics, Cengage Learning, 2011.	x	
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69	MAE043 - Materials Selection in Mechanical Design*	M.F. Ashby, Materials selection in mechanical design, Elsevier, 2011.	x	
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70	MAE044 - Automotive Vehicle Dynamics*	1. Fundamentals of Vehicle Dynamics, Thomas D. Gillespie, SAE, 1992.	x	
		2. Vehicle Dynamics, Theory and Application, Reza N. Jazar, Springer, 2009.	x	
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71	MAE045 - Introduction to Finite Element Analysis*	Saeed Moaveni, Finite element analysis : Theory and Application with ANSYS, Pearson education International	x	
72	MAE048 - Introduction to Industrial Automation	[1] Introduction to Industrial Automation, Stamatios Manesis and George Nikolakopoulos, Taylor and Francis Press, 2018	x	
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74	MAE051 - Engineering Impact on Society	[1]. Department of Mechanical Engineering Taught in English, TNUT 2023	x	
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76	MAE053 - Quality Management	[1] Dr. Dang Ngoc Cu, Prof. Dr. Nguyen Dinh Phan, Textbook of Quality Management, National Economics University Publishing House, 2012;	x	
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77	MAE054 - Engineering Computations	[1] S. J. Chapman, Essentials of MATLAB Programming, Second Edition, Cengage Learning, 2008, ISBN: 978-0-495-29568-6.	x	
		[2] J. DeFranza and D. Gagliardi, Introduction to Linear Algebra with Applications, Waveland Press Inc., 1st Edition. ISBN: 978-1478627777.	x	
		[3]. MATLAB, The MathWorks, Inc., Full or Student Version, R2010b or later	x	
78	MAE482 - Composite Materials*	J.S. Daniel and O. Ishai. Engineering Mechanics of composite materials. 2nd Edition, Oxford University Press, Inc, 2006.	x	
		R.M. Jones. Mechanics of Composite materials. 2nd Edition, Taylor & Francis, Inc, 1999	x	
79	TTV001 - Machining Workshop*	[1]. Bài giảng hướng dẫn thực tập cơ sở nghề điện - Điện tử (Lưu hành nội bộ).	x	
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80	TTV002 - Internship in Industry	Textbooks of all courses in the study program	x	
		Documents and catalogs given by the intern company	x	
81	MAE020 - Graduation Project	Textbooks of previous courses	x	
		Document from the internship	x	

II. TEACHING AND LEARNING STRATEGY

The specialized teaching program in Mehanical Engineering is designed based on the learning outcomes of the training program. The sequence and content of instruction approach gradually increasing students' awareness and ability level, in which each experience builds on previous experiences and reinforces those experiences. Along with learning knowledge, students are trained in skills, autonomy and responsibility through experiments, practice, practice, experience and integrated modules and good thesis. In addition, teaching methods are focused on motivating students to achieve the expected output standards.

Teaching-learning strategies applied in the training program:

Strategy	Description	Methods
Teaching-learning strategies		
Direct	Most theoretical subjects are taught by the method as presentations, questions and answers, hints and diagnostic questions, homework assignments for students and testing students' self-study ability through exercises, discussions, lectures, seminars…	- Presentations; - Hints and diagnostic questions; - Sample demonstration; - Practice
Indirect	Some courses are taught indirectly without the lecturer suggestion. Selected subjects in the curriculum can be conducted by project-based teaching (PBL) or problem-based teaching(PBL). Learners are provided with the best environment in terms of funding and other resources for learning these courses. Business internships, field trips, course projects, graduation projects, etc.	- Require - Problem solving - Case study - Build ideas
Interact	This method is implemented in most subjects of the training program. Students work on group exercises, presentations,	- Debate, discuss - Problem solving - Brain work

	experiments, corporate internships, field trips, and graduation projects...	- Team work - Interaction, feedback
Learning Strategies		
Experience	The subjects of the training program are designed for experiential learning as basic science subjects, basic disciplines and majors. Students are equipped with practice learning and experiments in the laboratory. Business internships, professional training, design projects, graduation thesis…	- Simulation - Focused Image - Role playing, games - Models - Reality; Experiment
Independence	Experimental activities, design in the graduation thesis course, presentation of theses, design projects, homework, writing experimental reports, presenting experiments, and learning...	- Individual work assignment - Research projects, thesis - Computer Using Guide - Reflection

III. METHODS OF PLOs ASSESSING

The method of student assessment is based on the course output standards, reflecting the achievement of the program's output standards, ensuring validity (measuring the output standards), and ensuring reliability, objectivity, and fairness.

- The main forms of assessment:

+ Evaluation according to progress (regular assessment): assignments, reports;

+ Staged assessment: Mid-term and Final exam

+ Assessment by capacity: Seminar

- Translation ability
- The ability to express through files and images
- Presentation ability
- Ability to link, corporate, and lead a team/group

+ Assessment of comprehension and synthesis: short tests, essays, practices;

+ Assessment of reading comprehension, lesson preparation: test at the beginning of the lesson.

The assessment standards are designed in detail through rubrics shown in the detailed course outline, including scale rubrics, analytical rubrics, and some synthetic rubrics and course answers.

IV. ACTIVITIES TO SUPPORT STUDENTS AND EXTRACURRICULAR

1. Student advisory and support activities

Advising students on the University's rules, regulations, and activities; policies, scholarships, jobs... Receive information, questions, suggestions, and recommendations from students and coordinate with related parties to resolve. Supporting students in all aspects of their study, training, and job search. Organize practical activities to take care of the material and spiritual life and protect the legitimate interests of students.

2. Scientific research and start-up activities

Organizing training and fostering knowledge for students on scientific research and technology transfer. Guide students to participate in the implementation of projects, participate in competitions on creativity. Support students with equipment, machinery, and funding... in conducting scientific research; Organization to praise and reward students with outstanding achievements in research. Propagating and mobilizing to equip students with the knowledge and arouse the spirit of entrepreneurship in students. Organization of courses, and seminars on starting up for students, guiding students to participate in projects and competitions about entrepreneurship. Build an ecosystem to support startups and innovations in school. Connect investors and businesses for startup groups.

3. Extracurricular activities and career orientation

Organizing cultural, artistic, physical training and sports activities, volunteering activities, working together for the community, exchange activities, training, legal, political, and ethical education activities, lifestyle for students, helping students to develop comprehensively physically, mentally, and intellectually. Organizing networking, consulting, orientation, and job placement activities for students.

Organization for students to visit, experience, and practice at businesses to help students hone their practical knowledge and choose a suitable career after graduation.

V. COMPARATIVE TRAINING PROGRAMS BETWEEN VIETNAM AND INTERNATIONAL

For developing the training program for Mechanical Engineering, the Faculty of Mechanical Engineering, TNUT has consulted and compared it with the training program in Mechanical Engineering, Mechanical Engineering Technology of the following Schools/Universities.

Table 4.1. List of comparable training programs when building Mechanical Engineering training programs

Number	School/Institute University	Name of the comparative training program	Number of credits	Training time	Diploma
1	Ho Chi Minh City University of Technology and Education	Mechanical Engineering Technology http://hcmute.edu.vn/ArticleId/9fdc7a42-b5f7-4964-a6e3-9ea15d01d7fa/nganh-cong-nghe-ky-thuat-co-khi	132	4 years	Engineer
2	Hưng Yên University of Technology and Education	Mechanical Engineering Technology https://drive.google.com/file/d/1i5GlDhcNstZhxQw8eQJTricU2J-r5VxX/preview	132	4 years	Engineer
3	University at Buffalo, USA	Mechanical Engineering Technology https://catalog.buffalo.edu/academicprograms/mechanical_engineering_bs.html	128	4 years	Engineer
4	Oklahoma University, USA	Mechanical Engineering Technology https://Catalog.okstate.edu/engineering-architecture-technology/mechanical-engineering-technology/#coursestext	124	4 years	Engineer

TABLE 4.2. COMPARATIVE TABLE OF FRAMEWORK OF ENGINEERING PROGRAMS OF MECHANICAL ENGINEERING SECTOR IS CONSTRUCTION WITH SAME FRAMEWORK ISSUED BY DOMESTIC AND FOREIGN TRAINING INSTITUTIONS

STT	Mehanical Engineering Training Program (Under construction/updating/tuning)	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
		CTĐT 1	CTĐT 2	CTĐT 1	CTĐT 2
I	**Knowledge and technical reasoning**				
1.	Understand and apply foundational knowledge of natural sciences, social sciences, and foreign language and informatics tools to be ready to receive basic industry knowledge and lifelong learning capabilities	X-95%	X-90%	X-80%	X-80%
2.	Apply core knowledge of mechanics, electricity, electronics and control to acquire and solve Electromechanical Engineering engineering expertise	X-95%	X-85%	X-60%	X-70%
3.	Using specialized knowledge in the professional activities of Mechanical engineers	X-95%	X-80%	X-80%	X-85%
II	**Personal and professional skills and qualities**				
4.	Analyze, synthesize and solve problems in the field of Mechanical engineering	X-95%	X-90%	X-95%	X-95%
5.	Test, practice and experiment with technical problems in the field of Mechanical engineering	X-95%	X-90%	X-95%	X-95%

6.	Ability to consider engineering problems of mechatronic systems flexibly	X-95%	X-75%	X-80%	X-80%
7.	Have creative capacity, dare to think and dare to do; constantly cultivate and train yourself to be ready for career advancement	X-95%	X-80%	X-80%	X-80%
8.	Understanding corporate culture and knowing how to work in a professional environment, well implement social responsibility and professional ethics	X-95%	X-85%	X-70%	X-60%
III	**Soft skills**				
9.	Able to work independently and in a team effectively	X-95%	X-90%	X-95%	X-95%
10.	Communicate effectively in many forms: written, electronic communication, graphics, and presentations	X-95%	X-95%	X-95%	X-95%
11.	Having foreign language ability equivalent to level 6 for Bachelors and level 7 for Engineers	X-95%	X-90%	X-95%	X-95%
IV	**Conceptualize, design, implement, and operate Mechanical systems in business, social and environmental**				
12.	Assess the role and responsibility of the engineer to the society, industry, and the globalization	X-95%	X-90%	X-90%	X-90%
13.	Apply knowledge and skills to start a business and start a business in the field of mechanical and related field	X-90%	X-95%	X-50%	X-90%

14.	Conceptualizing ideas, establishing requirements, determining the function of components constituting mechanical systems	X-90%	X-90%	X-50%	X-80%
15.	Design of systems and components of mechanical systems	X-95%	X-90%	X-60%	X-60%
16.	Deploy the hardware and software components of the mechanical systems	X-70%	X-70%	X-70%	X-70%

TABLE 4.3. COMPARISON TABLE OF ENGINEERING PROGRAMS OF MECHANICAL ENGINEERING SECTOR IS CONSTRUCTION WITH SAME PROGRAMS ISSUED BY DOMESTIC AND FOREIGN TRAINING INSTITUTIONS

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
A	**APM**		**53**				
1	BAS110	Ho Chi Minh Ideology *	2	X-100%	X-100%	-	-
2	BAS123	Marx - Lenin Philosophy *	3	X-100%	X-100%	-	-
3	BAS215	Political Economics of Marxism and Leninism *	2	X-100%	X-100%	-	-
4	BAS217	History of The Communist Party of Vietnam *	2	X-100%	X-100%	-	-
5	BAS305	Scientific Socialism *	2	X-100%	X-100%	-	-
6	FIM207	Introduction of Laws *	2	X-100%	X-100%	-	-
7	GMA001	Engineering Principles	3	X-70%	X-70%	X-100%	X-100%
8	ENG104A	English for Academic Purposes	4	X-95%	X-70%	X-100%	X-100%
9	ENG106A	English for Engineering	3	X-95%	X-70%	X-100%	X-100%
10	CHE101	General Chemistry	3	X-90%	X-90%	X-100%	X-100%

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
11	MAT001	Introductory Linear Algebra	3	X-95%	X-60%	X-100%	X-100%
12	MAT102	Calculus 1	3	X-95%	X-60%	X-100%	X-100%
13	MAT103	Calculus 2	3	X-95%	X-60%	X-100%	X-100%
14	MAT004	Calculus 3	4	X-95%	X-85%	X-100%	X-100%
15	MAT005	Differential Equations	3	X-70%	X-60%	X-100%	X-100%
16	PHY001	Physics 1	4	X-100%	X-100%	X-100%	X-100%
17	PHY002	Physics 2	3	X-100%	X-100%	X-100%	X-100%
18	PHY003	Physics Laboratory	1	X-100%	X-100%	X-100%	X-100%
19	BAS0109	Obligatory Physical Education	(1)	X-90%	X-90%	X-50%	X-50%
20	TCV004	National defence education	(5)	X-90%	X-90%	X-50%	X-50%
21	B103BC1	Elective Physical Education 1	(1)	X-90%	X-90%	X-50%	X-50%
22	B103BĐ1	Elective Physical Education 2	(1)	X-100%	X-100%	X-50%	X-50%
23	B103BR1	Elective Physical Education 3	(1)	X-50%	X-90%	X-50%	X-50%
24	B103CL1	Elective Physical Education	(1)	X-50%	X-90%	X-70%	X-100%

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
		4					
25	MAE052	Industrial Environment and Sustainable Development	3	X-90%	X-90%	X-50%	X-50%
26	GMA007	Principles of Communication	3	X-90%	X-90%	X-90%	X-100%
27	MAE051	Engineering Impact on Society	3	X-50%	X-90%	X-50%	X-50%
28	GEE001	Electrical Science	3	X-50%	X-90%	X-50%	X-50%
29	MAE053	Quality Management	3	X-50%	X-90%	X-50%	X-50%
30	MAE049	Industrial Enterprises Management	3	X-60%	X-60%	X-70%	X-100%
31	MAE025	Industrial Maintenance Engineering and Management	3	X-60%	X-60%	X-50%	X-50%
32	GMA004	Introduction to ME Practice	3	X-60%	X-60%	X-50%	X-50%
33	GMA002	Introduction to Engineering Drawing and CAD	3	X-60%	X-60%	X-70%	X-100%
34	MAT106	Applied Math for MAE	3	X-60%	X-60%	X-70%	X-100%

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
35	TTV101	Machining Workshop	0	X-80%	X-80%	X-70%	X-100%
36	MAE029	MAE Laboratory	3	X-80%	X-80%	X-70%	X-100%
37	MAE006	Engineering Materials	3	X-80%	X-80%	X-100%	X-100%
38	MAE042	Mechatronics	3	X-80%	X-80%	X-100%	X-100%
39	MAE044	Automotive Vehicle Dynamics	3	X-80%	X-80%	X-100%	X-100%
40	MAE014	Instrumentation and Computer	3	X-80%	X-80%	X-100%	X-100%
41	MAE001	Statics	3	X-80%	X-80%	X-100%	X-100%
42	MAE002	Dynamics	3	X-80%	X-80%	X-100%	X-100%
43	MAE005	Mechanics of Solids	3	X-80%	X-80%	X-100%	X-100%
44	MAE008	Thermodynamics	3	X-80%	X-80%	X-100%	X-100%
45	MAE109	Fluid Mechanics	2	X-80%	X-80%	X-100%	X-100%
46	MAE017	Product Design with CAD	3	X-80%	X-80%	X-100%	X-100%
47	MAE115	Manufacturing Processes	4	X-80%	X-80%	X-100%	X-100%
48	GMA006	Higher level language	3	X-80%	X-80%	X-100%	X-100%
49	MAE045	Introduction to Finite Element Analysis	3	X-80%	X-80%	X-100%	X-100%

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
50	MAE010	Heat Transfer	3	X-80%	X-80%	X-100%	X-100%
51	MAE054	Engineering Computations	3	X-80%	X-80%	X-100%	X-100%
52	EEC010	Systems Analysis	3	X-80%	X-80%	X-100%	X-100%
53	GEE002	Engineering Economics	3	X-80%	X-80%	X-100%	X-100%
54	MAE122	Design Project in Mechanical Engineering	2	X-80%	X-80%	-	X-100%
55	MAE007	Material Laboratory	1	X-80%	X-80%	X-100%	X-100%
56	MAE104	Design of Machine Elements	3	X-80%	X-80%	X-100%	X-100%
57	MAE016	Design Process and Methods	3	X-80%	X-80%	X-100%	X-100%
58	MAE003	Theory Of Machines and Mechanisms	3	X-80%	X-80%	X-100%	X-100%
59	MAE027	Product Design in CAE Environment	3	X-90%	X-90%	X-50%	X-50%
60	MAE032	Geometric dimensioning and Tolerance	3	X-90%	X-90%	X-70%	X-70%
61	MAE018	Manufacturing Automation	3	X-90%	X-90%	X-50%	X-50%
62	MAE043	Materials Selection in	3	X-90%	X-90%	X-50%	X-50%

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
		Mechanical Design					
63	MAE482	Composite Materials	3	X-90%	X-90%	X-50%	X-50%
64	MAE048	Introduction to Industrial Automation	3	X-90%	X-90%	X-50%	X-50%
65	TTV302	Bachelor Internship	4	X-90%	X-90%	X-100%	X-100%
66	MAE320	Bachelor Graduation Project	6	X-90%	X-90%	X-70%	X-70%
67	EE0020	Control Systems	3	X-90%	X-90%	X-100%	X-100%
68	MAE026	Hydraulic and Pneumatic Systems	3	X-90%	X-90%	X-100%	X-100%
69	MAE030	Electrical & Electronic Equipment for Industrial Machinery	3	X-90%	X-90%	X-50%	X-50%
70	MAE031	Machining Technology	3	X-90%	X-90%	X-50%	X-50%
71	MAE033	CAD/CAM-CNC	3	X-90%	X-90%	X-50%	X-50%
72	MAE034	CAD/CAM/CNC Laboratory	3	X-90%	X-90%	X-100%	X-100%
73	MAE035	Design of jigs and fixtures	3	X-90%	X-90%	X-100%	X-100%
74	MAE037	Additive Manufacturing	3	X-90%	X-90%	X-100%	X-100%
75	MAE038	Injection Molding Design	3	X-90%	X-90%	X-100%	X-100%

STT	Mã HP	Tên học phần	Số TC	Compare with training programs of domestic education and training institutions		Compare with training programs of foreign education and training institutions	
				CTĐT 1	***CTĐT 2***	***CTĐT 3***	***CTĐT 4***
76	MAE039	Industrial System Design	3	X-90%	X-90%	X-100%	X-100%
77	MAE041	Advanced CAD/CAE	3	X-90%	X-90%	X-100%	X-100%
78	TTV002	Internship in Industry	6	X-85%	X-90%	X-100%	X-100%
79	MAE020	Graduation Project	6	X-85%	X-90%	X-100%	X-100%
	TỔNG CỘNG		**155**		***0***		

PART V. IMPLEMENTATION INSTRUCTIONS

1. The training program is implemented according to the university training regulations of the regular system according to the current credit system of the Ministry of Education and Training and the Thai Nguyen University of Technology - Thai Nguyen University.

The standard unit of time is calculated as follows:

The training program is implemented according to the university training regulations of the regular system according to the current credit system of the Ministry of Education and Training and the Thai Nguyen University of Technology - Thai Nguyen University.

Where:

1 Credit = 15 periods of lessons

= 30 periods of lessons for experiment or practice

= 45 periods of lessons for self-study

= 45 ~ 90 hours internship at the facility

= 45 ~ 60 hours of graduation project or graduation thesis implementation

Number of hours of the course is a multiple of 15.

2. Foreign language output standards: According to the regulations of Thai Nguyen University of Technology. During the study period, the School may control the development of students' foreign language proficiency over each academic year to determine the number of credits of subjects in the semester for allowing registration. Students can either self-study or register for a foreign language development program.

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