

HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF TRANSPORTATION ENGINEERING

UNDERGRADUATE PROGRAM 2017

ENGINEER IN TRANSPORT MECHANICAL
ENGINEERING

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Undergraduate Program

Name of program:	Transport Mechanical Engineering
Education level:	Engineer
Major:	Transport Mechanical Engineering
Program code:	7520116
Duration:	5 years
Degree	Engineer in Transport Mechanical Engineering
Credits in total:	160 credits

(Issued at Decision No/ QĐ-ĐHBK-ĐT dated by the Rector of Hanoi University of Science and Technology)

1. Program Goals

On successful completion of the programme, students will be able to:

- 1.1. Have strong core and advanced engineering knowledge, professional and problem-solving skills and competencies to design, manufacture and operate systems and machines in transport mechanical engineering field.
- 1.2. Have professional and personal skills and attributes including lifelong learning and self-study abilities to pursue higher levels of education to get adapted to the ongoing scientific and technological development.
- 1.3. Have communication, foreign language and teamwork skills to work in interdisciplinary, cross-cultural, and multinational environments.
- 1.4. Have abilities to conceive ideas, to design, to implement and operate systems in enterprises and society.

2. Program Learning Outcomes

On successful completion of the programme, students will be able to:

- 2.1. Be equipped with comprehensive core and advanced engineering knowledge to get adapted successfully to jobs relevant to their disciplines, with due focus on abilities to apply core and advanced transport mechanical engineering knowledge and modern instruments to design and develop transport mechanical engineering products, including:
 - 2.1.1. Abilities to apply knowledge of underlying mathematics and science to design transport mechanical engineering systems/machines.

- 2.1.2. Abilities to use core and advanced engineering knowledge to analyze mechanical engineering systems/machines.
- 2.1.3. Abilities to use advanced engineering knowledge, modern methods and instruments to design and assess mechanical engineering systems/machines.
- 2.2. Be equipped with personal and professional skills and attributes, lifelong learning and self-studied abilities to pursue higher levels of education to get adapted to the ongoing scientific and technological development, including:
 - 2.2.1. Abilities to identify, determine and model technical problems, to estimate and analyse them quantitatively, to identify random factors, to come up with conclusions, solutions and recommendations.
 - 2.2.2. Abilities to develop hypothesis and probabilities, to understand and select information from paper-based, electronic formats or internet, to conduct experimental surveys, to verify and prove hypothesis.
 - 2.2.3. Abilities to develop a holistic view of any problems, to identify emerging problems and interactions in systems, to arrange and determine key factors as well as to analyse strengths and weaknesses and come up with solutions.
 - 2.2.4. Abilities to be persistent and flexible, willing to take risks, and know how to make full use of creative and critical thinking, to conduct self-evaluation of one's own knowledge, skills and attitudes, to know how to study for lifelong learning; to manage time and resources.
 - 2.2.5. Professional ethics and conduct, honesty and sense of responsibility, proactive career planning, regular self-updating of technical information.
- 2.3. Be equipped with communication and teamwork skills, including:
 - 2.3.1. Abilities to set up, develop teams including technical, multi-disciplinary ones, and to organize team activities.
 - 2.3.2. Abilities to select effective communication strategies, to develop communication structures, to communicate effectively in writing, multimedia and graphic media with good presentation skills.
 - 2.3.3. Good English proficiency at work with minimum TOEIC score of 500.
- 2.4. Conceive ideas for the purpose of design, development and operation in enterprise and social settings, including:
 - 2.4.1. Understanding roles and responsibilities that engineer holders should have in the society, impact that technological applications can have on the society, related legislations and regulations, historical and cultural contexts, global current development issues and prospects.
 - 2.4.2. Respecting multicultural values, mastering business strategies, objectives and plans of the respective organization, having technical commercialization mindset, being adaptable to different working environments.

- 2.4.3. Being able to develop objectives, requirements for technical systems, to define their functions, concepts and structures; to do technical system modelling for feasibility, and to develop project implementation plans.
- 2.4.4. Being able to develop and analyze design processes and approaches, to apply technical knowledge and analytical results in designs, to design and work in multidisciplinary teams, to understand multi-objective designing.
- 2.4.5. Being able to plan system development, implementation and analysis; to apply control system knowledge, to program diagnosis integrated with both software and hardware, to understand relevant sets of testing standards, to test, verify and validate, monitor and manage the implementation process.
- 2.4.6. Being able to develop and optimize operation process and operation process training, to understand other support options related to the system operation process, system improvement and development, system demobilization, operation process management.
- 2.5. Have political quality and willingness to serve people, to have good health and meet requirements in developing and defending the country, including:
 - 2.5.1. Political theory qualifications in line with general programs and regulations of the Vietnam Ministry of Education and Training.
 - 2.5.2. Physical Education Certificate and Military Training Certificate in line with general programs and regulations of the Vietnam Ministry of Education and Training.

3. Program Content

3.1 General Program Structure

Professional component	Credit	Note
General Education	50	
Mathematics and basic sciences	32	Major oriented
Social science and Humanities	12	In accordance with regulations of Vietnam Ministry of Education and Training
Physical Education/ Military Education (Military Education is for Vietnamese student only)	-	
English	6	02 basic English courses
Engineering Education	110	
Basic and Core of Engineering	48 (± 2)	Consist of at least 1÷3 projects
Soft skills	9	Include of 02 compulsory modules: - Social/Start-up/other skill (6 credits);

		- Technical Writing and Presentation (3 credits).
Major oriented elective module	16 (± 2)	Elective module provides oriented knowledge toward an industry field.
Engineering Practicum	2	Scheduled for third year
Major elective module	19	Elective module provides in-depth knowledge toward an industry field.
Graduation Practicum	4	Scheduled for fourth year
Engineer Thesis	12	Topic must be relevant to major and knowledge gained during graduation practicum
Total	160 credits	

3.2 Course List & Schedule

No.	Course ID	Course Name	Credit	Semester											
				1	2	3	4	5	6	7	8	9	10		
Social science and Humanities			12												
1	SSH1110	Fundamental Principles of Marxism-Leninism I	2(2-1-0-4)	2											
2	SSH1120	Fundamental Principles of Marxism-Leninism II	3(2-1-0-6)		3										
3	SSH1050	Ho-Chi-Minh Thought	2(2-0-0-4)			2									
4	SSH1130	Revolution Policy of Vietnamese Communist Party	3(2-1-0-6)				3								
5	EM1170	General Law	2(2-0-0-4)		2										
Physical Education			5												
6	PE1014	Theory in sport	1(0-0-2-0)												
7	PE1024	Swimming	1(0-0-2-0)												
8	Elective courses	Elective course 1	1(0-0-2-0)												
9		Elective course 2	1(0-0-2-0)												
10		Elective course 3	1(0-0-2-0)												
Military Education															
11	MIL1110	Vietnam Communist Party's Direction on the National Defense	0(3-0-0-6)												
12	MIL1120	Introduction to the National Defense	0(3-0-0-6)												
13	MIL1130	General Military Education	0(3-0-2-8)												
English			6												
14	FL1100	English I	3(0-6-0-6)	3											
15	FL1101	English II	3(0-6-0-6)		3										
Mathematics and basic sciences			32												
16	MI1111	Analysis I	4(3-2-0-8)	4											
17	MI1121	Analysis II	3(2-2-0-6)		3										
18	MI1131	Analysis III	3(2-2-0-6)			3									
19	MI1141	Algebra	4(3-2-0-8)	4											
20	MI3180	Experimental Probability- Statistics	3(3-1-0-6)			3									
21	PH1110	Physics I	3(2-1-1-6)	3											
22	PH1120	Physics II	3(2-1-1-6)		3										
23	IT1140	Introduction to Computer Science	4(3-1-1-8)		4										
24	PH1131	Physics III	2(2-0-1-4)			2									
25	ME2011	Engineering Graphics I	3(3-1-0-6)			3									
Basic and Core of Engineering			46												
26	TE2000	Introduction to Transportation Engineering	2(1-0-3-4)	2											
27	TE2601	Fluid Engineering	3(2-1-1-6)			3									
28	TE3400	Hydrodynamic Machines	3(3-0-1-6)				3								
29	ME2030	Introductory Mechanical Engineering	2(2-1-0-4)		2										
30	ME2201	Technical Graphics II	2(2-1-0-4)			2									
31	ME2215	Engineering Mechanics I	2(2-1-0-4)			2									
32	ME3108	Engineering Mechanics II	2(2-1-0-4)			2									
33	ME2102	Strength of Materials	2(2-1-0-4)			2									

34	ME3060	Theory of Machinery	3(3-0-1-6)				3						
35	ME3090	Machine Details	3(3-0-1-6)				3						
36	ME3171	Mechanical Technology	3(3-0-0-6)					3					
37	ME3232	Project of Machine Elements	2(0-4-0-4)					2					
38	ME3230	Tolerances and Measurement Techniques	2(2-1-0-4)					2					
39	HE2012	Thermal Engineering	2(2-1-0-4)					2					
40	EE2012	Fundamentals of Electrical Engineering	2(2-1-0-4)			2							
41	ET2010	Electronic Engineering	3(3-0-1-6)				3						
42	MSE2228	Materials Science	2(2-0-1-4)					2					
43	TE3010	Structure of Internal Combustion Engines	3(3-0-1-6)					3					
44	TE3200	Automobile Structures	3(3-1-0-6)					3					
Soft skills			9										
45	EM1010	Introduction to Management	2(2-0-0-4)	2									
46	EM1180	Business Culture and Entrepreneurship	2(2-1-0-4)						2				
47	ED3280	Applied Psychology	2(1-2-0-4)										
48	ED3220	Soft Skills	2(1-2-0-4)										
49	ET3262	Technology and Technical Design Thinking	2(1-2-0-4)										
50	TEX3123	Industrial Design	2(1-2-0-4)										
51	TE2020	Technical Writing and Presentation	3(2-2-0-6)										
Elective Module													
Module: Automotive Engineering 1			18										
52	TE3021	Fundamentals of Internal Combustion Engines	3(3-1-0-6)					3					
53	TE3210	Theory of Automobile	3(3-1-0-6)					3					
54	TE3221	Automobile Maintenance and Repair	4(3-1-1-8)						4				
55	TE4200	Automobile Electronics	3(3-0-1-6)					3					
56	TE4210	Automobile Design and Calculation	3(3-1-0-6)						3				
57	TE4220	Chassis-Frame Technology	2(2-0-0-4)						2				
Module: Automotive Engineering 2			18										
58	TE3021	Fundamentals of Internal Combustion Engines	3(3-1-0-6)					3					
59	TE3210	Theory of Automobile	3(3-1-0-6)					3					
60	TE3221	Automobile Maintenance and Repair	4(3-1-1-8)						4				
61	TE4200	Automobile Electronics	3(3-0-1-6)					3					
62	TE3041	Fuel Supply Systems of Internal Combustion Engine	2(2-1-0-4)						2				
63	TE5031	Design of Internal Combustion Engine	3(3-1-0-6)						3				
Module: Fluid Power and Automation Engineering			18										
64	TE3411	Theory of Wings and Blades	2(2-1-0-4)						2				
65	TE3420	Turbomachines I	2(2-0-1-4)						2				
66	TE3430	Water Turbine I	2(2-1-0-4)						2				
67	TE3460	Hydraulic Machines	2(2-1-0-4)						2				
68	TE3461	Industrial Fluid Power Transmission	2(2-1-0-4)						2				

		and Automation																		
69	TE4579	Control of Fluid Power Systems	2(2-1-0-4)																	2
70	TE4580	PLC Applications in Controlling Industrial Hydraulic Systems	2(2-0-1-4)																	2
71	TE4571	Hydroelectric Power and Pumping System	2(2-1-0-4)																	2
72	TE4578	Fundamentals of Wind Turbine and Ocean Energy Engineering	2(2-1-0-4)																	2
73	TE4000	Engineering Practicum	2(0-0-4-4)																	2
Major elective module																				
Module: Automotive Engineering 1			19																	
74	TE4241	Fundamentals of Vehicle Dynamics	2(2-1-0-4)																	2
75	TE5201	Applied Informatics in Automotive Engineering	3(2-2-0-6)																	3
76	TE5211	Fundamentals of Automotive Mechatronics	2(2-0-1-6)																	2
77	TE5221	Vehicle Testing	3(3-0-2-6)																	3
78	TE5230	Specialized Automobiles	3(3-1-0-6)																	3
79	TE5241	Automobile Design Project 1	2(1-2-1-4)																	2
80	TE5032	Air Pollution from Automobile	2(2-1-0-4)																	2
81	TE5242	Project	2(1-2-1-4)																	2
Module: Automotive Engineering 2			19																	
82	TE4241	Fundamentals of Vehicle Dynamics	2(2-1-0-4)																	2
83	TE5211	Fundamentals of Automotive Mechatronics	2(2-1-0-6)																	2
84	TE5221	Vehicle Testing	3(3-0-2-6)																	3
85	TE5230	Specialized Automobiles	3(3-1-0-6)																	3
86	TE5032	Air Pollution from Automobile	2(2-1-0-4)																	2
87	TE5020	Dynamics and Vibrations of Crankshaft System in Internal Combustion Engine	3(3-1-0-6)																	3
88	TE5061	Automobile Design Project 2	2(1-2-1-4)																	2
89	TE5062	Project	2(1-2-1-4)																	2
Module: Fluid Power and Automation Engineering			19																	
90	TE4490	Turbomachines II	2(2-0-1-4)																	2
91	TE4500	Water Turbine II	2(2-1-0-4)																	2
92	TE4441	Hydrodynamic Transmission	2(2-1-0-6)																	2
93	TE4570	Manufacturing Technology of Fluid Machines	3(3-1-0-6)																	3
94	TE4576	Industrial Robots	2(2-1-0-4)																	2
95	TE4581	Applied Hydraulic Circuits	2(2-1-0-4)																	2
96	TE4582	Computer-Aided Design and Simulation of Fluid Machinery	2(2-1-0-4)																	2
97	TE4541	Project I	2(1-2-1-4)																	2
98	TE4551	Project II	2(1-2-1-4)																	2
Graduation Practicum and Thesis			16																	
99	TE5001	Graduation Practicum	4(0-0-8-12)																	4
	TE5002																			
	TE5003																			
100	TE5991	Engineer Thesis	12(0-0-24-24)																	12
	TE5992																			
	TE5993																			

4. Course Outlines

4.1 General Education Courses

SSH1110 Fundamental Principles of Marxism- Leninism I 2(2-1-0-4)

Objectives: Providing students with the most basic rationale from which to access the content of Ho Chi Minh Thought and the Revolution Policy of Vietnamese Communist Party courses, understanding the Party's ideological foundation; Building trust, revolutionary ideals for students; Step by step establishes the most general worldview, ecology and methodology to reach the professional majors.

Contents: Introducing the concept of Marxism-Leninism and some general issues of the course. Basics of the worldview and methodology of Marxism-Leninism.

SSH1120 Fundamental Principles of Marxism- Leninism II 3(2-1-0-6)

Objectives: Providing students with an understanding of the basic principles of Marxism-Leninism from which to establish a basic rationale to be able to access the content of Ho Chi Minh's Thought and the Revolution Policy of Vietnamese Communist Party courses. Step by step establishing the most general worldview and methodology for students to reach the professional majors. Developing revolutionary outlook on life and cultivating new human morality.

Contents: Basic contents of Political Economy of Marxism-Leninism and Scientific socialism. The focus of economic theory of Marxism-Leninism on capitalist production methods; The basic contents of Marxism-Leninism theory of socialism; Real socialism and prospects.

SSH1050 Ho-Chi-Minh's Thought 2(2-0-0-4)

Objectives: Providing students with a systematic understanding of Ho Chi Minh's ideology, ethics, cultural values and the basic knowledge of Ho Chi Minh's creative application of Marxism-Leninism in Vietnam. In combination with the course Fundamental Principles of Marxism-Leninism, the course will help students to have knowledge of ideological foundation, guideline of the Vietnamese Communist Party and Vietnam revolution.

Content: Overview of the basis, the process of formation and development of Ho Chi Minh's thought; The basic contents of Ho Chi Minh's thought regarding of the Vietnam revolution during revolution of national liberation and the construction of Socialism.

SSH1130 Revolution Policy of Vietnamese Communist Party 3(2-1-0-6)

Objectives: Providing students with the basic contents of the revolutionary policy of the Communist Party of Vietnam, which mainly focuses on policy of the Communist Party during reform process applied in some basic areas of social life. Building students' trust in the Communist Party's leadership following the Communist Party's goals and ideals. Helping students to apply major's knowledge to proactively and positively solve economic, political, cultural and social issues according to the Communist Party's and State's guidelines, policies and laws.

Content: Systematic understanding of the Communist Party's policy in revolutionary periods, especially during national reform: industrialization guideline, guideline to build a socialist-oriented economy market, guideline to build political system, guideline to develop culture and solve social problems, diplomacy in foreign policy.

EM1170 Introduction to the legal environment 2(2-0-0-4)

Objective: This course equips students with general knowledge about concept of legal science of State and Law, basic content of fundamental laws, such as the Constitution, Administration, Civil and Criminal Law in Vietnamese legal system. This module also equips students with specialized legal knowledge to help students apply the law in their life and work.

Content: Overview of origin of State and Law; Nature, function and types of State and Law; The state apparatus of the Socialist Republic of Vietnam; The system of legal documents; Law enforcement, legal violations and liability. Introduction of the most basic content of the major law branches in Vietnam.

MIL1110 Vietnam Communist Party's Direction on the National Defense 0(3-0-0-6)

Objectives: To provide students with the basic knowledge of Marxism - Leninism, Ho Chi Minh ideology on war, army and national defense; correctly aware of the origin and nature of the war; Party's views on building a national defense and the people's armed forces to wage a people's war to protect the Socialist Republic of Vietnam. To help students learning the fighting art of our ancestors and Vietnamese military arts since the Party was established.

Content: Objects and research methods of National Defense - Security Education subject; Marxism – Leninism's views, Ho Chi Minh ideology on war, army and national defense; building the national defense and people's security; people's war to defend the Socialist Republic of Vietnam; building the Vietnamese people's armed forces; combining socio-economic development with strengthening national defense and security; Vietnamese military art.

MIL1120 Introduction to the National Defense 0(3-0-0-6)

Objective: Be aware of the conspiracy and expedient of hostile forces against Vietnam's revolution in the current period, which is the platform for fighting and preventing the strategy of "peaceful evolution", Riot to topple from the hostile forces; fight against the enemy taking advantage of ethnic and religious issues against the Vietnamese revolution to maintain political security and protect Vietnam's territorial integrity.

Equip students with the knowledge of high-tech warfare; knowledge of building a militia and civil defence, mobilized reserve forces, the national movement to fight against crime and social evils, protect national security and preserve social order and security; steadily protecting the territorial sovereignty, frontier and sea-island of Vietnam.

Content: Prevent from the strategy of "peaceful evolution", riot to topple from the hostile forces towards the Vietnam's revolution; prevent the enemy from attacking with fire by high-tech weapons; build militia and civil defence, mobilized reserve forces and industrial mobilization to serve national defense; build and defend national sovereignty and frontier. Some major contents about ethnicity, religion and the fight against the enemy taking advantage of ethnic and religious issues against the Vietnamese revolution; basic issues on national security protection and social order and safety maintenance; basic issues on national security protection and social order and safety maintenance; basic issues on the fight against crime and social evils; Building the national movement to protect the national security.

MIL1130 General Military Education 0(3-2-0-8)

Objectives: To provide students with general knowledge about the general military, the necessary military skills to meet the requirements of building and consolidating the people's armed forces. After the course, the students can be ready to join the militia forces, to reserve for the army, and to perform military obligation to defend the nation.

Students can understand and use some common vehicles and weapons; have knowledge of infantry tactics; know how to prevent, avoid large destructive weapons and to master bandage and injury transferring skills.

Contents: team unit and three coordinating military subjects; how to use military topographic maps; a number of infantry weapons; gunpowder; prevention of great destructing weapons; First aid of war wound; how to attack and defend for each people in battle; technique for using AK submachine gun.

FL1100 English I 3(0-6-0-6)

Objectives: The course which is designed for beginners in English aims at providing students with basic skills in Listening, Speaking, Reading and Writing. Upon completion of the course, students are supposed to achieve 250 on TOEIC scores or level 2/6 (VSTEP).

Contents:

- Listening skills: Students listen to simple dialogues or monologues about different topics in daily life.
- Speaking skills: Students practice speaking in different situations, practice using stresses, intonations.
- Reading skills: Students get used to and practice different comprehension skills: reading for gists, skimming and scanning, inferencing, and improve their vocabulary.
- Writing skills: Student practice writing tasks at simple level

FL1101 English II 3(0-6-0-6)

Objectives: Upon completion of the course, students are able to achieve 300 on TOEIC or level 2/6 (VSTEP).

Contents: Students study different topics, such as sports, jobs and occupations, success, holiday and special occasions, etc. In terms of grammar, students learn to use simple present,

simple past, future tenses, present perfect, modal verbs, comparatives and superlatives. Students also practice more thoroughly with stresses and intonation. Students continue to study 4 skills (Listening, Speaking, Reading and Writing) at elementary level.

MI1111 Analysis I 4(3-2-0-8)

Objectives: This course provides fundamental knowledge about calculus for single and multivariable functions needed to study further mathematics as well as engineering subjects. Students will be provided a mathematical foundation to succeed in the fields of Technology, Engineering and Economics.

Contents: Limits, Continuity and Differentiation of single- and multivariable Functions. Integration of single variable Functions.

MI1121 Analysis II 3(2-2-0-6).

Objectives: This course provides the basic knowledge about applications of calculus to geometry, parametric dependent integrals, double integrals, triple integrals, line integrals, surface integrals and vector fields. Students can understand the basics of computing technology and continue to study further.

Contents: Applications of calculus to geometry, parametric dependent integrals, double integrals, triple integrals, line integrals, surface integrals and vector fields.

MI1131 Analysis III 3(2-2-0-6)

Objective: To provide the knowledge and calculation skills on infinite series and basic differential equations, one-sided Laplace transform, to formulate Mathematical foundations for students of technology majors, providing mathematical tools and modeling for students to use in engineering problems such as mechanical oscillations, signal processing, and some practical problems related to ordinary differential equations.

Contents: Infinite numerical series, series of functions, Fourier series, first-order differential equations, Second-order linear differential equations, first-order systems of differential equations, Laplace transforms, some models and modelling of technical problems.

MI1141 Algebra 4(3-2-0-8)

Objective: To form the skills of logical, creative thinking for learners. Students should be able to have an understanding and a competence to apply the knowledge on sets, mappings, logic, algebraic constructs in expressions and thinking on many fields. Moreover, they should be able to understand ideas and computational techniques of linear algebra. Based on that knowledge and skills, students could study other subjects in the engineering training program.

Contents: Set theory, mappings, symbolic logic, theory of groups, rings and fields, the field of complex numbers. Basic problems in linear algebra as matrices, determinants, systems of linear equations, vector spaces, linear mappings, eigenvectors, eigenvalues, bilinear forms, quadratic forms, Euclidean spaces, quadratic curves and surfaces in three-dimensional Euclidean Space.

MI3180 Probability, Statistics and Experimental Programming 3(3-1-0-6)

Objectives: Students gain basic knowledge of probability and statistics (random variables (one-dimensional or multi-dimensional), distribution rules, numerical characteristics, limit theorems, parameter estimation, and hypothesis testing) as well as basic concepts of experimental programming (least squares method, orthogonal programming of first and second order as well as experimental programming for finding minimizers) and are able to understand materials on these specific topics.

Contents: Basic concepts of probability, probability distributions, numerical characteristics of random variables, limit theorems, parameter estimation and hypothesis testing of random variables (one-dimensional as well as multi-dimensional); least squares method, orthogonal programming (order 1 & 2), experimental programming for finding minimizers.

PH1110 Physics I 3(2-1-1-6)

Objectives: provide students with the knowledge of the basis laws of classical mechanics, the conservation laws, vibration and mechanical waves, the methods of analyzing and solving relevant problems.

Content: Mechanical motion in which the main topics are: Vectors, Kinematics, Forces, Motion, Momentum, Energy, Angular Motion, Angular Momentum, Gravity, Planetary Motion, Moving Frames, and the Motion of Rigid Bodies. The motion of a simple body (ideal particle) and systems of bodies are considered. Specifically motion as mechanical vibration and waves with main topics: Oscillators, Energy, Poynting Vector. The Thermal motion is investigated by statistical and thermodynamic methods. The main topics are thermodynamic systems, Kinetic Gas Theory, Distribution Function, Thermodynamic laws of ideal gas, Carnot cycle, Thermal Engine, Real gas, Phase Transitions and application.

PH1120 Physics II 3(2-1-1-6)

Objectives: The goals of this part of the course are to provide students with the knowledge of the basis laws of electromagnetism, the way of describing electric and magnetic fields, as well as their interaction with matter, the methods of analyzing and solving relevant problems. The laboratory sessions help students to practice the skills at performing measurements of electromagnetic quantities, setting up simple experiments to investigate topics in the studied lectures, analyzing experiment data to obtain conclusions, evaluating measurement errors.

Content: Static electrical field - Insulator - Conducting objects and capacitor - Magnetic field - Electromagnetic induction - Magnetic material - Electromagnetic oscillations and waves - Electromagnetic field.

PH1131 Physics III 2(2-0-1-4)

Objectives: provide students with the knowledge of properties and the nature of light. The laboratory sessions help students to perform some experiments related to the topics in the studied lectures.

Content: Wave properties of light include interference, diffraction, polarization phenomena. Particle properties of light consists of thermal radiation phenomena, Compton. Schrodinger's equation. Einstein's equation and application.

IT1140 Introduction to Computer Science 4(3-1-1-8)

Objectives: The course not only provides students with basic IT knowledge (according to Circular No. 03/2014 / TT-BTTTT on the regulation of IT use skill standards), including basic understanding of how information is presented and processed in computers, computer hardware, operating system, internet, utility software as well as providing some skills to use office software, but also equip students with the ability to describe algorithms by various methods, comprehend the principles and programming structures of high-level programming languages and be able to implement algorithms in the C programming language.

Content: Information concept and information representation in computers. Computer system: hardware, operating system, internet, application software and office software. Algorithm and algorithm representation; Basic programming structures, basic data types and structured data type in the C programming language...

ME2011 Engineering Graphics I 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Describe and solve space geometrical problems, including: Intersections, true size, distance, angle, etc. by using orthogonal view method.
- Create a technical drawing to describe a solid (a mechanical part) according to the rules of standards.
- Read comprehensively of one-part technical drawing.
- Practice a design software to use for study and industrial problems later.

Contents:

- Projects and views (by using orthogonal view method) of points, lines and faces. Dependent and visual problems.
- Auxiliary views and true size problems.
- Intersection problem and application to a cut-solid.
- Standards in technical drawings.
- Views in technical drawing: base views, auxiliary views, section views, pictorials views, break views.
- Dimensional problems.
- Reading comprehensively 2-dimensional drawing (assisted by a design software)
- Practice a 3D design software.

4.2 Soft skill Courses

EM1010 Introduction to Management 2(2-1-0-4)

Objectives: The course provides basic knowledge of the concept, nature, and roles of management; a number of approaches to the management of an organization, business environment, decision-making process in an organization; managerial functions such as planning, organizing, leading, controlling in a company.

After completing this course, students will be able to: grasp the basic knowledge of business management, understand the operating environment of an organization, apply that knowledge into the learning process related to management of an organization at the university in the immediate future and future work; understand the management functions of planning, organizing, leading and controlling in an organization; improve the communication, presentation, teamwork, planning, time management, analytical, decision-making skills, .. and apply the knowledge and skills to manage a specific organization or business.

Contents: Overview of management of an organization: including the concept of management, the management process, and identify who is the manager? Where do they work? What are the manager's roles? The concept of organization, the characteristics of an organization, the operating environment of an organization.

Planning function includes the definition of planning, the roles of planning, the types of plans, planning methods and processes, and factors affecting to the quality of a plan.

Organizing function includes definitions and roles of organizational function, the contents of organizational functions: organizational structure design, management process development and human resources management.

Leading function include definition of leadership, the contents and role of leadership functions, and popular leadership styles.

Controlling function includes the definition of controlling, the roles of controlling function, the methods and types of controlling, the characteristics of an effective control system and controlling principles.

EM1180 Business Culture and Entrepreneurship 2(2-1-0-4)

Objective: The course equips students with knowledge and skills about the basic knowledge of culture and business culture, the role of business culture as an important factor for business development in enterprises. After finishing the course, the students will be able to:

- Understand and have an entrepreneur spirit in general; technology startup in particular.
- Have the ability to create, assign tasks, coordinate work in group work.
- Identify necessary documents through books, observations, interviews.

Contents:

- An overview of corporate culture and the role of corporate culture: Concept of culture; Corporate culture; Business culture.

- Business philosophy: Concept, the role of business philosophy; Content of business philosophy; How to build business philosophy of enterprises; Business philosophy of Vietnamese enterprises.
- Business ethics and social responsibility: Concept, role of business ethics; Corporate social responsibility; Expressive aspects of business ethics.
- Entrepreneurial culture: The concept of entrepreneurial culture; Factors affecting entrepreneurial culture; The components of entrepreneurial culture; Entrepreneurial style; Evaluation standards for entrepreneurial culture.
- Corporate culture: Concept of corporate culture; Steps to build corporate culture; Business culture models in the world; Current situation of cultural construction in Vietnamese enterprises; Solutions to build a suitable corporate culture model in Vietnam.
- Entrepreneurial spirit: Concept and meaning of entrepreneurial spirit; Forms of entrepreneur and technology start-up; Select a start-up model.

ED3280 Applied Psychology 2(1-2-0-4)

Objectives: This subject aims at providing students the basic knowledge about psychological science and its application in reality as well as learning progress and career activities. Student can also better understand of themselves and other people for more proper behaviour, effective learning, better motional self-control and personality development in order to adapt to social changes and the future career.

Moreover, the subject is beneficial to training teamwork skill, decision making skill, presentation skill and skills to give and receive feedback and appropriate attitudes towards the future career.

Contents:

Exploring the human psychological life; The necessity of psychology in life and technical career; The psychological processes, states and attributes of individuals and society with characteristics, laws and mechanisms that arise and form psychological phenomena.

Subject is applied in the learning activities of technical students in the missions such as characteristics of learning activities, communication activities, scientific research activities of technical students; some psychological-social laws affect the psychological atmosphere of the student team and collective in the learning of school; The issues of psychological contradiction in learning groups and the adaptation of students with technical learning.

Career personality; Personality type characteristics of students with learning and technical occupations; Occupational personality structure; Creative thinking developing, creative capacity of technical laborers; Required capacity and quality of students to adapt to future careers in the current technology context.

ED3220 Soft Skills 2(1-2-0-4)

Objectives: students is able to: Identify the importance of personal development skills at school, at work and in their life; Analyze the fundamental knowledge to develop personal

skills; Practice the steps to basically form the personal development skills; Aware of the need to practice skills of studying and working adapting to modern society and future career.

Personal development skills include: Being proactive and setting personal goals; Developing positive thinking; Managing time effectively; Communicating (Small Talk and Big Talk, Listening Skills, Persuasion, Presentation); Working in a team.

Contents:

Team and Teamworking: Why to work in a team; Fundamental knowledge of a team; Introduction to basic personal skills of teamworking; Introduction to interpersonal skills in teamworking.

Basic Personal Skills – Personal Achievements: Positive Thinking; Living Values; Time-Management (Managing ourselves).

Interpersonal Skills – Team Achievements: Effective Communication & Listening; Presentation; Persuasion.

Organization Skills in Teamworking: Team Building; Meetings; Setting and Monitoring Plans; Solving Problems; Evaluating Teamworking.

ET3262 Technology and Technical design thinking 2(1-2-0-4)

Objectives: Provide students with thinking about the steps in the product design process. Providing knowledge and skills on steps to design products properly from the beginning helps to reduce the time to design technology products. Strengthen teamwork skills, presentation skills, skills in planning, writing reports as well as necessary attitudes at work.

Content:

Knowledge: General process of technical design; Problem-solving skills; Engineering design process; techniques to create specifications of products; techniques to develop a plan to design products; techniques to select best alternatives; and techniques for Testing.

Introduction to Design of Experiment (DoE): The basic principles of DoE; go in depth in defining problems, methods of selecting influence factors; methods of determining sample size.

Competition between teams: Each team designs and completes a product defined in week 1; Final Report; Final Presentation on the whole product design process; Examination of all learned skills as the module's learning outcomes.

TEX3123 Industrial Design 2(1-2-0-4)

Objective: This subject aims to provide learners with the most basic knowledge of design and a number of principles in the product design, the industrial design process, design elements, the principles in design layout, the design documentation. Besides, this subject helps learners have the skills to apply knowledge in researching, synthesizing, evaluating and presenting the solutions of the improvement and development of artistic designs in the industrial production. The subject also provides students with teamwork skills, presentations, and attitudes needed to work in the company.

Content:

Overview of Design: Provide the learners with the most basic knowledge about the industrial art design: product concept and the art design of industrial products (from single product design to design style of product system of the company or corporation), the role of industrial art design and thinking design and some principles in product design, Ergonomics principles in product design.

The process of industrial art design: Provide learners with basic knowledge about: The process of industrial art design (forming and creating the Designing tasks and the designing solutions, completing designing solutions).

Design Elements: Providing learners with basic knowledge about the elements of industrial art design: shapes, lines, colors, sizes, materials, and space. This helps the learner to perceive the product from the point of view of product design, to explain and to understand more deeply about the visual elements of the industrial design.

Design Composition Principles: Providing learners with basic knowledge about principles in industrial arts design: Balance, rhythm, unity, emphasis. This helps the learner to be aware of the harmony that is generated in the product through the use of design layout principles.

Design Portfolio: Providing learners with knowledge on industrial design art profiles: Concept, role, classification, requirements, structure, presentation and evaluation. This helps the learner to understand the role of the design file, make a profile for a product design plan and present it.

TE2020 Technical Writing and Presentation 3(2-2-0-6)

Objectives: By the end of this course, students will have demonstrated the ability to research and analyze content for relevance, organize and plan the delivery of content in both written and orally presented formats. Organize information into easily accessible formats and write to a variety of audiences. Create reports for online delivery and submission. Work collaboratively in groups in both face-to-face and online modes.

Content: Learning outcomes identify the critical performances, and the knowledge, skills and attitudes that successful students will have reliably demonstrated through the learning experiences and evaluation in the course. To achieve the critical performance, students will have demonstrated the ability to:

1. Define report scope and content
2. Set writing objectives and define goals for proper messaging and delivery of information to a variety of audiences.
3. Develop project roles, responsibilities and relationships
4. Research, analyze, design, develop and deliver an effective written or oral presentation
5. Write in clear and concise manner (business/technical writing technique)
6. Define, write and review report content
7. Develop and communicate project specifications
8. Communicate and analyze research findings

9. Build a business case that address project needs
10. Present project concepts and ideas to user groups and stakeholders.

4.3 Professional Education

TE2000 Introduction to Transportation Engineering 2(1-0-3-4)

Objectives: Providing students with basic and introductory knowledge in the field of Transport Mechanical Engineering including automotive technology, energy engineering and hydraulics automation. Upon completion of this course, student will be able to:

- Describe the role of industries and the structure of industries in the field of transport mechanical engineering in the economy of Vietnam and the world.
- Presenting the general structure and basic principles of some typical equipment, facilities and systems in the field of transport mechanical engineering.
- Identify basic equipment and requirements in laboratories and workshops of the school.

Contents: Basic concepts and knowledge about careers; Theory and practice in the use, exploitation and operation of a number of typical equipment, facilities and systems in the field of transport mechanical engineering.

TE2601 Fluid Engineering 3(2-1-1-6)

Objectives:

- The fluid engineering studies the laws of equilibrium and mechanical movement of liquids, the forces of interaction between liquids and submerged objects in it and the application of those laws into practice. The module introduces the basic properties of liquids and gases. Study static laws, kinetics, fluid dynamics and flow states. Calculate real flow. Hydraulic calculation of pipelines. The same dimension theory and the application of the properties of liquids in real-world problems;
- After the end of the course, students have the ability to solve and apply practical problems related to statics and fluid dynamics;
- The course also provides students with teamwork skills, presentations and attitudes needed to work in the company later.

Contents:

- Basic knowledge of comprehensive fluid engineering to adapt well to jobs suitable to the discipline, being able to apply basic knowledge into practice, combining the ability to use modern tools to calculate;
- Professional skills and personal skills, able to learn at a higher level, the ability to self-study to adapt to the continuous development of science and technology and able to learn for life;
- Good communication, foreign language and teamwork skills to work in an interdisciplinary, multicultural and multinational environment;

- Ability to form ideas, design, construction and technical calculations in the field of application of the hydrological engineering in the actual environment.

TE3400 Hydrodynamic Machines 3(3-0-1-6)

Objectives: Upon completion of this course, student will be able to:

Get fundamental knowledge of hydraulic machine operation, the construction of important types of hydraulic machines such as hydraulic turbine, hydrodynamic and hydrostatic pumps. Understand hydraulic diagram of hydraulic transmission systems, kinematic and dynamic equations of simple hydraulic machines and systems. Select hydraulic machine type for different application needs in the field of power mechanical engineering and others as well.

Contents:

- Overview of energy exchange principle of hydraulic machines distinguished for the two groups: hydrodynamic and hydrostatic machines in application areas;
- Hydraulic transmission formed by integration of hydraulic machines and components;
- The structural principle of hydrodynamic machines, energy exchange principle, kinematic/kinetic equations and application area;
- The structural principle of hydrostatic machines, kinematic/kinetic equations in pump/motor mode and industrial applications;
- Simple hydraulic transmission systems, advantage/disadvantage of each type and some example of applications in power mechanical engineering, automotive engineering or ship building.

ME2030 Introductory Mechanical Engineering 2(2-1-0-4)

Objectives: Understand and determine the importance, relationship between the knowledge blocks (basic, foundational, specialized courses) and between the courses have and will learn in the technical universities in a systematic way, especially the knowledge of the mechanical, mechatronics and related fields, they are a stable basis for successfully completing the final task of the whole education program.

This course provides students with the basics of engineering and manufacturing of mechanical products. Thereby, this course allows students to select the appropriate fabrication processes for typical mechanical products, including the selection of materials, processes and machines to manufacture products. In addition, this course helps students to have skills of teamwork, presentation and report.

Contents: Some basic concepts of mechanical production. Materials used in mechanics. Surface treatment. Metal and alloy casting technology. Pressure processing technology. Welding and metal cutting technology. Cutting processing on machine tool. Mechanization and automation in mechanical production.

ME2201 Technical Graphics II 2(2-1-0-4)

Objective: Equip students with basic knowledge and skills in order to: express a drawing in the plane of a device, machine in industry in technical drawings (assembly drawing) by both methods: conventional and CAD. Read assembly drawing and detail drawing.

Content:

- Express structural members and joints.
- Express drive members and unit.
- Create a plain assembly drawing.
- Read and comprehend assembly drawing and detail drawing.
- AutoCAD 2D

Course project including 01 assembly drawing of size A1 by hand and 01 by CAD; 06 detail drawing.

ME2102 Strength of Materials 2(2-1-0-4)

Objectives: Provide the necessary knowledge about strength of materials to solve practical problems that relate to the stages from design to manufacturing and to serve for the study of other specialized courses in the field of mechanical and construction, etc.

Contents: Concept of internal force, stress, stress state, strain, generalized Hooke law. Basic knowledge to calculate durability, stiffness of tension bars, compress, blending, torsion. The durable theory. Geometric feature of cross sections

ME2215 Engineering Mechanics I 2(2-1-0-4)

Objectives:

- The course provides students with general and fundamental knowledge of the motion and balance of planar, spatial solid bodies and system of planar solid bodies.
- At the same time, the course trains students to get thinking methods and research methods for prospective engineers. The course is also responsible for providing basic knowledge for students to study other subjects.

Contents: Solid object statics studies the theory of forces and the equilibrium of solids under the action of forces. The main contents of statics include: basic concepts: force, torque, moment, solid objects, equilibrium of solids, ... Static axioms. Force system shortening. The equilibrium condition of a solid body and solid multi-body systems. Center of gravity. Balance of solid objects under friction. Solid kinematics studies the mechanic motion of solid objects geometrically, regardless of the cause of the motion and the cause of its movement. The two basic characteristics of point kinematics are velocity and acceleration. As for solid objects, the two quantities of kinematic characteristics are angular acceleration, angular acceleration of solid objects. Basic motion of a solid object: translation and rotation around fixed axis. To investigate the planar motion of an object. Problems of the motion combination of points, the motion combination of solid objects. Movement of a object around a fixed point. General motion of a solid object.

ME3108 Engineering Mechanics II 2(2-1-0-4)

Objectives: Equipping student with fundamental knowledge of solid kinetics, students get principle of mechanic motion under forces, the relationship between the force and motion of the mechanic systems.

Contents: Kinetics studies mechanic motion of solids, solid objects under forces. This section presents the basic laws of dynamics of point, the geometric characteristics of mass of an object, the momentum and energy calculation methods for mechanics. Mechanic principles: the virtual work principle, the d'Alembert principle, the d'Alembert-Lagrange principle. The 2nd Lagrange equation for mechanics. Solid mechanics, reaction force in bearing of a rotation around a fixed axis. Primary theory about gyroscope. General motion kinetics. Impact dynamics. Kinetics in relative motion.

ME3060 Theory of Machinery 3(3-0-1-6)

Objectives: Introduce definitions and basic concepts, structural structure, how to form and layout of the structure. Methods of analysis and synthesis of kinetics, forces and dynamics of common mechanisms and machines, methods of synthesizing a number of mechanisms.

Content: Structural structure. Analysis of kinetics, forces and dynamics of structure. Real motion of the machine. Camshaft structure. Gear structure and gear system. Synthetic flat structure.

ME3090 Machine Details 3(3-0-1-6)

Objectives: Equip students with the basic knowledge of working principles, structure and design calculation methods of common machine and machine parts. Hone the ability to analyze mechanical transmission systems in common machines and apply the knowledge learned in machine design issues.

Content: Basic issues in calculate and design machine details: load, stress, working ability, fatigue strength, etc. The transmission commonly used in mechanical transmission: belt transmission, chain, gear, screw. Shafts, bearings and roller bearings.

ME3171 Mechanical Technology 3(3-0-0-6)

Objective: Provides students with basic knowledge of mechanical technology, how to set up a manufacturing technology of machineries and set up technology of products assembly.

Content: Basic concepts, machined product surface quality, machining precision, standardization, machining allowances, technological properties in structure, workpice selection and workpice production methods, machining, mechanical engineering process design, manufacturing process of typical products, gear manufacturing technology, assembly technology.

ME3232 Project of Machine Elements 2(0-4-0-4)

Objective: To systematize and synthesize knowledge of basic science subjects and basic technical subjects in order to solve problems related to analysis, machine design and machine details. Equip for student with practical knowledge of working principles, structure and

methods of calculating overall machine design, as well as training skills in analyzing, designing and making the technical document.

Content: Analyzing the transmission system, based on that, calculate the kinematic parameters needed for a machine. Calculating for design of component transmitters in the transmission system. Calculation and design of supporting and connecting parts. Calculation of box design and other extra details. Create design documents (report, drawings) ... of the machine

HE2012 Thermal Engineering 2(2-1-0-4)

Objectives: The course provides students with basic knowledge about the processes of conversion of energy, which are mainly thermal energy into mechanical energy. From there, students have the ability to apply to calculate the design of heat engines and air conditioners so that they are most effective. The course helps students understand the process of heat transfer and their application in practice, helps understand the nature of heat transfer and how to improve heat transfer efficiency with basic types of heat exchangers.

Content: Technical thermodynamics and heat transfer: The law of energy change (Thermal energy and mechanical energy). Properties of materials. The working principle of thermal engines (internal combustion engines, jet engines, steam turbines and gas turbines of thermal power plants and air-conditioners). Basic forms of heat transfer: heat conduction, convection, and radiation. Synthetic heat transfer phenomenon and types of heat exchangers.

EE2012 Fundamentals of Electrical Engineering 2(2-1-0-4)

Objectives: Provide fundamental knowledge of electrical engineering. Students are able to analyse electric diagram, scheme; operate main electrical equipments in industry and able to self study in electrical engineering field.

Contents:

- Electric circuit: concept of electric circuit. Sinusoidal currents. Circuit analysis methods. Three-phase electrical system. Transient process in electrical circuit.
- Electric machine. Transformer. Induction motor. Synchronous motor. Direct current motor. Motor control.

ET2010 Electronic Engineering 3(3-0-1-6)

Objectives: The course equips students with the knowledge of operating principles, characteristics, parameters and fields of use of electronic components to serve as the foundation for specialized subjects. The course also provides basic concepts about semiconductor elements and its applications (diodes, BJT, FET ...), algorithm amplifier circuits, oscillator circuits.

Content: General introduction about electronic components: Electronic materials, Passive components. Discrete semiconductor electronic components: Diodes, Bipolar Transistors, Field Effect Transistors. Discrete semiconductor components. Photoelectronic components. The Digital and Pulse Technologies section will provide concepts of basic pulse generation circuits, logic circuits, methods of optimization and logic function representation.

MSE2228 Materials science 2(2-0-1-4)

Objectives: Students are required to have a general understanding of material structure and properties of common materials so that they can select, design and use them effectively in their specific projects.

Content: Structure and properties of technical materials, application of material properties in design.

TE3010 Structure of Internal Combustion Engines 3(3-0-1-6)

Objectives: Upon completion of this course, student will be able to:

- Understand and explain the operating principle of internal combustion engine;
- Understand and explain the functions, mission and working principle of systems, details and detail cluster in internal combustion engine;
- Understand the structure of detail and detail cluster of systems in internal combustion engine.

Contents:

- Basic knowledge of working principles of four-stroke, two-stroke, turbocharged engine, structure of block and cylinder head, component of crankshaft and connecting rod, component of intake and exhaust;
- Basic Knowledge of working principle and structure of systems (fuel supply system, cooling system, lubricating system, starting system and exhaust gas treatment system) in internal combustion engine.

TE3200 Automobile Structures 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Identify and present functions of automobiles, basic systems and layout of such systems in automobiles;
- Ability to present functions, structures, working principles and analyze the structure of systems and details in automobiles;
- Ability to learn and write reports on structure, working principles and analyze the structure of systems and details in automobiles.

Contents:

- General layout in automobiles;
- Internal combustion engine;
- Powertrain system;
- Brake systems, suspension systems, navigation systems in automobiles.

TE3021 Fundamentals of Internal Combustion Engines 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Present and analyze the basics of internal combustion engine;
- Analysis and calculate the work cycle of the internal combustion engine;

- Analysis the gas exchanges processes in the two-stroke engine and processes of mixture formation in the internal combustion engine;
- Ability to build and explain the performances of internal combustion engine.

Contents:

- Basic knowledge relating to real working cycle of the automotive engines, indicated and effective parameters of the cycle;
- Basic knowledge of mixture formation methods and the performances of the automotive engine.

TE3210 Theory of Automobile 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Understand and able to identify (analyze) kinematics and dynamics of wheels;
- Able to analyze and determine the forces acting on automobiles: active forces, drag and force from the road surface; determine the conditions of moving, rollover and slide of automobiles;
- Able to build dynamic characteristics of automobile lateral;
- Analyzing and evaluating the dynamics of automobiles during braking, turning and vertical oscillations;
- Analyzing and evaluating the fuel economy, mobility and safety of automobiles;
- Able to write and present the report.

Contents:

- The forces and moments acting on automobiles;
- Calculation of automobile traction force;
- Automotive braking;
- Automotive driving;
- Automotive vibrations;
- Mobile and safety in the movement of automobiles.

TE3221 Automobile Maintenance and Repair 4(3-1-1-8)

Objectives: Upon completion of this course, student will be able to:

- Understand and have general knowledge about automobile maintenance and repair;
- Analyzing methods of diagnosis, inspection and evaluation of technical status and methods of automobile maintenance and repair;
- Using tools and equipment in automobile inspection, maintenance and repair;
- Know how to use and look up documents and have the ability to self-learn to develop knowledge about automobile maintenance and repair.

Contents:

- Overview of automobile repair and maintenance;
- Diagnosis, inspection and repair of the engine;

- Diagnosis, inspection, maintenance, repair of fuel systems and ignition systems for gasoline and diesel engines;
- Diagnose, test, maintain, repair of engine lubrication and cooling systems;
- Diagnosis, inspection, maintenance and repair of powertrain systems;
- Diagnosis, inspection, maintenance, repair of brake systems and wheel assemblies;
- Diagnosis, inspection, maintenance, repair of suspension systems and steering systems.

TE4200 Automobile Electronics 3(3-0-1-6)

Objectives: Upon completion of this course, student will be able to:

- Understand and be able to apply basic technical knowledge of electricity and electronics to automotive electric systems and automotive control systems;
- Able to identify, analyze, and solve the problems of electrical and electronic engineering on automobile;
- Skills in teamwork, presentation and reading comprehension of technical documents in English.

Contents:

- Overview of automotive electric and electronic systems;
- Power supply system, starting system, ignition system, electric body system;
- Components of automotive electronic control system, electronic motor control system, automatic transmission control system, ABS system, electric power steering system;
- Communication system on automobile;
- Self-diagnosis system on automobile.

TE4210 Automobile Design and Calculation 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Able to analyze the working conditions of the clusters (systems) to determine the forces and select the design plan;
- Able to apply the professional knowledge to design the calculation of clusters and systems of automobiles;
- Evaluate capacity, quality and durability of the design cluster (systems);
- Understand the design method by using 3D softwares.

Contents:

- General requirements in automotive design;
- General layout of automobiles;
- Force modes and calculation modes;
- Design and calculation of clutch, manual transmissions, continuously variable transmission, cardan, active and passive axles;
- Suspension, brake, steering system;
- Introduction to 3D design softwares.

TE4220 Chassis-Frame Technology

Objectives: Upon completion of this course, student will be able to:

- Understand and be able to analyze the structure of automobile chassis-frame, layout of control and inspection equipment inside the automobile body;
- Understand and be able to design parts to improve the active safety and passive safety related to automobile chassis-frame;
- Understand the production process, maintenance and repair process of automobile chassis-frame.

Contents:

- Function, classification, structure of automobile chassis-frame;
- Active and passive safety;
- Regulating climate in automobiles;
- Impact dynamics;
- Repair technology of automobile chassis-frame;
- Manufacturing technology of automobile chassis-frame;
- Calculate automobile chassis-frame.

TE3041 Fuel Supply Systems of Internal Combustion Engine 2(2-1-0-4)

Objectives:

- Upon completion of this course, student will be able to:
- Understand the overview of fuel supply systems used in internal combustion engine;
- Understand, analyze and present the structure and working principle of fuel supply systems used in internal combustion engine;
- Analyze and evaluate the stability of working speed of the internal combustion engine.

Contents:

- Fuel supply system of the gasoline engine;
- Fuel supply system of the diessel engine;
- Fuel supply system of the gas and multi-fuel engine;
- Automatic regulation of the engine speed.

TE5031 Design of Internal Combustion Engine 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Understand the basic process of internal combustion engine design and manufacture;
- Analyze the functions, principles and structure of the mechanical parts, components of major systems in internal combustion engine;
- Explain and apply the calculation method in designing the mechanical parts, components of major systems in internal combustion engine.

Contents:

- Basic knowledge of design and calculation of internal combustion engine;
- Knowledges of the design and calculation method of the mechanical parts, components and major systems in internal combustion engine;

- Basic knowledge of specialized softwares on calculating and design of internal combustion engine.

TE3411 Theory of wings and blades 2(2-1-0-4)

Objectives:

- The objective of this subject is to understand the role and influence of wings and blades in industrial fluid engineering. In order to carry out and obtain an aerodynamic goal of wings and blades, students need to understand the aerodynamic profile and fluid dynamics;
- The goal of theoretical study, calculation and design is to optimize aerodynamic performance of wings and blades. This goal needs to study from simple level to complex one: airfoil, single 3D wings and blades, 2D blade row, and 3D blade row (concept of blade row is usually used in turbomachineries such as pump and turbine, etc.). Semi-empirical methods, numerical methods can be used to solve a direct problem and a design problem for single blade and blade row;
- Students are required to study extensively by searching on internet, how to have a definition of numerical methods along with professional software, and how to apply computational power in solving a blade problem.

Contents: The subject entitled “Theory of wings and blades” plays an important role in a training program for students (e.g. engineers and bachelors) studying in fluid engineering in combination with other majors. The contents in this subject are shown as follows:

- Showing the role and influence of wings and blades in industrial fluid engineering, analyzing an aerodynamic form and characteristic of airfoils;
- Understanding 3D effect and aerodynamic characteristic of wings and blades;
- Understanding calculation methods used for airfoil and 3D wings and blades;
- Understanding the methods of fluid dynamics for 3D rectilinear and non-rectilinear blade row;
- Approaching professional software applied in calculating fluid dynamics and developing a new professional code.

TE3420 Turbomachines I 2(2-0-1-4)

Objectives: The objective of this subject is to understand basic concepts of rotodynamic pump and fan, its structure and operating principle, operating and energy characteristic, features of manufacture and preparation, calculating the main dimensions of a fan.

Contents: The subject entitled “Turbomachines I” plays an important role in a training program for students (e.g. engineers and bachelors) studying in fluid engineering in combination with other majors. The contents in this subject are shown as follows:

- Defining and classifying pump and fan;
- Understanding the structure and operating principle;
- Understanding operating and energy characteristics and similarity law;
- Analyzing active force in a pump;
- Studying a cavitation phenomenon in a pump;
- Understanding manufacturing feature, operation and preparation;
- Calculating important parameters and dimensions.

TE3430 Water Turbine I 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

Understand and able to select, calculate a water turbine for a specified hydro-power plant. Have ability to calculate and design some common types of water turbine, understand how to operate and maintenance water turbines.

Contents: Basic concept of water turbine. Operation process of water turbine. Cavitation of water turbine. Operation characteristic of water turbine. Calculating and designing the main parts of Kaplan water turbine. Calculating and designing the main parts of Penton water turbine. Constructure of main parts of water turbine. Controlling systems of water turbines.

TE3460 Hydraulic Machines 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand basic knowledge of hydraulic displacement machines;
- Understand structure and operation principle of the machines, calculation of main parameters of the machines and how to operate the machines safely.

Contents:

- Basic concept of hydraulic displacement machine such as structure diagram, operation conditions, displacement, rate volume, force and torque equations, power equation and efficiency...
- Discription about material of components of hydraulic machine such as piston pumps and motors, gear pumps and motors, radial and axial rotor-piston pumps and motor, vane pumps and motor...

TE3461 Industrial Fluid Power Transmission and Automation 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand basic concept of fluid power system. Understand operation principle of hydraulic and pneumatic components and devices (such as Compressors, Hydraulic pumps, components...). Understand basic knowledge about driving of hydraulic system;
- Have ability to calculate and design hydraulic and pneumatic circuits to control industrial systems.

Contents:

- Basic concept of hydraulic and pneumatic devices, basic components (name, symbol, functions, operation principle...), basic parameters and operation characteristics;
- Basic concept of hydraulic driving system: definition, classification, applications; basic hydraulic driving systems in industrial;
- Basic concept of hydraulic driving system based on cycling method; Logic controlling diagram; Synthentic and analysis a hydraulic system.

TE4579 Control of Fluid Power Systems 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand the basic concept of basic control methods of a hydraulic or pneumatic system. Understand operation principle of fluid power controlling components, electronic controlling components, basic control methods in industry, synthesize and build automatic control system diagrams for hydraulic and pneumatic systems;

- Have skills of team work, presentation and professional attitudes for work in company after graduation.

Contents:

- Basic concept of controlling a hydraulic or pneumatic system, understand about control systems;
- Application of control methods on controlling a hydraulic or pneumatic system;
- Update new technology on controlling fluid power systems.

TE4580 PLC Applications in Controlling Industrial Hydraulic Systems 2(2-0-1-4)

Objectives: Upon completion of this course, student will be able to:

- Get fundamental knowledge of PLC language, structure of PLCs, basic scripts used in PLC programming as well as PLC applications in industrial hydraulic transmission systems;
- Calculate and design control diagram for hydraulic transmission system using PLC;
- Have skills of team work, presentation and professional attitudes for work in company after graduation.

Contents:

- Basic concepts, structure and usage targets of PLC in hydraulic transmission system in industries;
- Understanding and applying basic programming language for PLC, basic components constituting the PLC control system;
- Understanding and constructing systems applied PLC control in basic hydraulic transmission systems.

TE4571 Hydroelectric Power and Pumping System 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand about the systems of calculation method for determination of hydro-equipment and machine, the system design as well as the construction of Hydroelectric power and pumping system;
- The student also can learn about the problems and trouble shooting in system for developing the engineering skills in application of rotary machinery with fluid power system.

Contents:

- Basic concept of construction of Hydroelectric power and pumping system;
- Understanding the structure and operating principle of Hydroelectric power plan and Pumping station;
- Basic knowledge about selecting, designing and calculating a Hydroelectric power system;
- Basic knowledge about selecting, designing and calculating a Pumping system.

TE4578 Fundamentals of Wind Turbine and Ocean Energy Engineering 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand about general concepts of wind energy and ocean energy, how to use those energy. Get fundamental knowledge about potential of wind and ocean energy in Vietnam. Understand how to select devices that suitable with the potential of each type of the energy;
- Understand how to apply fluid mechanics theory on designing and calculating of wind turbines and ocean energy device.

Contents: The contents in this subject are shown as follows:

- Introduce the basic concept of wind energy and ocean energy, characteristic of them;
- Defining and classifying the potential of the energy. Defining specification parameters of each type of the energy;
- Understanding structures and operating principle of devices which use to convert wind and ocean energy. Calculating main parameters and dimensions of the devices.

TE4000 Engineering Practicum 2(0-0-4-4)

Objectives: Upon completion of this course, student will be able to:

- Understand the practical knowledge of structure, principles of details and systems;
- Applying theoretical knowledge into evaluation and solving some practical problems in model rooms, garages and companies.
- Able to participate in designing and manufacturing of new products in the field of transportation engineering.

Content: Students work the practice of technicians at manufacturing and research companies in the field of transportation engineering.

TE4241 Fundamentals of Vehicle Dynamics 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Explain dynamics and its effects on safety and comfort in the process of moving vehicles on the road;
- Establishing basic models of automobile dynamics research;
- Identify assessment methods and technical solutions to improve the quality of automobile dynamics.

Content:

- Overview of automobile dynamics;
- Wheel dynamics on automobiles;
- Automotive vertical dynamics;
- Automotive longitudinal dynamics;
- Automotive horizontal dynamics;
- Controlling automobile dynamics.

TE5201 Applied Informatics in Automotive Engineering 3(2-2-0-6)

Objectives: Upon completion of this course, student will be able to:

- Generalizing characteristics and tasks set out in the calculation and design of automobiles;
- Common design software and usage principles;
- Application of Matlab software in the calculation of automobile design.

Content:

- Issues in calculating, designing cars and some popular software;
- Use utility tools in automotive design software;
- Simulation of automotive dynamics with Matlab Simulink software;
- Exercises for automotive engineering.

TE5211 Fundamentals of Automotive Mechatronics 2(2-0-1-6)

Objectives: Upon completion of this course, student will be able to:

- General knowledge about mechatronic systems and components in automotive mechatronics systems;
- Identifying and presenting the characteristics of common sensors, being able to propose a circuit diagram using common sensors;
- Identify and present characteristics of common actuators; able to propose a circuit diagram for common actuators;
- Understand the concept of microprocessor and microcontroller, know how to find and search common microcontrollers and design microcontroller-connected circuits with peripheral devices;
- General understanding of continuous automatic control system;
- Know how to synthesize vibration control system on 1/4 suspension model.

Content:

- Overview of mechatronic systems;
- Sensors;
- Actuators structure;
- Microcontrollers;
- Automatic control system;
- Studying on the suspension system.

TE5221 Vehicle Testing 3(3-0-2-6)

Objectives: Upon completion of this course, student will be able to:

- Understand the principle of sensors in engine and automotive experiments;
- Establish experiments to determine the dynamic, fuel economy and vehicle emissions features;
- Synthesizing and analyzing experimental data;

- Teamwork skills, presentation and reading comprehension of technical documents in English.

Content:

- Introduction;
- Sensors used in automotive experiments;
- Determining the coefficient of impact between vehicles and the environment;
- Measuring engine power and transmission system;
- Determining the dynamic properties of vehicles;
- Measure exhaust components of motor vehicles;
- Error of measurement and data processing.

TE5230 Specialized Automobiles 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Understand the overview of specialized vehicle systems and the applicability of vehicles in the national economy;
- Ability to design each part and convert some parts on specialized vehicles;
- Understand the principles of design and use of some specialized vehicles.

Content:

- Basics of specialized vehicles;
- General outline of basic vehicles and specialized equipment;
- Specialized transport vehicles;
- Construction machines and vehicles;
- Special vehicles;
- Independent wheel construction vehicles.

TE5241 Automobile Design Project 1 2(1-2-1-4)

Objectives: Upon completion of this course, student will be able to:

- Analyzing and calculating the forces and planning for designing clusters/ systems on automobiles;
- Calculate the basic parameters of the automotive clusters/ systems and develop the design dossier;
- Analysis of diagnostic methods, inspection and assessment of technical status and repair methods of automotive cluster/ systems.

Content:

- Develop plans to implement projects for instructors;
- Implement specific tasks of the project according to the plan with the guidance of teachers;
- Prepare project reports and present with the council.

TE5032 Air Pollution from Automobile 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Explain the formation of pollutants in automobile emission and impact on human health, environment and society;
- Understand the methods of sampling and measurement to determine the concentration of toxic component in automobile emission according to the emissions standards in the world;
- Analyze and understand the solutions to minimize the toxic emissions in automobile emission.

Content:

- Toxic component in automobile emission;
- Method of measurement to determine the toxic component in automobile emission and emission standards of automobile engine;
- Reduce emissions from automobiles engines by solutions related to the structure and combustion mixed quality;
- Reduce emissions from automobile engines by solutions of exhaust gas treatment;
- Reduce emissions from automobile engines by solutions using clean fuel and alternative fuels.

TE5242 Project 2(1-2-1-4)

Objectives: Upon completion of this course, student will be able to:

- Synthesis of knowledge of specialized subjects;
- Solving research issues on automobiles;
- Methods of scientific research to organize graduation thesis and scientific research.

Content:

- Develop a plan to conduct a scientific research;
- Implement specific tasks to organize research;
- Writing reports and presentations.

**TE5020 Dynamics and Vibrations of Crankshaft System in Internal Combustion
Engine 3(3-1-0-6)**

Objectives: Upon completion of this course, student will be able to:

- Ability to present and analyze kinetics and dynamics of component of crankshaft and connecting rod;
- Calculate and offer balancing solutions of internal combustion engine;
- Calculate and propose solutions to reduce the torsional vibrations of the crankshaft system of internal combustion engine;
- Ability to use specialized softwares in calculating dynamics and vibrations of crankshaft system in internal combustion engine.

Content:

- Kinetics of component crankshaft and connecting rod;
- Dynamics of component crankshaft and connecting rod;
- Kinetics and dynamics of V engine;
- Balance of internal combustion engine;
- Torsional vibration of internal combustion engine;
- Application of specialized softwares in calculating dynamics and vibrations of crankshaft system in internal combustion engine.

TE5061 Automobile Design Project 2 2(1-2-1-4)

Objectives: Upon completion of this course, student will be able to:

- Understand and use the calculating method for thermodynamic cycle of internal combustion engine; calculating kinetics and dynamics of crankshaft and connection rod;
- Understand the structure of the main components and systems that are presented on a technical drawing.

Contents:

- Calculating Method for engine thermodynamic cycle; kinetics and dynamics of the crankshaft and connecting rod components;
- Analysis of calculation results on pressure-volume, kinetics and dynamics diagrams of engine cycles; Understanding the cross and longitudinal sections of engine and drawing specialized components.

TE5062 Project 2(1-2-1-4)

Objectives: Upon completion of this course, student will be able to:

- Identify and present functions, structures, working principles and analyze the structure of systems and details in advance internal combustion engine;
- Ability to learn and write reports on structure, working principles and analyze the structure of systems and details in the advance internal combustion engine.

Content:

- The latest components and systems on internal combustion engines;
- Development trend of internal combustion engines in the world;
- Advance softwares used in calculating and designing internal combustion engines.

TE4490 Turbomachines II 2(2-0-1-4)

Objectives: Upon completion of this course, student will be able to:

- Understand the calculation methods for designing centrifuge pump and fan;
- Understand the calculation methods for designing axial and mix flow pump;
- Understand how to calculate and design the main parts of pump.

Content:

- Reminding the basic concept of Turbomachine;

- Calculating and designing centrifuge pump;
- Calculating and designing axial and mix flow pump;
- Study structure of main parts of turbomachine.

TE4500 Water Turbine II 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand and applicable the calculation methods for designing water turbine;
- Understand how to calculate and design the main parts of water turbine;
- Understand working principle of governor; Identifying each type of governor; Able to calculate and select set of optimal parameters of the governor.

Content:

- Calculating and designing propeller of Kaplan turbine;
- Designing flow path parts of inlet and outlet of Kaplan turbine;
- Calculating and designing Penton turbine;
- Structure of main parts of water turbines;
- Governor system of water turbine.

TE4441 Hydrodynamic Transmission 2(2-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Understand working principle of Hydrodynamic Transmissions;
- Understand structure, working principle and characteristic of Hydrodynamic coupling;
- Understand structure, working principle and characteristic of Hydrodynamic Torque Converter;
- Understand structure, working principle and characteristic of Hydromechanic Torque Converter.

Contents:

- Basic theory of Hydrodynamic Transmission;
- Hydrodynamic Coupling;
- Hydrodynamic Torque Converter;
- Hydromechanic Torque Converter.

TE4570 Manufacturing Technology of Fluid Machines 3(3-1-0-6)

Objectives: Upon completion of this course, student will be able to:

- Understand general technology of manufacturing of fluid machines;
- Ability to apply suitable machining process on manufacturing mechanical parts of fluid machines;
- Ability to design manufacturing processes of the main parts of hydraulic displacement machines;
- Ability to design manufacturing processes of the main parts of Turbomachines.

Contents:

- General criterias of designing fluid machines;
- The common machining methods;
- Manufacturing technology of the main parts of Hydraulic machines;
- Manufacturing technology of the main parts of Turbomachines;
- Balancing methods for rotating parts.

TE4576 Industrial Robots 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand basic concepts of Industrial Robots;
- Ability to apply industrial robots on automatic working systems;
- Ability to study, calculate and design a simple industrial robot.

Content:

- General concept about industrial robots; Basic concepts, definition, classification and structure of industrial robot;
- Kinetics and dynamics of industrial robot;
- Driving systems of robot; Application of fluid power driving systems on Industrial Robots;
- Control systems of Industrial robots.

TE4581 Applied Hydraulic Circuits 2(2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand working principle, structure of hydraulic components of a hydraulic control system;
- Ability to analyze and explain working principle of the hydraulic control systems;
- Ability to design a hydraulic control system based on the requirements.

Content:

- Introduction of a hydraulic system;
- Common components and parts of hydraulic system;
- Hydraulic circuits and applications.

TE4582 Computer-Aided Design and Simulation of Fluid Machinery (2-1-0-4)

Objectives: Upon completion of this course, student will be able to:

- Understand basic laws of fluid dynamic;
- Ability to create and modeling simple matters;
- Ability to create and modeling complex matters of turbomachines;
- Ability to apply computational on calculating hydraulic machinery;
- Ability to create and modeling matters of hydraulic machines.

Content:

- Laws of fluid flow and conditions;

- Open FOAM and its application on fluid machines;
- Modeling fluid flow passing through a turbomachine;
- Modeling hydraulic machine using computer.

TE4541 Project I 2(1-2-1-4)

Objectives: Upon completion of this course, student will be able to:

- Ability to design a hydraulic system based on analyzing the requirements;
- Ability to calculate basic parameters of a hydraulic system;
- Ability to select suitable hydraulic components and able to create technical drawings.

Content:

- Analyzing the requirements to design mechanical structure of hydraulic machine systems;
- Calculating hydraulic control system;
- Creating technical drawing of mechanical structure and hydraulic control system;
- Writing report and making a presentation.

TE4551 Project II 2(1-2-1-4)

Objectives: Upon completion of this course, student will be able to:

- Ability to design turbomachine such as centrifugal pump and fan, axial pump;
- Ability to design water turbine such as axial turbine, mix-flow turbine, Penton turbine...

Content:

- General descriptions about turbomachines;
- Calculating and designing structure of a turbomachine;
- Creating technical drawing of turbomachine;
- Writing report and making a presentation.

TE5001 Graduation Practicum 4(0-0-8-12)

Objectives: Upon completion of this course, student will be able to:

- Understand the practical knowledge of the structure, working principles of automotive engine systems.
- Apply theoretical knowledge of previous courses to assess and solve practical problems in laboratories, manufacturing facilities and automotive services.
- Have the capacity to design, manufacture and operate new products and equipment systems in the automotive industry.

Content:

Students learn the organization of production and practice the specific work of technicians who are engineers in production facilities, research in the field of automotive engine.

TE5002 Graduation Practicum 4(0-0-8-12)

Objectives: Upon completion of this course, student will be able to:

- Understand the practical knowledge of structure, principles of details and systems on automobiles to serve graduation projects;
- Applying theoretical knowledge into evaluation and solving some practical problems in model rooms, garages and companies.
- Able to participate in designing and manufacturing of new products in the field of transportation engineering related to graduation projects.

Content:

- Students work the practice of technicians at manufacturing and research companies in the field of transport mechanical engineering;
- Writing reports and presentations.

TE5003 Graduation Practicum

Objectives: Upon completion of this course, student will be able to:

- Understand the reality of structure and operation of fluid power systems;
- Ability to apply knowledge on evaluating and solving problems on site;
- Ability to design and manufacture components, parts or fluid power system.

Content:

Students apply the knowledge gained from the courses to solve specific tasks of the graduation project under the guidance of instructors; write thesis and complete the technical drawings related to graduation thesises.

TE5991 Engineer Thesis 12(0-0-24-24)

Objectives: Upon completion of this course, student will be able to:

- Develop the process of exploitation, maintenance and repair of automotive engine equipments, capable of proposing system of technical solutions;
- Design and calculate and set up technological processes to manufacture new products in the field of automotive industry.

Content:

- Apply the knowledge gained from the courses learned to solve the specific tasks of the project under the guidance of the supervisor;
- Write the project description and complete the technical drawings related to the topic;
- Present the graduation thesis.

TE5992 Engineer Thesis 12(0-0-24-24)

Objectives: Upon completion of this course, student will be able to:

- Develop a process of designing a cluster / system of machines and equipments in the field of transportation engineering;
- Setting up the process of using, maintenance and repair of machines and equipments in the field of transportation engineering;

- Able to propose a system of technical solutions and to participate in designing and manufacturing of new products in the field of transportation engineering.

Content:

Students apply the knowledge gained from the courses to solve specific tasks of the graduation project under the guidance of instructors; write thesis and complete the technical drawings related to graduation theses.

TE5993 Engineer Thesis 12(0-0-24-24)

Objectives: Upon completion of this course, student will be able to:

- Ability to propose technical solution, new design of fluid power system;
- Ability to design and manufacture a fluid power system;
- Ability to operate, do maintenance and repair machines and systems relating to Transport mechanical engineering field, Automation, Renewable Energy and Special vehicles;
- Ability to self-study and write reports.

Content:

- Calculating and designing fluid power machines and system;
- Creating technical drawing;
- Writing report;
- Making presentation and doing defence engineer thesis.