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| UNIVERSITY OF TRANSPORT AND COMMUNICATIONS**FACULTY OF MECHANICAL ENGINEERING**  | **SOCIALIST REPUBLIC OF VIETNAM** **Independence - Freedom - Happiness** |
|  |  *Hanoi, December , 2023* |

**PROGRAMME OBJECTIVES**

**Major: Mechanical Engineering**

**Major code: 7520103**

**Education level: Full-time undergraduate (Degree: Engineer)**

**1. General objectives**

a) To train human resources, enhance the people's literacy and foster talents; Perform scientific and technological researches in pursuit for new knowledge and products, serving the requirements of socio-economic development, ensuring national defence and security and international integration.

b) To develop in learners political and ethical qualities, solid background knowledge and expertise, professional practice skills, research capacity, the creativity to solve problems related to automotive design, assembly and engineering operation, the ability to apply science and technology at university level and professional responsibility, the adaptability to working environments, the self-learning ability to keep up with the ceaseless development of science and technology.

**2. Specific objectives**

Those graduates in this Mechanical Engineering program can develop a thriving career in businesses, agencies, organizations, educational and research institutions, and consulting firms. They can also pursue education at a higher level. Graduates are expected to:

1st objective: Apply their engineering knowledge, critical thinking and problem solving skills in professional activities with a creativity, confidence and responsibility.

2nd objective: Be able to work well and get promoted in professional, competitive working environment nation-wide and abroad.

3rd objective: Further develop their competency through training programs at higher levels, qualification fostering programs and self-study.

4th objective: Be knowledgeable in economics and politics: Learners are expected to have basic knowledge in the fields of social sciences and humanities relevant to their major; to have a good health meeting the requirements of national construction and protection.

# BRIEF OUTLINE OF ALL COURSES MECHANICAL ENGINEERING

**COURSES IN THE FIRST SEMESTER**

## GQP201.3: National defence and security education 1

**National defense and security policy of the Communist Party of Vietnam:** Studying the basic theoretical views of the Party on the military line, including: Basic issues of Marxist-Leninist doctrine, Ho Chi Minh's thought on war, army and

organization country; The Party's viewpoint on building all-people national defense,

people's war for national defense, building the people's armed forces and people's security; Combining socio-economic development with strengthening defense and security and some basic contents about the history of Vietnam's military art over the periods

The construction of the militia and self-defense force, the reserve force for mobilization and mobilization of the defense industry; Building and protecting national border territorial sovereignty; Protect national security, maintain social order and safety; Building a movement of all people to protect national security.

## GQP202.2: National defence and security education F2

**Defense and security work:**

To study the basic contents of current national defense and security work, including: Strategic prevention of "peaceful evolution", riots and subversion of hostile forces opposing the Vietnamese revolution; Some basic contents on ethnicity and religion and the struggle against the enemy from taking advantage of ethnic and religious issues to oppose the Vietnamese revolution; Preventing and combating violations of the law on environmental protection; Preventing and combating violations of the law on ensuring traffic order and safety; Preventing and combating certain types of crimes infringing upon the honor and dignity of others; Information security and prevention of law violations in cyberspace; Non-traditional security and non-traditional security threats in Vietnam.

## GQP203.3: National defence and security education F3

**General military:**

Equip learners with basic knowledge about: Mode of living, studying, working during the day, during the week; The regular regimes, arrangement of internal affairs in the barracks; General understanding of the troops and services in the Vietnam People's Army; Regulate each person to have a gun; Command the team of units; General understanding of military topographic maps; Avoid enemy fire attack with high-tech weapons and military triathlon.

## CPM03.2: Basic Informatics

Equip students with basic computer knowledge, key operations using Windows operating system and basic skills in C programming to solve some common problems.

## DSO01.2: Linear Algebra

Linear algebra is the most widely-used mathematical tool in engineering, applied science and statistics. It is also an indispensable tool for research mathematicians. This course provides an introduction to the concepts and theories that form the foundation of Linear Algebra: Matrix algebra and determinants, Solve systems of linear equations; Ax = b; Finite-dimensional linear spaces; Linear operators, eigenvalues and eigenvectors.

## GIT01.3: Calculus 1

The course aims at providing students with basic knowledge in the following subjects: Real numbers and sequences, real-valued functions. Limit and continuity, derivative and differential. Mean values theorems. L’Hospital’s rule, Taylor’s formula. Infinite integral and definite integral, improper integrals. Geometric applications of definite integrals. Series of real numbers and series of functions, Power series, Fourier series.

## GDT01.1: Physical Education F1

Physical education in university

* + The effect of physical education on body development
	+ Some methodological principles in PE
	+ Self-monitoring and medical examination during PE
	+ Methods of teaching, learning movements and fostering to improve physical quality
	+ Hygiene and exercise.

# COURSES IN THE SECOND SEMESTER

## MLN01.2: Marxist - Leninist philosophy F1

Contents promulgated in Decision No.52/2008/QD-BGD&DT, dated September 18, 2008 of the Minister of Education and Training on promulgating the program of political theory subjects at University and College level used for Marxist-Leninist amateurs, Ho Chi Minh thought.

## GIT02.3: Calculus 2

The course aims at providing students with basic knowledge in the following subjects: limits and continuity of functions of several variables, partial derivatives, total differential, chain rule and derivative of implicit functions, higher order partial derivatives, Taylor’s theorem, extrema. Triple and double integrals and applications. Line and surface integrals. Differential equations of the first order and second order.

## CLT201.3: Theoretical mechanics

The Engineering mechanics study the general rules of motion and balance of the objects under the relevant interactions between them.

Part 1 - Statics: Equilibrium study of the solid under the effect of force.

Part 2 - Kinetics: The study of the geometric properties of the object motion, which is not considered to cause of motion.

Part 3 - Dynamics: Study the rule of motion of bodies under the action of the force.

Three quarters of subjects in close contact with each other, prior knowledge of the basis for the acquisition of the following knowledge.

## HOA04.2: Chemistry

The basic principles of thermodynamics (application of principles I and II in chemistry; chemical balance, phase balance; reaction rate, factors affecting reaction rate…); properties of the solutions (acids, bases, salts); determine pH of the medium; electrochemical properties, electromotive force of batteries, electrolysis and its applications in electroplate and paint; chemical current sources (batteries, accumulators...); corrosion and methods of protecting materials, equipment in mechanical industry.

## VLY201.4: Physics

With this subject students are equipped with basic and common knowledge about the natural world via various types of motion from simple to complex ones in mechanics, thermodynamics, electromagnetism and optics.

## VKT301.3: Engineering Drawing F1

The basic concepts of descriptive geometry which are used in engineering drawing subject: the theory of projections; the projection of a point, a straight line, a plane, a curve and solid primitives, determine the projections of a point located on the surface of a solid primitive. The standards for engineering drawing. The performance of objects: Orthographic drawings, axonometric and oblique drawings. Create a drawing in AutoCAD.

## GDT02.1: Physical Education F2

* Technical theory of running short distances.
* Posture - basic gymnastics techniques.
* Techniques to practice running short distances.
* Check standards of student's mental health - students by age.

# COURSES IN THE THIRD SEMESTER

## MLN02.3: Marxist - Leninist philosophy F2

Contents promulgated in Decision No.52/2008/QD-BGD&DTDT, dated September 18, 2008 of the Minister of Education and Training on promulgating the program of political theory subjects at University and College level, used for Marxist-Leninist amateurs, Ho Chi Minh thought.

##  The Marxist-Leninist Political Economy module is designed with 6 chapters, ensuring the basic, systematic, scientific, updating new knowledge, associated with practice, creativity, skills, thinking, and quality. learner quality. The module equips students with basic knowledge of Marxist-Leninist political economy about capitalist production methods and political economy issues of the transition to socialism in Vietnam

## KTN01.3: Heat engineering

Applying the laws of thermodynamics 1 and 2 to investigate the basic thermodynamic processes of ideal and real gases, the theoretical cycle of some dynamic devices: internal combustion engines, compressors, air conditioners.. .

Investigate a number of stable heat exchange processes by means of: conduction, convection, radiation; heat exchanger

## VKT03.3: Engineering Drawing F2

The performance of objects: sectional views and sections, enlarge view. Joints, gears, springs. Detail drawings, assembly drawings, reading assembly drawings and making detailed drawings from an assembly drawing, advanced AutoCAD.

## KTD01.3. Electrical engineering

Accommodating students with knowledge of electrical circuit and electric machines, including: Methods for single, three phase, operation principle, characteristics, applications of transformer, DC, AC motors, generators, motor selection, control schematics.

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## CNG201.3: Mechanical Materials Science

This is a course to study the structure of materials commonly used in the mechanical field. On that basis, the research and analysis of the mechanical, physical, and chemical characteristics of the materials are carried out.

* Learn and apply structure transformative technologies to create new structures with properties and characteristics suitable for use requirements.
* Introduction of materials commonly used in mechanical engineering and methods to change their properties to improve the efficiency of materials.

## KTM01.3: Theory of machines

Accommodating learners with some methods of designing mechanisms and Analyzing kinematic and kinetic characteristics of machines and mechanisms. Through this course, learners would understand the working principles of some common mechanisms as well as have the ability of designing some common mechanisms such as bar mechanism, cam mechanism, gear mechanism

 Project: Analyzing kinematic and kinetic characteristics of a mechanism; Designing cam mechanism, designing gear mechanism.

## GDT03.1: Physical Education F3

* Technical theory of middle distance running and high jump technique
* High jump technique lying on the bar
* Techniques for practicing middle distance running

# COURSES IN THE FORTH SEMESTER

## KTN202.2: Hydraulic and pneumatic transmission

 The course outlines the concepts of hydraulic and pneumatic transmission in industry and transportation, the characteristics of elements in hydraulic and pneumatic transmission systems, and methods of calculating basic transmission circuits.

## TKM04.2: Applying Softwares in Mechanical Engineering

The course equips students with the basic knowledge and skills about the software system i.e. CAD/CAM/CAE technology, methods for designing 2D and 3D models, and simulating and processing the results from simulation software. After finishing the course, learners will be proficient in using popular 2D and 3D drawing software (Autocad, Inventor).

## TTX02.2: Workshop Practice

To equip students with the basic concepts of mechanical engineering. Structure, working principle of the machines: Turning, milling, milling, planning, drilling, boring, electric welding machine, steam welding machine, CNC machine. Set up technological steps, processing modes, operations, and operations of machines to create products (casting, welding, turning, cold, milling, planning, reaming - drilling...). Technological measures to ensure machining accuracy, detail surface quality, and machining productivity. Compare theory and practice. Improve skills.

## HCM01.2: Ho Chi Minh’ s Thought

In addition to the introductory chapter, the course content includes 5 chapters: Chapter 1 presents the basis, process of formation and development of Ho Chi Minh’s thought; Chapter 2 to 5 present the basic content of Ho Chi Minh’ thought according to the objectives of the course.

## SBV212.4: Mechanics of Materials in Mechanical Engineering

Providing learners with fundamental knowledge and skills on mechanics of materials; understanding and know-how-to-analyzing stresses, strains of machinery components and/or structures subjected to loadings; design analyses and requirement on materials, mechanical properties of machinery components and/or structures under in-service conditions; understanding and evaluating methods for design analyses in order to design machinery components and/or structures satisfying technical and economic requirement.

## TKM01.4: Machine Elements

Providing learners with fundamental knowledge about machine elements such as: structures and characteristics; advantages, disadvantages, and applications; force and stress analysis; kinematic analysis; potential failure modes; design criteria; design procedure and guidelines to ensure working functionalities of basic transmissions and joints in mechanics.

## GDT04.1: Physical Education F4

* Technical theory of volleyball
* Volleyball practice techniques

# COURSES IN THE FIFTH SEMESTER

## Elective courses

Choose 1 out of 2 courses below:

1. ***DCO301.3: Theory of internal combustion engine***

Equip students with basic knowledge about the processes occurring in the cylinder of an internal combustion engine, the fuel used in an internal combustion engine, and the working principles of the main systems on an internal combustion engine.

1. ***KTN06.3: Thermodynamics***

## DTU04.2. Electronic engineering

* + The course belongs to the basic knowledge block of the industry
	+ The course provides basic knowledge about electronic components, BJT bipolar transistor, field effect transistor FET, volt-ampere characteristic of each circuit, polarization method for BJT, FET, amplifier circuits used BJT, FET, amplifier cascade circuits, circuits using algorithmic amplification, oscillator circuits. In addition, the course also provides basic knowledge about digital electronic circuits such as representation and minimization of logic functions, analysis and design of some common logic circuits.

## DCS01.3: History of the Communist Party of Vietnam

Contents promulgated in Decision No. 52/2008/QD-BGD&DT, dated September 18, 2008 of the Minister of Education and Training.

The module belongs to the basic knowledge block, providing students with a system of knowledge about the birth and leadership of the Communist Party of Vietnam for the Vietnamese revolution from 1930 to present. Equip students with scientific methods of thinking about history and the ability to apply them to practical work, analyze and evaluate current socio-political issues.

Students have the ability to organize group work and communicate, make good presentations, and apply them to practice.

1. ***TKM202.1: Project of Machine Elenment***

The course equips students with skills to calculate and design mechanical transmission systems, mechanical transmissions, bearings, and keys. Learners are able to calculate and select standard parts as well as tolerance. The course allows students to apply the theory of calculating machine details and assembly tolerances to solve practical problems by calculating and designing a specific gear reducer..

## Elective courses

Choose 1 out of 4 courses below:

1. ***DKH06.2: Automatic control***

The course provides general knowledge about automatic control, electromechanical conversion processes and mechanical control as required.

1. ***KTM03.2: Engineering Vibration***

Providing students with fundamentals on mechanical vibration (free vibration, forced vibration of SDOF and MDOF, methods for depressing vibration,…). Upon this students are able to calculate the vibration of machines and vehicles, for example cars, trucks, wagons. All calculations are completed by programming on micro computers.

1. ***TKM201.2: Strategy for developing products***

+ Understand product development strategies and product life cycles.

+ Industrial design for products. Design, manufacture, and test sample products.

1. ***KTN217.2: Theory of automatic regulation of thermal processes***

## Elective courses

Choose 1 out of 4 courses below:

1. ***DSO06.2: Statistics and data analysis***

This course provides an introduction to probability theory and statistics. Topics covered are: descriptive statistics, basic probability, confidence intervals for parameter estimates, significance tests, z-test, t-test (one and two sample), chi-squared test, simple linear regression between two variables, least squares fit of data to a model.

1. ***KTM02.2: CAE/FEM technology***

Equip with knowledge about the finite element method (FEM), distinguish and use some basic finite elements, and build FE models of simple structures.

Understand and evaluate simulation results as well as be aware of the benefits and limitations of FEM.

1. ***KTN302.2: Theory of fire***
2. ***MHT26.2: Computer operating system***

## TKM03.2: Mechanical Tolerances and Measurements

Accommodating students in Mechanical Engineering with knowledge of tolerances in the design and fabrication of machine and machine elements. Ability to understand and apply the provided knowledge in order to calculate suitable tolerances in manufacturing and assembly. Determining the tolerances in ordinary joints. Understand the measurement methods of dimensional tolerance, tolerances of surface forms and positions, surface roughness.

## Elective course: Foreign Language B1

Attain foreign language proficiency according to B1 level in 6 European levels

# COURSES IN THE SIXTH SEMESTER

## KMT32.2: Enviromental engineering

The subject equips students with basic knowledge about the environment, the relationship between the environment and development; Environmental pollution; current global environmental problems. In addition, the course also equips students with a number of techniques to control environmental pollution in the field of traffic mechanics.

## TTK02.2: Mechanical engineering experiment (\*)

The module "Mechanical Engineering Experiment" aims to equip students with basic knowledge of the structure, operating principles and operating skills of using machinery and equipment for the Mechanic industry: Applications mechanical measuring instruments, non-destructive quality control equipment and CNC machining machines.

## Elective courses

Choose 1 out of 5 courses below:

1. ***KTM204.2: Robot and robot arm in manufacturing***

This course provides students with basic knowledge about robots and manipulators in production. This knowledge is the foundation for the application of robots and manipulators in modern production, thereby helping students better understand the application of CAD/CAM technology in the production process***.***

1. ***CNG219.2: New material technology***

The course provides basic knowledge about development trends and applications of new materials such as nanomaterials, composite materials, and smart materials (shape memory effect). It equips students with knowledge about new materials technology to select suitable materials used in mechanical parts to ensure the best..

1. ***KTD.2: Electrical equipment***
2. ***DCO207.2: Structure and calculation of internal combustion engines***

- The course provides knowledge about the kinematics and dynamics of the connecting rod shaft crankshaft mechanism, balance, structure of internal combustion engine parts and systems, and knowledge related to design calculations, and testing of engine parts.

- After finishing the course, students are able to analyze and solve problems of engine kinematics and dynamics, calculate and design parts of internal combustion engine systems, and apply them to repair engine and maintenance.

1. ***DTX265.2: Fundamental of power conversion on railway vehicles***

Provides students with basic knowledge about transmission and conversion of electrical power in general and on railway vehicles: basic knowledge about semiconductor elements, diodes, transistors, and transistors. Application techniques of power electronic elements: rectifier techniques, DC-DC power conversion techniques, and inverter techniques; PWM pulse width adjusting technique, and some power conversion applications on railway vehicles.

## Elective courses: Mechanical Foreign Language

Choose 1 out of 3 courses below:

1. ***CK.3: Mechanical English***
2. ***CK.3: Mechanical French***
3. ***CK.3: Mechanical Russian***

## CNG02.4: Mechanical manufacturing technology

The course equips with basic knowledge about methods of making workpieces, machining on cutting machines, technological processes for manufacturing parts, and jigs for manufacturing. After the course, students are able to build a technology process to manufacture parts.

## Elective courses

Choose 1 out of 4 courses below:

1. ***KTN301.2: Recycled energy***
2. ***KTM05.2: Mechatronic Systems***

Equip an overview of typical mechatronic systems. Analyze the components that build up a mechatronic system such as sensors, actuators, and controllers. analyze and model the components of the system and their typical properties, so that analyze the dynamic relationships of the entire system. The content focuses on mechanical systems, control of mechanical systems, information exchange signals between components, signal acquisition (measuring mechanical quantities using sensors) as well and Signal Processing.

1. ***KTM06.2: Automation in mechanical production processes***

The course "Automation in Mechanical Manufacturing Process’’ aims to equip students with basic knowledge of automatic control systems in general and tasks in engineering production in particular. Through the course students understand the basic equipment in assembly of mechanical products being applied in production. The basic equipment in assembly such as the feed structure, technology equipment and automated test systems is linked together via a control system.

1. ***DCO203.2: Fundamental of maintaining and repairing machines and vehicles.***

Equipped with basic knowledge of diagnosis, maintenance, and repair of machines and vehicles. Ability to conceive, design, implement, and operate machinery and vehicles in accordance with business, social, and environmental contexts.

## Elective courses

Choose 1 out of 5 courses below:

1. ***DTX262.2: Reliability and machine durability***

Equip students with the fundamental knowledge of the theory of reliability and durability of machine; methods of evaluating reliability and durability of sudden failure elements and abrasion damage elements; methods of evaluating reliability and durability of the system composed of series connection elements, parallel connection elements (redundant system) which restore and do not restore.

1. ***KTM208.2: Electronic circuit engineering***
2. ***KTN09.2: Heat exchange equipment***
3. ***CNG214.2: Mechanical factory design.***

- Equip with basic knowledge about workshop characteristics in factory manufacturing mechanical products and methods of calculation and design of mechanical manufacturing factories.

- Equip with effective teamwork skills to be able to analyze, discuss, and together come up with design diagrams, floor layout diagrams, machine layout diagrams... of workshops in the factory or the entire factory.

1. ***TKM203.2: Advanced machining process.***

The module equips students with basic knowledge about advanced machining methods such as: waterjet machining, abrasive stream machining, ultrasonic machining... Advantages and disadvantages, the scope of use of each method. It will help students understand new technologies for the machining process

# COURSES IN THE SEVENTH SEMESTER

## Elective courses

Choose 1 out of 5 courses below:

1. ***QLY06.2: Management Science***

The basic content of management science is to provide the foundational knowledge in management in general.

1. ***DAN01.2: Project and project management***
2. ***DCO202.2: Exhaust gas and exhaust gas treatment***

The subject belongs to the basic knowledge of the branches

- The subject provides knowledge about the harmful effects of exhaust gases,

studying the mechanism of exhaust gas formation. Besides, the subject also analyzesand evaluates the effectiveness of exhaust gas treatment methods.

- Students have the ability to organize teamwork, communicate, and present

1. ***DTX266.2: Fundamentals of railway.***

The course provides basic knowledge about:

- Concepts about railway transport operations, technical equipment of the railway transport industry: fixed equipment, vehicles Railway traffic, train organization.

- Contents about uses, railway foundation structure, railway upper deck architecture, railway tracks, railway lower deck architecture; Bridges, culverts, railway tunnels; Train station; Types of signals, interlocking equipment, road closing equipment, railway information; Types of locomotives and rolling stock (Diesel locomotives, electric locomotives), locomotive traction, train brakes; Organization of train operations.

1. ***CPM18.2: C++ programming.***

# COURSES IN THE SEVENTH SEMESTER

# SPECIALIZATION 1- MANUFACTURING ENGINEER

## CNG207.3: Stamping technology

Equip knowledge about stamping and forming technologies such as sheet stamping, and volume stamping... to evaluate, analyze, and select appropriate stamping and forming technologies for a specific part. Equip skills to analyze, select, calculate, predict, and solve problems when designing technology processes to stamp a specific part.

## CNG208.2 : Equipment for machining stamping

The course equips basic and in-depth knowledge of various types of stamping and shaping equipment such as hammers, hydraulic presses, and mechanical presses... After finishing the course, students can evaluate, analyze, and select suitable stamping equipment for specific products, thereby supporting the use and operation of the machine and designing the stamping mold.

## CNG03.2: Metal casting technology

The course provides basic knowledge about casting technology (concepts, principles of detailed and mold design, casting methods...) and applications of casting technology in mechanical engineering. Equip students with knowledge about casting design to evaluate, analyze, and select appropriate casting methods for each specific part.

## CNG05.3: Welding Technology

The course equips basic theoretical knowledge about metal welding technologies, welding equipment, welding materials, and welding quality inspection methods. After finishing the course, students can apply the knowledge to analyze and select welding materials, welding technology, and welding equipment, and calculate welding modes to serve the welding process for parts and welding structures in accordance with specific conditions.

## CNG211.3 : CNC machining technology

The course equips basic knowledge about CNC machining features, cutting tools and sub-tools on CNC machines, knowledge to operate CNC machines and programs on CNC machines. After finishing the course, students can evaluate and choose machining options on CNC milling machines and CNC lathes. Equip effective teamwork skills when programming and machining on CNC machines.

## CNG06.1 : Metal welding Technology Asignment

The course provides knowledge to help learners understand, distinguish, and apply weld symbols. Besides, learners understand weld inspection methods to analyze and select suitable materials for welded structures or specific welds. Students have knowledge of calculations, design and establishment of welding technology processes, and design of welding fixtures for specific welding structures. Equip skills to form ideas, design and implement the design of welding technology processes and welding jigs.

## CNG204.3: Cutting tool and cutting machine

The course equips basic knowledge about the characteristics and technological capabilities of cutting machines and tools, knowledge to calculate and design shaped tools, and knowledge to design dynamic diagrams for cutting machines. Equip skills to investigate, survey, and discover knowledge related to the field of cutting machines and tools. Equip skills for forming and designing cutting machines and tools.

# COURSES IN THE EIGHTH SEMESTER

## CNG13.1: Project of technology for manufacturing parts

The course equips learners with knowledge about calculating and establishing technological processes for manufacturing machine parts and designing jigs for machining parts. Equip with reasoning, analysis, and problem-solving skills related to technology for manufacturing machine parts and jigs. Equip with effective communication skills in the field of technology for manufacturing machine parts and fixtures. Equip skills to form ideas, design and implement technological processes and jigs.

## CNG12.4: Technology for manufacturing parts

The course provides basic knowledge about the technological process of manufacturing various types of parts and methods for performing operations in the technological process of manufacturing machine parts.

## CNG215.3: Mechanical assembly technology

The course belongs to the specialized knowledge block. The course equips basic knowledge about the assembly technology of mechanical products, methods of establishing assembly technology processes and using supported tools in the process. Equip students with effective teamwork skills when coordinating to establish and carry out the assembly process.

## CNG209.2: Mold design

The course equips learners with basic knowledge about the structure of sheet stamp molds, plastic molds, mold design methods, and mold manufacturing. After finishing the course, students can design, evaluate, and select appropriate mold structures. Students have the skills to form ideas, design, and implement mold design plans.

## CNG210.3: Processing technology and surface protection

The course provides basic knowledge about surface science, the structural state of surfaces, and the interaction of surfaces while working. Equip students with knowledge about surface treatment and protection technologies to choose surface treatment methods to improve the workability and longevity of parts. Equip skills for testing, investigating, surveying, and discovering knowledge related to the field of surface treatment and effective teamwork.

## Elective courses

Choose 1 out of 2 courses below:

1. ***CNG301.2: Welding stress and welding deformation***

The course equips learners with basic knowledge about stress and deformation when welding. After finishing the course, students are able to calculate stress and deformation for a basic structure, and analyze and select suitable methods that reduce stress and deformation generated by a welding process.

1. ***CNG302.2: Non-traditional machining methods***

The course provides basic knowledge about non-traditional machining methods such as chemical and electrochemical machining methods, thermal machining methods, electrochemical machining methods, combined machining method.

## CNG16.2: Specialized internship

The course equips learners with knowledge in the field of mechanical engineering. Students are required to have a sense of civic responsibility, have the right attitude and professional ethics, and have a sense of discipline and industrial behavior. Equip skills to implement and operate in the field of mechanical engineering.

# COURSES IN THE TENTH SEMESTER

**(Engineer Program)**

## CNG17.4: Engineer graduation internship (engineering level)

The course equips learners with knowledge in the field of mechanical engineering. Students are required to have a sense of civic responsibility, have the right attitude and professional ethics, and have a sense of discipline and industrial behavior. Equip skills to effectively organize and work in groups to accomplish common goals, and skills to form ideas, design and implement in the field of mechanical engineering.

## CNG18.10: Engineer graduation project

The course equips learners with specialized knowledge of mechanical engineering. Equip with reasoning, analysis, and problem-solving skills related to mechanical engineering. Equip effective communication skills, ability to form ideas, design, and implement them in the field of mechanical engineering.

# COURSES IN THE SEVENTH SEMESTER

# SPECIALIZATION 2- AUTOMATION IN MECHANICAL DESIGN

## Elective courses

Choose 1 out of 2 courses below:

1. ***MHT25.2: Computer structure and computer network***
2. ***TKM09.2: CIM & FMS***

The course provides basic knowledge about flexible manufacturing systems FMS and integrated manufacturing systems CIM; Application of automation in the mechanical production process.

After finishing the course, students can analyze and evaluate the characteristics, structure, and working principles of automatic production lines***.***

## TKM08.2: CAD/ CAM Technology F1

This course equips students with the basic knowledge of CAD/CAM technology, the ability for applying Mastercam software to design and program NC code for manufacturing a special part.

## TKM07.2: Geometric Modeling in CAD/CAM

This course provides students with the most necessary knowledge and skills about geometric modeling and methodology of building mathematical model of parts moded in a computer environment. These knowledge and skills are the basic to CAD/CAM technology and learning other courses.

## TKM15.2: Applying Softwares for analyzing structure and simulating the dynamics of machine

This course provides students with the necessary knowledge and skills about building models, simulating mechanics, and analyzing results by simulation software. It also provides students with skills to analyze structures modeled using CAD/CAE software based on the finite element method.

## Elective courses

Choose 1 out of 2 courses below:

1. ***TKM204.2: Robot and robot arm in manufacturing***

This course provides students with basic knowledge about robots and manipulators in production. This knowledge is the foundation for the application of robots and manipulators in modern production, thereby helping students better understand the application of CAD/CAM technology in the production process***.***

1. ***TKM205.2: Planning production – CAPP***

This course provides students with the knowledge of planning manufacturing in mechanical manufacturing with the support of a computer. Equip knowledge of typical methods applied for planning manufacturing..

## TKM10.3: CNC machines & CNC machining technology

The course equips basic knowledge about CNC machining features, cutting tools and sub-tools on CNC machines, knowledge to operate CNC machines and programs on CNC machines. After finishing the course, students can evaluate and choose machining options on CNC milling machines and CNC lathes. Equip effective teamwork skills when programming and machining on CNC machines.

## TKM302.2: Reverse engineering

The course provides students with basic knowledge about reverse engineering technology, tools, software, and skills used in reverse engineering software to rebuild CAD models from physical models. After finishing the course, students are able to form ideas for applying reverse engineering technology in the production process and are able to operate and use software, machines, and equipment in this technology.

## TKM16.1: Project of Applying Softwares for analyzing structure and simulating the dynamics of machine

This course provides students with the skills for calculating and analyzing mechanical structures using FEM software as well as analyzing the dynamics of the machines for a specific case in mechanical engineering.

# COURSES IN THE EIGHTH SEMESTER

## TKM206.3: Mechanical Design Optimization

This course helps students apply educated knowledge in the optimization of mechanical design, applying CAD/CAM technology to the processes of mechanical design. In addition, this course also helps students update on methods and new technologies in mechanical design.

## TKM207.3: Machine and mold for plastic part

This course provides students with basic knowledge about mold and machines for plastic parts. Students also understand mold structure, the design process, and mold analysis. During the course, students can also use CAD/CAM/CAE to design, analyze, and machine molds.

## Elective courses

Choose 1 out of 2 courses below:

1. ***TKM209.2: Visual LISP, ActiveX Programming in Mechanical Design***

This course provides students with the most necessary knowledge and skills to program using the Visual LISP to support the mechanical design.

1. ***TKM210.2: Object Oriented Programming with Visual C++, ARX Objects***

This course provides students with the most necessary knowledge and skills to program using C++ programming to create ARX Objects.

## TKM18.1: Project of CAD/CAM technology

This course requires students to apply CAD/CAM software (CATIA) for designing, analyzing, and machining parts. After finishing this course, students are able to design and establish a complete process for machining specific parts.

## TKM208.1: Project of Machine and mold for plastic part

This course requires students to apply CAD/CAM/CAE software for designing, analyzing, and machining the molds. After finishing this course, students are able to design a complete mold for a plastic part.

## TKM20.2: Specialized internship

The course equips students with the knowledge in practice as follows:

- The manufacturing process with the application of CAD/CAM.

- The principle structure of the CNC machine, machining processes as well and CAM software.

- Program NC code for CNC machines for manufacturing products.

- Understanding the methods for testing the product quality.

- Understanding the organization of the workshops and the roles of design and manufacturing divisions.

## TKM17.3: CAD/ CAM Technology F2

This course equips students with the knowledge about the new technologies such as reverse engineering, rapid prototyping for generating products. This course also equips students with the skills for design, machining programming using Catia software.

## TKM303.2: Automatic system structure

Equip knowledge about the mechanical automation system structure and application of these systems in mechanical production. Beside, equip knowledge to analyze the components and operating principles of automatic production systems in mechanical engineering.

# COURSES IN THE TENTH SEMESTER

**(Engineer Program)**

## TKM21.4: Graduation internship

The course equips learners with knowledge in the field of mechanical engineering, especially knowledge in specialization of Automation In Mechanical Design. Students are required to have a sense of civic responsibility, have the right attitude and professional ethics, and have a sense of discipline and industrial behavior. Equip skills to effectively organize and work in groups to accomplish common goals, and skills to form ideas, design and implement in the field of mechanical engineering.

## TKM25.10: Graduation project

The course equips learners with specialized knowledge of mechanical engineering, especially knowledge in specialization of Automation In Mechanical Design. Equip with reasoning, analysis, and problem-solving skills related to mechanical engineering. Equip effective communication skills, ability to form ideas, design, and implement them in the field of mechanical engineering.