Mechanical Engineering

※ MEE4046(Micro-Study) is not included in major credits and included in graduation credits.
※ MEE2030(Technological Innovation and Industrialization Strategy) is not included in major credits.

Mechanical Engineering Advanced Major Course (Major credits 72 credits or more)

Major pre-requisite(total 29 credits or more) : select one from PHY1001, 1002, 1101, 1102, CHM1001, MEE2006, MEE2007,
MEE3005, MEE3006, STS2007 or STS2008,
take more than 3 credits or more from CHM1002, 1051, 1052, BIO1101, or MAT3020
(Major pre-requisite is not included in major completion credits)

Major required course(total 30 credits in 10 courses) : MEE2008, 2011, 2012, 2013, 2022, 2025, 3004, 3015,3025, 4021

Selective Course : 42 credits or more in major course other than required course
※ Recommend to complete the course of MEE2014, 2026, 3003, 3011, 3013, 3026, and 3032
※ MEE2030 is not included in major credits.

Multiple-Major Course in Mechanic Engineering (Major credits 45 credits or more)

Pre-requisite(total 16 credits in 6 courses) : select one from PHY1001, 1002, 1101, BIO1101 or CHM1001,
MEE2006, MEE2007(in case the first major is other major, MAT2410 and MAT2420 needs to be recognized as alternative course.
(Pre-requisite course needs to be completed and is not included in major completion credits.

Required Course : MEE2011, 2012, 2013, 2022, 2025, 3004, 3025 (total 21 credits in 7 courses)

Selective course : 24 credits or more among major course other than required course.

※General major course in mechanical engineering(unauthorized course based on engineering certificate was abolished from the students in the class of 2012

※ In case that the students majoring in other major from the class of 2006 take mechanical engineering with multiple majors, they need to take differential and integral calculus I, differential and integral calculus II additionally.

<Course Roadmap for Required Courses of Mechanical Engineering>

sem. / year	1st Semester		2nd Semester	
1	COR1001	2 cr.	COR1003	3 cr.
	STS2005	3 cr.	CHS2001	6 cr.
	PHY1001	3 cr.	CHS2002	
	PHY1101	1 cr.	CHS2003	
			CHS2004	
	CHM1001	3 cr.	CHS2006	
			SHS2001	
	HSS3014 [1]	1 cr.	SHS2002	
			SHS2003	
	BIO1101	3 cr.	SHS2004	
	CHM1002		SHS2005	
	CHM1051		SHS2006	
	CHM1052		SHS2007	
	MAT3020 select one course [2]		STS2001	
			STS2002	
			STS2010	
			STU4011 select two courses[3]	3 cr.
			STS2006	3 cr.
			PHY1002	1 cr.
			PHY1102	3 cr.
			STS2007	
			STS2008 select one course[4]	3 cr.
			MEE2008	
		16 cr.		min. 19 cr.

2	ETS2001 ETS2002 ETS2003 ETS2004 select one course	3 cr.	HFS2001 HFS2002 HFS2003 select one course	3 cr.
	MEE2006 MEE2011 MEE2022 MEE2025 [5]	3 cr. 3 cr. 3 cr. 3 cr.	MEE2007 MEE2012 MEE2013	3 cr. 3 cr. 3 cr.
		15 cr.		12 cr.
3	MEE3004 MEE3006	3 cr. 3 cr.	MEE3005 MEE3015 MEE3025	3 cr. 3 cr. 3 cr.
		6 cr.		9 cr.
4			MEE4021 [6]	3 cr.
				3 cr.

Notes : 1) All freshmen are required to take HSS3014 (Freshmen Seminar) at the first semester of the first year.

2) Students may take CHM1002, CHM1052 during their 2nd, and 4th semester.

3) Students may take CHS2001~4, CHS2006, SHS2001~7, STS2001~2, STS2010, STU4011 during their 3rd or 4th semester.

4) Students may take STS2007 or 2008 during the 1st semester.

5) Students may take MEE2025 during the 4th semester.

6) Students may take MEE4021 during the 7th semester.

MEE2001 Statics 3 cr.
(lect.: 3hr, theory 3)
Students learn about addition and subtraction of forces, centroid, distributed load, moment of inertia, friction, and force equilibrium. Also includes principles of static and analysis of simple structures, as well as concepts of internal force, pressure, and stress.

MEE2005 Introduction to Mechanical Engineering 3 cr.
(lect.: 3hr, theory 3)
Students learn basic principles in mechanics such as units, dimensions, and equilibrium conditions. In addition, students choose a topic to study from among those the faculty member offers.

MEE2006 Engineering Analysis I 3 cr.
(lect.: 3hr, theory 3)
An introduction to ordinary differential equations and their solutions, the Laplace transform, the Fourier transform, as well as partial differentiation equations and their solutions.

MEE2007 Engineering Analysis II 3 cr.
(lect.: 3hr, theory 3)
Vectors and matrices, coordinate transformation, vector differentiation and line and surface integrals, complex analysis and applications are introduced.

MEE2008 Introduction to Engineering Design 3 cr.
(lect.: 3hr, theory 1, design 2)

The basic process for engineering design (Engineering Design Process) is introduced in order to understand and evaluate the development of concepts of the design process. Also, the surrounding design factors such as market analysis, cost analysis, project planning, and management are considered.

MEE2011 Solid Mechanics 3 cr.
(lect.: 3hr, theory 3)
Basic theories of stresses and strains, including torsion, deflection of beams and shafts, and the strength of materials.

MEE2012 Fluid Mechanics 3 cr.
(lect.: 3hr, theory 3)
A study of equations of fluid motion and energy, dimensional analysis and similitude, analysis of laminar and turbulent flows, concepts of boundary layers, and internal and external flows.

MEE2013 Dynamics 3 cr.
(lect.: 3hr, theory 3)
Dynamic analysis of engineering models such as mass, the mass-spring-damper system, and rigid and nonrigid bodies. Includes relative motion, work and energy, as well as impact and momentum.

MEE2014 Materials for Mechanical Design 3 cr.
(lect.: 3hr, theory 2, design 1)
Crystal systems, phase equilibrium, solidification, imperfections in metals, and other structural materials.

MEE2021 Mechanism Analyses and Design 3 cr.
(lect.: 3hr, theory 2, design 1)
An analyses of kinematic mechanisms of machine elements such as linkages, cams, and gears, as well as the design methods of such machine elements.

MEE2022 Thermodynamics I 3 cr.
(lect.: 3hr, theory 3)
A study of the basic concepts of heat, work, energy, entropy, and the application of the first and second laws of thermodynamics. Includes an analysis of the energy conversion system and its application to mixed systems.

MEE2025 Model Design Production (lecture/practice 6 hours : experiment, practice 1, design 2) 3 Credits
This course has a goal of improving the basic senses and creativity in developing the products by design, plan and produce the simple products. This course gives the motivation to learn the advanced design method and evaluation analysis method through designing the products and producing the models based on the development and evaluation of design concept learned in the theory of engineering design. Students will evaluate the plan and design of the products targeting the development and present the products produced in the given rules at the end of the semester.

MEE2026 2D CAD 3 cr.
(lect.: 3hr, theory 3)
A study of the fundamentals of graphics hardware, software, standards, and geometric transformations, including visual realism, curves, surface designs, and solid modeling theories.

MEE2028 Product Design Basics (lecture 3 hours : theory 2, design 1) 3 Credits
Pre-requisite subject : MEE2025
This course is to understand the process to separate and integrate the functional element and morphological element of the products as the introductory course of product development. The concept, element, design process of the product design will be covered as the morphological element. In addition, this course helps students learn through the design of the product with simple function in the course and improve the senses to integrate functions and forms to encourage students in the higher grades to

understand the systematic combination of functions and type and improve the motivation.

MEE2030 Technological Innovation and Industrialization Strategy (lecture 3 hours : theory 3) 3 Credits

On the other side of the successful venture companies such as Apple and Google in Silicon Valley, there are CEOs like Steve Jobs and Larry Page who are equipped with engineering major and management thought for the successful companies. They are equipped with practical business management ability based on the excellent entrepreneurship and engineering practical capacity, which is possible because of the social support and education toward startup. To do so, this course intends to cover various themes such as entrepreneurship, strategic decision making, technological spread, dominant design, Disruptive innovation, and IPR to improve the entrepreneurship and practical technological business capacity. In addition, it intends to improve the vision to look at various themes comprehensively and improve the problem solving capacity to overcome effectively the problems inside and outside the organization of the companies comprehensively through enhancing the systematic thought method needed to students majoring in engineering. This enables the business in technology practically by improving the ability to look at the technology from the pont of view of customers and expanding the understanding the organization of the companies. (not included in the major credits).

MEE3001 Product Design Analysis I: Reliability 3 cr.

(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2011)

An introduction to the mechanical behavior of engineering materials and their uses in structural and design-related applications. Problems involving elasticity, rubber elasticity, creep, plasticity, viscoelasticity, and monotonic and cyclic fracture are discussed.

MEE3002 Thermodynamics II 3 cr.

(lect.: 3hr, theory 3)
(Prereq.: MEE2022)

Based on the concepts learned from Thermodynamics I, this course explores advanced thermodynamics and its applications, including the concept of available energy and an analysis of various thermal cycles.

MEE3003 Vibration 3 cr.

(lect.: 3hr, theory 3)
(Prereq.: MEE2013)

An analysis of free and forced vibration in a linear system, as well as the cause and minimization of vibration of mechanical parts and structures.

MEE3004 Manufacturing Processes 3 cr.

(lect.: 3hr, theory 3)
(Prereq.: MEE2011)

A study of the basic theories and technology in manufacturing mechanical components, including the fundamentals of the manufacturing processes (casting, metal forming, metal cutting, welding and joining), and the selection of processes and materials (metals, plastics, and ceramics) relative to design.

MEE3005 Numerical Analysis 3 cr.

(lect.: 3hr, theory 3)

A numerical analysis of a matrix equation's solution, interpolation, numerical integration, differentiation, and solution of ordinary differential equations, including its applications to mechanical engineering problems.

MEE3006 Mechanical Engineering Analysis 3 cr.

(lect.: 3hr, theory 3)

The primary focus of this class will be on mathematical concepts of linear algebra and their application for mechanical engineers, with an emphasis on the

fundamental study of vibration, control, and modeling.

MEE3011 Mechanical Component Design 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2011)
A study of mechanical design concepts of safety and optimization in consideration of elongation, compression, twist, deformation, yield, fracture, and fatigue. Includes mechanical design of machine components and power transmission.

MEE2012 Thermo Machinery 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2022)
A survey of the principles and stuructures of thermo machinery such as internal and external combustion engines, including a thermal analysis of the combustion chamber, inlet and exhaust system, fuel injector, nozzle, and turbine.

MEE3013 Automatic Control 3 cr.
(lect.: 3hr, theory 3)
(Prereq.: MEE2013)
Modeling of mechanical systems, their input and output relationship, linear controllers, and the properties and applications of several controllers.

MEE3015 Design Methology
(lect.: 3hr, theory 1, design 2)
(Prereq.: MEE2008)
Students work to improve an engineering product or develop a new product based on engineering disciplines, mainly mechanical engineering, electronics, computer engineering, chemical engineering, and so on. Through this course, students build their ability to conduct engineering projects.

MEE3022 Fluid Mechanics II (lecture.: 3hr, theory 3)
(Prereq.: MEE2012)
This course covers external fluid, compressive flow, and fluid machinery based on thermodynamics and fluid mechanics. By emphasizing the application of fluid dynamics, this course covers automobile aerodynamics and airplane aerodynamics and helps students learn the structure and basic principle of fluid machines such as pump, fan, compressor, and gas turbine. In addition, this course introduces new research areas including fluid dynamics applied to sports and environment and fluid engineering of Bio/MEMS/Nano /MR.

MEE3024 Process Analysis and Design 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE3004)
A study of the fundamentals of the manufacturing process (deformation theory, the slab method, and the finite element method), establishing the process models considering the tooling and the material behaviors, and the application of the numerical method to the selected manufacturing process models.

MEE3025 Mechanical Engineering Laboratory I 3 cr.
(lab.: 6hr, lab 3)
Experiments in material properties, structural stress, dynamics of machine components with the knowledge of solid mechanics.

MEE3026 Mechanical Engineering Laboratory II 3 cr.
(lab.: 6hr, lab 3)
Experiments in the fields of thermal and fluid mechanics, including measurements and performance evaluation of thermal systems and hydraulic machinery.

MEE3032 Heat and Mass Transfer 3 cr.
(lect.: 3hr, theory 3)
(Prereq.: MEE2022, 2012)
A survey of the theory of propagation and transfer of mass and energy based on the laws of conservation, as well as the application of the knowledge to the design of heat exchanges.

MEE4001 Product Design 3 cr.

Analysis II: FEA
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2011)
Principles of finite elements method in structure deformation, heat transfer, and fluid mechanics.

MEE4002 Refrigeration 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2022
Thermodynamic analyses for various refrigeration cycles. Design methodology for each component of a refrigerator based on heat-transfer principles.

MEE4003 Digital Control 3 cr.
(lect.: 3hr, theory 3)
(Prereq.: MEE3013)
Modeling and analysis of state space, discrete systems, Z-transform and input/ output relation in discrete time, and the design of control systems in state space.

MEE4004 3D-CAD 3 cr.
(lect.: 3hr, theory 2, design 1)
Fundamental aspects of engineering CAD and numerical control of machine tools, theories, and design methods of curves and free surfaces, machining and verifying simulation for free surfaces using the machining center.

MEE4011 Optimal Design 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2011)
Students learn the basics of statistics, the design of experiments, and some optimal design techniques including the Taguchi method. Students also to apply their knowledge to real problems to set up a test matrix and analyze test data to make a conclusion.

MEE4013 Advanced Dynamics 3 cr.
(lect.: 3hr, theory 3)
(Prereq.: MEE2013)
A survey of Newtonian dynamics in three dimensions and Lagrangian mechanics in the generalized coordinates. Also covers Hamilton's principle and constraint motions of particles and rigid bodies.

MEE4014 MEMS Design and Fabrication 3 cr.
(lect.: 3hr, theory 2, design 1)
An introduction to precise microsurface machining, the theory of the LIGA process, MEMS-based sensors and actuators, and smart materials (piezoelectric and shape memory alloy). Students also learn about design problems in the fabrication process.

MEE4015 Biomechanics 3 cr.
(lect.: 3hr, theory 3)
(Prereq.: MEE2011)
Students learn the material and mechanical properties of tissue and the skeleton, then apply basic mechanical theory to analyze them.

MEE4016 Introduction to Biomimetics 3 cr.
(lect.: 3hr, theory 2, design 1)
Biomimetics deals with new and efficient design and production application by analyzing the structural characteristics and mechanisms of biological components.

MEE4021 Creative Engineering Design II 3 cr.
(lect.: 3hr, design 3 prereq. MEE3015)
This capstone design course is for students to create a design project. The selected design will be fabricated so that the advanced design scheme is learned.

MEE4022 Introduction to New Energy Engineering 3 cr.
(lect.: 3hr, theory 3)
(Prereq.: MEE2022)
Students learn to model energy systems such as heat exchanger, valve, pipe, pump, and turbine using the concepts of thermodynamics, fluid dynamics, and heat transfer.

MEE4023 Robot Design and Control 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE3013)
Students study the kinematic and dynamic analysis of robots, with an emphasis on the application of humanoid

and exoskeleton robots, as well as the biomedical application of microrobots and macrorobots.

MEE4024 Measurement and Signal Processing 3 cr.
(lect.: 3hr, theory 3)
Basic concepts of measurement, uncertainty of the process, measuring system response, sensors, and analog and digital measurement techniques are introduced, including statistical analysis of measured signals (displacement, strain, stress, force, torque, pressure, flow rate, temperature, motion, and sound).

MEE4025 Automobile Engineering 3 cr.
(lect.: 3hr, theory 3)
Students learn the structure and the mechanism of the engine, the drive train, the chassis, and learn the electric and electronic systems in an automobile. Also, students learn some basic automotive safety and vehicle dynamics.

MEE4032 Microthermal Fluid Engineering 3 cr.
(lect.: 3hr, theory 2, design 1)
(Prereq.: MEE2012)
This course is an introduction to microthermal fluid engineering, which is of recent interest. This course provides a broad survey on various microfluidic and microthermal technology and introduces current knowledge behind each technique rather than discussing the in-depth physics of each system.

MEE4033 Mechatronics (lecture 3 hours : theory 2 : design 1) 3 Credits
This course based on the contents learned in automatic control and digital control course covers control system establishment method to control the actual machine system, sensor and signal processing method, control algorithm realization method, data processing and expression method. This course covers the programming method to utilize the knowledge about sensor and operator, practical circuit theory, machine and electronic cells and microprocessor.

MEE4046 Special Research 3 cr.
(lect.: 3hr, theory 1, design 2)
Students perform a research project about a specific subject in mechanical engineering.

MEE4047 Seminar in Mechanical Engineering 1 cr.
(lect.: 1hr, theory 1)
Current and recent mechanical topics will be introduced by invited speakers.

MEE4070 Internship I 3 Credits
This course improves the hands-on experience capacity through the implementation of industry and university cooperation project and experience in the field of mechanic engineering.

MEEG005 Continuum Mechanics 3 cr.
(lect.: 3hr, theory 3)
Fluid and solid mechanics are analyzed in conjunction with continuum mechanics, including an analysis of the transformation of kinematics, and the concepts of stress, strain, conservation, and energy balance in order to better understand deformation behavior.

MEEG006 Introduction to FEM 3 cr.
(lect.: 3hr, theory 3)
The basic theory for finite element modeling (FEM) is introduced for modeling deformation of solids, fluid motion, and heat transfer.

MEEG012 Computational Fluid Dynamics(lecture 3 hours : theory 2, design 1) 3 Credits
Pre-requisite subject : MEE2012
Computational fluid dynamics method is the useful tool to implement the experiment of virtual fluid dynamics through simulation. This course helps students improve the ability to create and interpret lattice through commercial program and learn to integrate the applied

fluid dynamic knowledge.