School of Mechanical, Aerospace and Nuclear Engineering

1. School Introduction

The School of Mechanical, Aerospace and Nuclear Engineering (SMANE) consists of three tracks such as Mechanical and Aerospace Engineering (MAE), Nuclear Science and Engineering (NSE) and System Design and Control Engineering (SDC). The SMNE focuses on world-class research and education in order to nurture creative experts and scholars who can contribute to the development and advancement of cutting-edge industries. Interdisciplinary approaches with the state-of-the-art facilities by concentrating on a variety of research fields, including design, manufacturing, thermofluid engineering, system control, robotics, system analysis, unmanned vehicles, aerospace engineering, energy, nuclear reactions, nuclear fuels and nuclear fuel cycle, nuclear fuel cladding and structural materials, nuclear reactor/system, and many nuclear applications. Although the SMANE provides two disciplines with students it together emphasizes the creativity and ingenuity of the education.

2. Undergraduate Programs

□ Track Introduction

1) Mechanical and Aerospace Engineering (MAE)

Mechanical and Aerospace Engineering deals with numerous systems and has a variety of important applications such as automobiles, aircraft, ships, home appliances, electronic devices, power plants and so on. The mechanical systems and the fundamental science and technology of mechanical and aerospace engineering have made dramatic advances and high impacts on the global economies and the standard of living. In the track of mechanical and aerospace engineering, students are educated and trained to learn the underlying principles of mechanical and aerospace engineering and to apply the knowledge to real-world examples and case studies hands-on. Disciplines include thermodynamics, fluid mechanics, solid mechanics, dynamics, machine design, advanced materials processing, laser-assisted manufacturing, micro/nano machining, unmanned vehicle control, MEMS, biomedical products, controls and mechatronics, acoustics, tribology and so on.

2) Nuclear Science and Engineering (NSE)

Nuclear Science and Engineering is comprised of various science and engineering branches, such as nuclear reactor physics, radiation engineering, nuclear safety engineering, thermohydraulics, nuclear materials engineering, radiation material science, nuclear fuel cycle engineering, health physics, nuclear policy, nuclear material safeguards and non-proliferation, nuclear power plant decontamination and decommissioning, and nuclear fusion science and engineering. The Track of Nuclear Science and Engineering currently has 10 faculty members and provides a variety of courses covering almost all the branches of nuclear science and engineering abovementioned. The thoroughness of our program will promote students to be fully qualified nuclear scientists and engineers who can compete globally.

3) System Design and Control Engineering (SDC)

System Design and Control Engineering focuses on; (i) rehabilitation robotics (ii) additive manufacturing & simulation (iii) smart factory control, and (iv) machine healthcare. The objective of this track is to provide a course of study that will enable the student: (i) to complement his/her viewpoint of the design activity from sketching to the logical engineering process of creating something new, or modifying/rearranging something that pre-exists for improvement, and thus (ii) to think not only creatively, but also systematically for the design of products, processes or other systems. The track provides the student with essential engineering design knowledge and tools to begin a productive professional career in industry or academia. Furthermore, the track teaches the student how to plan and manage the entire product development process. This will prepare the student to succeed not merely as an engineering designer but also as a design manager who is capable of driving the new product development projects.

□ Credit Requirement

Track	Required/Elective	Credit(minimum)		
		Interdisciplinary Major		Remark
		1st Track	2nd Track	
MAE	Required	33	9[1)]	
	Elective	21	9[2)]	
NSE	Required	33	3[3)]	
	Elective	21	15	
SDC	Required	24	-	
	Elective	30	18	

1) Students who choose MAE as their 2nd track are required to take at least three out of eight courses: Thermodynamics, Fluid mechanics, Solid MechanicsⅠ, Solid MechanicsⅡ, Dynamics, Mechanical Engineering

Lab, Mechanical Drawing and Lab, and Heat Transfer.

2) Students who choose MAE as their 2nd track can take additional required courses for the credits of elective courses.

3) Students who choose NSE as their 2nd track are required to take NSE213 Fundamentals of Nuclear Engineering course.

3. Curriculum ※ Opening courses are subject to change

□ Mechanical and Aerospace Engineering (MAE)

▶ Required : Core

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
MAE	MEN210	Thermodynamics 열역학	3-3-0		1
	MEN220	Fluid Mechanics 유체역학	3-3-0		2
	MEN230	Solid Mechanics Ⅰ 고체역학 Ⅰ	3-3-0		1
	MEN231	Solid Mechanics Ⅱ 고체역학 Ⅱ	3-3-0	Prerequisite: MEN230	2
	MEN250	Mechanical Drawing and Lab 기계제도 및 실습	3-2-2		1
	MEN270	Dynamics 동역학	3-3-0		2
	MEN300	Mechanical Engineering Lab Ⅰ 기계공학실험 Ⅰ	3-1-4	Prerequisite: MEN231, MEN310	2
	MEN310	Heat Transfer 열전달	3-3-0	Prerequisite: MEN210, MEN220	1
Total Credit			**24**		

▶ Required : Selective[1)]

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
MAE	MEN211	Applied Thermodynamics 응용열역학	3-3-0	Prerequisite: MEN210	2
	MEN301	Numerical Analysis 수치해석	3-2-2		2
	MEN320	Applied Fluid Mechanics 응용유체역학	3-3-0	Prerequisite: MEN220	1
	MEN350	Manufacturing Processes and Lab 기계공작법 및 실습	3-2-2	Prerequisite: MEN230	1
	MEN351	Machine Element Design 기계요소설계	3-3-0	Prerequisite: MEN231	2
	MEN370	Dynamic Systems and Control 시스템제어	3-3-0		1
Total Credit			**18**		

1) Selective requirements for the 1st track students: Take at least three out of six courses: Applied Thermodynamics, Numerical Analysis, Applied Fluid Mechanics, Manufacturing Processes and Lab, Machine Element Design, and Dynamic Systems and Control.

▶ Elective

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
MAE	MEN302	Introduction to Finite Element Method 유한요소법개론	3-3-0	Prerequisite: MEN230	2
	MEN303	Applied Engineering Mathematics 응용공학수학	3-3-0		1
	MEN352	Creative Engineering Design Ⅰ (Capstone Design) 창의적공학설계 Ⅰ (캡스톤 디자인)	3-1-4		2
	MEN400	Mechanical Engineering Lab Ⅱ 기계공학실험 Ⅱ	3-1-4	Prerequisite: MEN231, MEN270, MEN310	1
	MEN411	Combustion 연소공학	3-3-0	Prerequisite: MEN210, MEN220	1
	MEN412	Air-Conditioning and Refrigeration 공기조화냉동	3-3-0	Prerequisite: MEN210	2
	MEN413	Computational Fluid Dynamics 전산유체역학	3-3-0	Prerequisite: MEN301, MEN320	2
	MEN414	Design of Fluid Thermal Systems 열유체시스템 설계	3-3-0	Prerequisite: MEN310	2
	MEN415	Aerodynamics 공기역학	3-3-0	Prerequisite: MEN220	1
	MEN420	Introduction to Aerosol Technology 에어로졸 공학개론	3-3-0	Prerequisite: MEN220	1
	MEN431	Introduction to Plastic Deformation 소성학개론	3-3-0	Prerequisite: MEN231	1

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
	MEN432	Introduction to Mechanics of Composite Materials 복합재역학개론	3-3-0	Prerequisite: MEN230	1
	MEN451	Introduction to MEMS MEMS개론	3-3-0		2
	MEN452	Creative Engineering Design Ⅱ (Capstone Design) 창의적공학설계 Ⅱ (캡스톤 디자인)	3-1-4		1
	MEN453	Computer Aided Engineering 컴퓨터이용공학	3-2-2		1
	MEN454	Optimal Design 최적설계	3-2-2		1
	MEN457	Introduction to Electric-Electronic Engineering 전기전자공학개론	3-3-0	Prerequisite: PHY103	1
	MEN461	Introduction to Robotics 로봇공학	3-3-0		2
	MEN470	Mechanical Vibration 기계진동학	3-3-0	Prerequisite: MEN270	2
	MEN481	UAV Flight Control and Simulation 무인기 비행제어 및 시뮬레이션	3-3-0	Prerequisite: MEN270, MEN370	1
	MEN482	UAV Navigation and Flight Computers 무인기 항법 및 운용	3-3-0	Prerequisite: MEN270, MEN370	2

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
	MEN497	Special Topics in Mechanical Engineering Ⅰ 기계공학 특론 Ⅰ	3-3-0		-
	MEN498	Special Topics in Mechanical Engineering Ⅱ 기계공학 특론 Ⅱ	3-3-0		-
	MEN499	Special Topics in Mechanical Engineering Ⅲ 기계공학 특론 Ⅲ	3-3-0		-
SDC	SDC405	3D Printing 3D 프린팅	3-3-0		1
UIE	UIE204	Mechanics of Materials 재료역학	3-3-0		2
	UIE303	Structural Analysis 구조역학	3-3-0		1
	UIE304	Matrix Structural Analysis 매트릭스구조해석	3-3-0		1
	UIE408	Introduction to Structural Dynamics 구조동역학개론	3-3-0		-
ID	IID201	Design Elements and Principles 디자인요소와 원리	3-2-2		1
	IID221	Design History & Contexts 디자인 역사와 맥락	3-3-0		1
AMS	AMS202	Introduction to Materials Science and Engineering 재료공학개론	3-3-0	Identical: SCM202, ENE216	1
	AMS270	Introduction to Polymer Materials 고분자재료개론	3-3-0		2
	AMS311	Introduction to Metallic Materials 금속재료개론	3-3-0		-
SCM	SCM354	Introduction to Semiconductor 반도체개론	3-3-0		2
BME	BME421	Nano-Bioengineering 나노바이오공학	3-3-0		2
Total Credit			**108**		

□ Nuclear Science and Engineering (NSE)

▶ Required

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
NSE	NSE213	Fundamentals of Nuclear Engineering 원자력 공학 개론	3-3-0		1
	NSE214	Introduction to Nuclear Fuel Cycle Engineering 핵주기공학 개론	3-3-0		1
	NSE221	Nuclear Radiation Engineering & Experiment 원자력방사선공학 및 실험	3-2-2		2
	NSE222	Nuclear Materials Engineering & Experiment 원자력재료공학 및 실험	3-2-2		2
	NSE223	Nuclear Chemical Engineering 원자력화학공학	3-3-0		2
	NSE311	Introduction to Nuclear Reactor Theory 원자로이론 개론	3-3-0		2
	NSE312	Introduction to Nuclear Reliability Engineering 신뢰도 공학 개론	3-3-0		1
	NSE313	Nuclear Fuel Engineering & Experiment 핵연료공학 및 실험	3-2-2		1
	NSE325	Nuclear System Engineering & Experiment 원자로계통공학 및 실험	3-2-2		2
	NSE411	Introduction to Radiation Materials Science 방사선 재료 과학 개론	3-3-0		2
	NSE330	Fundamentals of Plasma Physics 플라즈마 물리학 기초	3-3-0		1
	NSE421	Nuclear Reactor Lab 원자로실험	3-0-6		-
	NSE427	Fundamentals of Nuclear Fusion 핵융합개론	3-3-0		1
	NSE457	Principles of Nuclear Safety Design 원자력 안전 설계 원리	3-3-0		1
	NSE480	Introduction to Nuclear Engineering IT 원자력 IT 개론	3-2-2		2
Total Credit			**45**		

▶ Elective

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
NSE	NSE216	Fundamentals of Electromagnetics 전자기학개론	3-3-0		1
	NSE250	Scientific Computation in Nuclear Fusion	3-3-0		2

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
		전산핵융합기초			
	NSE316	Thermodynamics and Metallurgy of Nuclear Materials 원자력재료 열역학	3-3-0		2
	NSE317	Basic MHD Renewable Energy Engineering 전자기 신재생 에너지공학 기초	3-3-0	Prerequisite: NSE216	1
	NSE318	Nuclear Engineering Design and Lab Ⅰ 원자력공학종합설계프로젝트 Ⅰ	2-0-4	Capstone Design	1
	NSE326	Nuclear Reactor Numerical Analysis 원자로 수치해석	3-3-0		1
	NSE327	Radioactive Waste Management 방사성폐기물관리	3-3-0		1
	NSE328	Nuclear Engineering Design and Lab Ⅱ 원자력공학종합설계프로젝트 Ⅱ	2-0-4	Capstone Design	2
	NSE329	Nuclear Engineering Design and Lab Ⅲ 원자력공학종합설계프로젝트 Ⅲ	2-0-4	Capstone Design	2
	NSE350	Introduction to perturbation methods 섭동방법론기초	3-3-0		1
	NSE351	Introduction to plasma kinetic theory and nonlinear physics 플라즈마 운동 이론 기초	3-3-0		2
	NSE400	Special Topics on Nuclear Engineering and Science Ⅰ 원자력공학 및 과학 특론 Ⅰ	3-3-0		-
	NSE401	Special Topics on Nuclear Engineering and Science Ⅱ 원자력공학 및 과학 특론 Ⅱ	3-3-0		-
	NSE402	Special Topics on Nuclear Engineering and Science Ⅲ 원자력공학 및 과학 특론 Ⅲ	3-3-0		-
	NSE403	Special Topics on Nuclear Engineering and Science Ⅳ 원자력공학 및 과학 특론 Ⅳ	3-3-0		-
	NSE404	Special Topics on Nuclear Engineering and Science Ⅰ 원자력공학 및 과학 특론 Ⅴ	3-3-0		-
	NSE416	Nuclear Engineering Design and Lab Ⅳ 원자력공학종합설계프로젝트 Ⅳ	2-0-4	Capstone Design	1
	NSE426	Instrumentation and Control Systems 원전계측제어시스템	3-3-0		2
MAE	MEN210	Thermodynamics 열역학	3-3-0		1

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
	MEN211	Applied Thermodynamics 응용열역학	3-3-0	Prerequisite: MEN210	2
	MEN220	Fluid Mechanics 유체역학	3-3-0		2
	MEN230	Solid Mechanics Ⅰ 고체역학 Ⅰ	3-3-0		1
	MEN270	Dynamics 동역학	3-3-0		2
	MEN301	Numerical Analysis 수치해석	3-3-0		2
	MEN310	Heat Transfer 열전달	3-3-0	Prerequisite: MEN210, MEN220	1
	MEN320	Applied Fluid Mechanics 응용유체역학	3-3-0	Prerequisite: MEN220	1
	MEN457	Introduction to Electric-Electronic Engineering 전기전자공학개론	3-3-0	Prerequisite: PHY103	1
SE	SCM202	Introduction to Materials Science and Engineering 재료공학개론	3-3-0	Identical: AMS202, ENE216	1
	SCM203	Physical Chemistry Ⅰ: Thermodynamics 재료물리화학 Ⅰ:열역학	3-3-0	Identical: AMS203	1
ENE	ENE212	Physical Chemistry Ⅰ 물리화학 Ⅰ	3-3-0	Identical: ACE203, CHM231	1
	ENE322	Instrumental Anaysis 기기분석	3-3-0	Identical: ACE391, CHM391	1
	ENE416	Introduction to Nanoscience and Nanotechnology 나노과학 및 기술	3-3-0	Identical: ACE416, CHM371	1
CSE	CSE232	Discrete Mathematics 이산수학	3-3-0		1,2
	CSE341	Principles of Programming Languages 프로그래밍언어	3-3-0	Prerequisite: CSE241	1,2
PHY	PHY204	Electromagnetism Ⅱ 전자기학 Ⅱ	3-3-0	Prerequisite: PHY203	2
	PHY301	Quantum Physics Ⅰ 양자물리학 Ⅰ	3-3-0	Prerequisite: PHY101, PHY103	1
	PHY303	Thermal and Statistical Physics 열 및 통계물리학	3-3-0	Prerequisite: PHY101, PHY103	2
	PHY315	Solid State Physics Ⅰ 고체물리학 Ⅰ	3-3-0	Prerequisite: PHY301	2
	PHY427	Introduction to Plasma Physics 플라즈마 물리학 입문	3-3-0		-
Total Credit			**113**		

□ System Design and Control Engineering (SDC)

▶ Required

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
SDC	SDC202	Computational Tools for Engineers 공학전산기법	3-3-0		2
	SDC401	Introduction to Mechatronics 메카트로닉스 개론	3-3-0		1
	SDC403	Project Lab 프로젝트 랩	3-3-0		1
MAE	MEN230	Solid Mechanics Ⅰ 고체역학 Ⅰ	3-3-0		1
	MEN250	Mechanical Drawing and Lab 기계제도 및 실습	3-2-2		1
	MEN270	Dynamics 동역학	3-3-0		2
	MEN300	Mechanical Engineering Lab Ⅰ 기계공학실험 Ⅰ	3-1-4	Prerequisite: MEN231, MEN310	2
	MEN370	Dynamic Systems and Control 시스템제어	3-3-0		1
		Total Credit	**24**		

▶ Elective

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
SDC	SDC302	Circuit Theory & Lab 회로이론 및 실습	3-2-2		1
	SDC304	Manufacturing System Design & Simulation 생산시스템설계 및 시뮬레이션	3-3-0		2
	SDC306	System Dynamics 시스템 동역학	3-3-0		2
	SDC402	Applied Robotics 응용로봇공학	3-3-0		2
	SDC405	3D Printing 3D 프린팅	3-3-0		1
	SDC410	Special Topics in SDC Ⅰ SDC 특론 Ⅰ	3-3-0		2
	SDC420	Special Topics in SDC Ⅱ SDC 특론 Ⅱ	3-3-0		-
	SDC430	Special Topics in SDC Ⅲ SDC 특론 Ⅲ	3-3-0		-

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks	Semester
MAE	MEN210	Thermodynamics 열역학	3-3-0		1
	MEN220	Fluid Mechanics 유체역학	3-3-0		2
	MEN231	Solid Mechanics Ⅱ 고체역학 Ⅱ	3-3-0	Prerequisite: MEN230	2
	MEN301	Numerical Analysis 수치해석	3-3-0		2
	MEN302	Introduction to Finite Element Method 유한요소법개론	3-3-0	Prerequisite: MEN230	2
	MEN310	Heat Transfer 열전달	3-3-0	Prerequisite: MEN210, MEN220	1
	MEN350	Manufacturing Processes and Lab 기계공작법 및 실습	3-2-2	Prerequisite: MEN230	1
	MEN351	Machine Element Design 기계요소설계	3-3-0	Prerequisite: MEN231	2
	MEN352	Creative Engineering Design Ⅰ (Capstone Design) 창의적공학설계 Ⅰ (캡스톤 디자인)	3-1-4		2
	MEN451	Introduction to MEMS MEMS개론	3-3-0		2
	MEN452	Creative Engineering Design Ⅱ (Capstone Design) 창의적공학설계 Ⅱ (캡스톤 디자인)	3-1-4		1
	MEN453	Computer Aided Engineering 컴퓨터이용공학	3-2-2		1
	MEN470	Mechanical Vibration 기계진동학	3-3-0	Prerequisite: MEN270	2
ID	IID232	3D CAD 3D CAD	3-2-2		2
HFE	HFE301	Experimental Design 실험계획법	3-3-0	Prerequisite: MTH211	1
	HFE305	Physical Computing 피지컬 컴퓨팅	3-2-2		1
CSE	CSE463	Machine Learning 기계 학습	3-3-0	Prerequisite: EE211, CSE331	2
MGE	MGE303	Data Mining 데이터 마이닝	3-3-0		1
Total Credit			**78**		

▶ Other

Track	Course No.	Course Title	Cred.-Lect.-Exp.	Remarks
	SDC201	Engineering Drawing and Analysis 기계제도 및 해석	3-2-2	Only opened upon request of retaking courses from students who already took the courses before. (SDC301) Prerequisite: IID202
	SDC301	Introduction to Engineering Systems Design (Design Project 3) 공학 시스템 디자인 개론 (디자인 프로젝트 3)	3-3-0	
	HSE207	Engineering Mechanics 공학역학	3-3-0	
	HSE308	System Control 시스템 제어	3-3-0	

4. History of Courses Change of 2019-2020

Category	2019		2020
MAE	<New>	⇨	MEN42001(Elective) Introduction to Aerosol Technology 에어로졸 공학개론
NSE	<New>	⇨	NSE330 (Elective) Fundamentals of Plasma Physics 플라즈마 물리학 기초

5. Course Descriptions

□ Mechanical and Aerospace Engineering (MAE)

MEN210 Thermodynamics (열역학)

Thermodynamics is the most fundamental course in Mechanical Engineering. This course aims to have students understand various fundamental laws of thermodynamics and to develop the ability to apply them to various thermal systems. It covers energy, heat and work, enthalpy, entropy, laws of thermodynamics, thermodynamic properties, analysis of cycle performance and various engineering cycles.

MEN211 Applied Thermodynamics (응용열역학)

This course is focused on the application of the principles of thermodynamics to understand the properties of ideal gas mixtures. Topics cover available energy, availability and second-law efficiency, chemical reactions, thermodynamic relations and phase and chemical equilibrium. The basics of molecular dynamics and statistical thermodynamics are introduced.

MEN220 Fluid Mechanics (유체역학)

This is an introductory course in Fluid Mechanics. Topics covered include fundamental concepts of fluid mechanics, fluid statics, governing equations in integral form, governing equations in differential form, Bernoulli equation, dimensional analysis, viscous flow in ducts, and boundary layer flows.

MEN230 Solid Mechanics Ⅰ (고체역학Ⅰ)

In this course, students perform an in-depth study on the concept of stress-strain analysis, based on statics (force and moment) and mechanics of deformable bodies. Students learn to analyze the force and moment applied on the cross-section of a beam subjected to tension, compression, bending, and torsion. Methods to determine stress-strain distribution and deflection of beams are presented. Energy methods based on the equilibrium between strain energy and external work, alternative to force-moment equilibrium, are also introduced.

MEN231 Solid MechanicsⅡ (고체역학Ⅱ)

This course builds upon Solid Mechanics and introduces the mechanical behavior of various materials, including metals, ceramics, polymers, and composites. A rigorous definition of three-dimensional stresses and strains is presented, based on which the mechanical behavior is analyzed. Students learn representative failure modes, including fracture, fatigue, wear, and creep, and methods are presented to predict the failure mode and life based on various failure criteria. Various case studies are performed to demonstrate failure analysis techniques.

MEN250 Mechanical Drawing and Lab (기계제도 및 실습)

This course is provided in two modes – lecture and lab – that run in parallel. In lectures, lines, projections, views, and tolerances, which are fundamental components of mechanical drawings, are presented. The lab component allows the students to apply the knowledge obtained in lectures to produce drawings utilizing CAD software. In the term project, 3-4 students work as a team to execute the project in a creative and practical manner. The projects will help students learn to work efficiently in a teamwork environment and improve their communication skills.

MEN270 Dynamics (동역학)
This course introduces various dynamics systems. For dynamics analysis, principles and applications of Newton's law, work-energy methods, and impulse-momentum methods will be covered in this course.

MEN300 Mechanical Engineering Lab Ⅰ (기계공학실험 Ⅰ)
This course provides students with practical and experimental techniques for observation and measurement of mechanical principles and physical phenomena and focuses on analyzing experimental results and writing technical reports.

MEN301 Numerical Analysis (수치해석)
This course introduces numerical methods with emphasis on algorithm construction, analysis and implementation. It includes programming, round-off error, solutions of equations in one variable, interpolation and polynomial approximation, approximation theory, direct solvers for linear systems, numerical differentiation and integration, and initial-value problems for ordinary differential equations.

MEN302 Introduction to Finite Element Method (유한요소법개론)
In this course, the theory and formulation behind the finite element method will be introduced. To gain hands-on experience of the finite element method, practical applications in engineering will be covered.

MEN303 Applied Engineering Mathematics (응용공학수학)
This course provides a comprehensive, thorough, and up-to-date treatment of engineering mathematics. It is intended to introduce applied mathematics that are most relevant for solving practical problems to students of engineering, physics, mathematics, computer science, and related fields. A course in elementary calculus is the sole prerequisite.

MEN310 Heat Transfer (열전달)
This course deals with heat transfer problems associated with steady and transient conductions, forced and free convections, and radiation. Basic heat transfer mechanism, formulation of the problems and their solution procedures, and empirical correlations will be introduced. Also, some examples of practical applications will be discussed.

MEN320 Applied Fluid Mechanics (응용유체역학)

In this course, based on the topics learned in MEN220, advanced topics such as viscous flows, inviscid flows, lift and drag, basic turbulent flows, fundamentals of compressible flows, and turbomachinery will be covered.

MEN350 Manufacturing Processes and Lab (기계공작법 및 실습)

The course introduces engineering materials used in industry from the perspectives of composition, microstructures, properties, and heat treatment. It provides an extensive knowledge of various manufacturing processes, develops basic mathematical descriptions for selected processes, and helps students apply these concepts to process selection and planning. Manufacturing processes ranging from traditional (casting, machining, forging, powder metallurgy, injection molding, welding) to nontraditional/cutting-edge (electrodischarge machining, rapid prototyping, microfabrication) are introduced. From the manufacturing standpoint, the students learn the advantages and limitations of various processes in terms of quality, cost, and productivity. The lab component of this course allows the students to design and manufacture mechanical components hands-on.

MEN351 Machine Element Design (기계요소설계)

This course prepares students to design mechanical systems both at component- and system-level in a creative and comprehensive manner. Students learn to analyze, select, and synthesize machine components, as applied to springs, bearings, shafts, gears, fasteners, and other elements in a mechanical system. In addition, students learn to identify and quantify the specifications and trade-offs for the selection and application of components, which are commonly used in the design of complete mechanical systems. The course will require team projects in which the students will learn to develop conceptual design, optimize design parameters, and work efficiently in a teamwork environment.

MEN352 Creative Engineering Design Ⅰ (창의적공학설계Ⅰ)

In this course, students will develop their design capabilities through a team-project. To accomplish a given objective, students should define the problem, design and manufacture the system, and evaluate the final product by themselves. Through the whole process, students can broaden their understanding about creative engineering design.

MEN370 Dynamic Systems and Control (시스템제어)

Automatic control has played a vital role in various engineering and technological fields. It is not only important in space vehicles, missile guidance systems, aircraft autopiloting, and robots, but also in modern manufacturing and industrial processes. This course covers dynamic modeling and response of systems with mechanical, hydraulic, thermal and electrical elements, linear feedback control systems design, and analysis in time and frequency domains. Students learn basic mathematical and computational tools for modeling and analysis of dynamic systems. They are also trained to identify, model, analyze, design, and simulate dynamic systems in various engineering disciplines using a unified approach.

MEN400 Mechanical Engineering Lab Ⅱ (기계공학실험 Ⅱ)

This is the second course of a two-semester sequence covering fundamentals of instrumentation and measurement and their application in engineering testing and experimentation. This course involves instructor-designed experiments and focuses on the application of the fundamental principles learned in MEN300 to more advanced tests and measurement applications.

MEN411 Combustion (연소공학)

Combustion is based on thermodynamics, heat transfer, and fluid mechanics. This course deals with the energy conversion process from chemical to mechanical energy. Since energy consumption mostly occurs during the combustion process, the topics include not only flames and their characteristics but also practical combustion machines.

MEN412 Air-conditioning and Refrigeration (공기조화냉동)

This course covers the basic engineering principles of air-conditioning and refrigeration systems based on the topics in thermodynamics, heat transfer, and fluid mechanics. Cooling load calculation methods, Psychrometric chart, Air-conditioning system design based on thermodynamic cycle analysis, and performance analysis for major components such as compressor, condenser, evaporator and expander are introduced. It also discusses various alternative refrigeration methods and refrigerants.

MEN413 Computational Fluid Dynamics (전산유체역학)

This class is designed for use in introductory and intermediate courses in computational fluid dynamics (CFD) for students of aerospace engineering, mechanical engineering, and civil engineering with interest in fluid mechanics and heat transfer. Fundamental knowledge of programming and graphics is required for the applications of methods presented throughout the text. Since one learns a great deal by developing his or her own code to solve some partial differential equations, no program listing is included, and it is encouraged that students develop their own codes for the solutions of the proposed problems. For purposes of analysis, the numerical solutions of the sample problems are presented in tables. In the initial stage, the emphasis is on finite difference methods for solving parabolic, elliptic and hyperbolic equations, and in the final stage, the solution schemes is extended to the solution of a system of partial differential equations.

MEN414 Design of Fluid Thermal Systems (열유체시스템설계)

This course covers various design methods for various practical applications related to thermal/fluid engineering such as fluid machineries, duct systems, heat exchangers, and heat pumps. In addition, this course covers design of energy production/conversion systems including future renewable energies such as hydropower, tidal power, wind power, solar photovolaics, geothermal energy, biomass energy, and fuel cells.

MEN415 Aerodynamics (공기역학)

This course constitutes a solid study emphasizing inviscid, incompressible flow. Fluid mechanics is a prerequisite. Course topics include the review of fundamental principles and equations in fluid mechanics, fundamentals of inviscid, incompressible flow, incompressible flow over airfoils, and incompressible flow over finite wings.

MEN420 Introduction to Aerosol Technology (에어로졸 공학개론)

Aerosols represent airborne solid particles or liquid droplets such as airborne fine dusts.
The objectives of this course are

1. To understand and calculate the statistics of a given particle size distribution in the air.
2. To determine the movement of aerosols by a given transport mechanics (inertial movement, diffusion, electrical migration) and analyze the important mechanisms for a given aerosol system.
3. To design a system to generate aerosols, to collect aerosols, and to measure size distributions of aerosols.

Fluid mechanics (MEN220) is a prerequisite.

MEN431 Introduction to Plastic Deformation (소성학개론)

This course deals with the fundamental theory of plasticity including the constitutive relations in plastic deformation and the methods of analysis for grasping the deformation behavior. The analytic solution of nonlinear problems in plastic deformation will be covered.

MEN432 Introduction to Mechanics of Composite Materials (복합재역학개론)

This course will introduce students to the fundamental mechanics of composite (more than one phase) solids. The primary objective of this course is to engage the students in important concepts related to material constitutive responses of composite materials at both micro- and macro- scales. Students should gain a basic understanding of the fundamental techniques used to analyze composite structures. Topics of the course will include effective stiffness properties of composites, constitutive description of laminated plates, and laminated plate theory. Failure theories and experimental results for laminated composites will also be discussed.

MEN451 Introduction to MEMS (MEMS 개론)
This course introduces MEMS, one of the most typical interdisciplinary research areas. Physical principles of micro structure and micro-fabrication techniques will be taught first and case studies of design, fabrication, and applications of diverse micro devices including micro-mechanical sensors (accelerometer, pressure sensor, flow sensor, temperature sensor), micro-actuator, and microfluidics will be covered in this course.

MEN452 Creative Engineering DesignⅡ (창의적공학설계Ⅱ)
In this course, students can develop their design ability as an independent mechanical engineer through a term-project where they propose an engineering problem including its necessity, design, manufacture, evaluate and present the system by themselves.

MEN453 Computer Aided Engineering (컴퓨터이용공학)
In this course, students study the theories and algorithms of CAE used in the design and manufacture of various products. Through these studies, the students will develop their capabilities to design, analyse, and manufacture various products using CAE techniques.

MEN454 Optimal Design (최적설계)
In this course, various optimization theories and algorithms are introduced, in order to improve students' capabilities in optimization including defining a problem, developing formulae, and adopting proper algorithms.

MEN457 Introduction to Electric-Electronic Engineering (전기전자공학개론)
Introduction to electric-electronic engineering: This course is designed to provide the mechanical engineering students with basic electrical and electronic skills and knowledge required for experimental set-ups. For example, basic circuit theory, fundamental electromagnetics, op amp, dc power supply, diode, rectification circuits will be discussed.

MEN461 Introduction to Robotics (로봇공학)
Robot definition, history, and its components/Open and closed loop Kinematics and inverse kinematics/Jacobian and Inverse Jacobian/Dynamics/Actuators, sensors, vision, voice recognition/Robot Controls/Robot Projects

MEN470 Mechanical Vibration (기계진동학)

This course introduces concepts of mechanical vibration, including free and forced vibration of single/multi-degree of freedom systems. Relevance of eigenvalue problems to multiple DOF system analysis is introduced together with some numerical techniques. Finally, numerical approximation and techniques for the distributed systems are studied.

MEN481 UAV Flight Control and Simulation (무인기 비행제어 및 시뮬레이션)

This course covers aircraft dynamic models, low-level flight control (autopilot) design, guidance, navigation, and high-level path planning for the autonomous operation of unmanned air vehicles (UAVs). Matlab/Simulink computer simulations will be used throughout the course to help students put theory into practice.

MEN482 UAV Navigation and Flight Computers (무인기 항법 및 운용)

This course is intended to introduce to student (i) the basic concepts of signals and signals processing including UAV/Aircraft navigation data, (ii) the various instruments used for navigation, methods of processing the navigation data, choice of flight computers and issues related to flight software implementation, and (iii) practical experiences to develop a UAV, flight computer, or navigation system as a project.

MEN497~499 Special Topics in Mechanical Engineering I~ III (기계공학 특론 I ~ III)

In this course, special topics in mechanical engineering are discussed based on the knowledge of the principles of solid mechanics, dynamics, thermodynamics, fluid mechanics, heat transfer, manufacturing process, system design, and power system engineering. Topics may include machine design, advanced materials processing, laser-assisted manufacturing, micro/nano machining, MEMS, biomedical products, controls and mechatronics, acoustics and dynamics, tribology, heat problems in microchips and light emitting diodes, wind power, blood flow, micro/nanofluidics, heat exchanger design in nuclear power plants, and combustion in engines.

□ Nuclear Science and Engineering (NSE)

NSE213 Fundamentals of Nuclear Engineering (원자력 공학 개론)

This course deals with physical basics and engineered application of the nuclear energy and the main objective is to provide the student with general understanding and knowledge of the nuclear engineering. The fundamentals of nuclear physics and interaction of radiation with matters are studied. The basic principles of nuclear reactor are investigated and various nuclear reactor concepts are discussed. The nuclear energy conversion and radiation protection are studied as well.

NSE214 Introduction to Nuclear Fuel Cycle Engineering (핵주기공학 개론)

This course introduces the nuclear fuel cycle which is the progression of nuclear fuel through a series of differing stages. It consists of steps in the front end, which are the preparation of the fuel, steps in the service period in which the fuel is used during reactor operation, and steps in the back end, which are necessary to safely manage, contain, and either reprocess or dispose of spent nuclear fuel. Depending on the reprocessing of the spent fuel, the specific topics include an open fuel cycle (or a once-through fuel cycle) and a closed fuel cycle considered in terms of sustainability of nuclear energy and nonproliferation. In particular, nuclear waste disposal (spent fuel) techniques will be discussed in terms of economics, safety and public acceptance.

NSE216 Fundamentals of Electromagnetics (전자기학 개론)

This course focuses on the electromagnetic theories as a basis for plasma engineering, nuclear fusion, radiation and nuclear engineering. The basic concepts on electricity and magnetism are included. Specific topics will include vector algebra and calculus; electrostatics in material media for Coulomb’s Law, Gauss’s Law, and boundary-value problems; steady electric currents for Ohm's law and Kirchhoff's law; magnetostatics in magnetic media for Ampere’s Law, Biot-Savart law, and vector potential; time-varying electromagnetics for Faraday’s Law and Maxwell's equation.

NSE221 Nuclear Radiation Engineering & Experiment (원자력방사선공학 및 실험)

The basic concepts and definition about radiation dosimetry are introduced and the biological effects on cells and human body organs are discussed. It also covers the generation, amplification, transfer and measurement of the electronic signal from various radiation detector based on the physics theory of the electronics signal and noise. The course also explores methods of radiation counting, timing and imaging system.

NSE222 Nuclear Materials Engineering & Experiment (원자력재료공학 및 실험)

This subject introduces basic concepts and applications of materials science and engineering to nuclear energy systems, while laboratory practices are designed for experiencing property tests of the lectured materials. Lectures include the essential knowledge of materials science and engineering as well as the effects of radiation and environments on material properties. The experiments are concerned with mechanical test and data analysis, phase transformation, observation by optical and electron microscopes, corrosion tests and irradiation effects.

NSE223 Nuclear Chemical Engineering (원자력화학공학)

This course will introduce students to the fundamental principles of nuclear chemical engineering as the first and foremost step to become scientists and engineers specialized in nuclear fuel cycle and radioactive waste management as well as nuclear materials and nuclear thermal hydraulics. At the end of this course, students will understand the fundamentals of chemical and electrochemical processes in nuclear power plants and nuclear fuel cycle systems.

NSE250 Scientific Computation in Nuclear Fusion (전산핵융합기초)

This is an introductory course to various numerical methods and practical techniques of software development widely being used in scientific computation of diverse research fields including nuclear fusion. Students must be able to use one of low-level (C/C++/Fortran) or high-level (Python/Matlab) languages as prerequisite.

NSE311 Introduction to Nuclear Reactor Theory (원자로이론 개론)

This course covers fundamental theory of nuclear fission reactors. Specific topics includes the followings: nuclear fission phenomenon, the chain nuclear reaction, diffusion/ moderation/absorption of neutron, multi-group neutron diffusion equations, heterogeneous reactor, reactor dynamics, reactivity and its change, perturbation theory and adjoint solutions, etc.

NSE312 Introduction to Nuclear Reliability Engineering (신뢰도 공학 개론)

Reliability evaluation is very important in safety-critical systems such as nuclear power plants. This course is designed to provide undergraduate students with the fundamentals and principles for reliability engineering. The course will cover the basic knowledge of reliability engineering and probabilistic modelling methods.

NSE313 Nuclear Fuel Engineering & Experiment (핵연료공학 및 실험)

This course introduces various nuclear fuels utilized in nuclear reactors worldwide. However, the focus is on low-enriched UO_2 fuel used in light water reactors and metallic alloy fuels suitable for recycling the used nuclear fuel. It also provides students opportunity to deal with thermophysical and metallurgical experiments of uranium alloys and compounds. Possible nuclear fuel experiments to be included are as follows: 1) ceramic and alloy fuel fabrication and processing; 2) Phase transformation enthalpy and temperature measurement; 3) thermal conductivity measurement of nuclear fuel and cladding materials.

NSE316 Thermodynamics and Metallurgy of Nuclear Materials (원자력재료 열역학)
Thermodynamics of materials is a good starting point to understand metallurgical behavior of nuclear materials usually being used under high temperature and high pressure environment, although nuclear fuel materials are apparently not in thermodynamic equilibrium for the most of their service time due to various types of radiations emitted from neutron-induced fission chain reactions. This course covers the very basics of thermodynamics and metallurgy of nuclear materials.

NSE317 Basic MHD Renewable Energy Engineering (전자기 신재생 에너지공학 기초)
The basic concept on the electromagnetic electricity generation and its magnetohydrodynamic (MHD) characteristics of electrically conducting liquid metal is introduced. The course focuses on the fundamental approach in therms of the electromagnetics and fluid mechanics for the understanding the liquid metal flow in the magnetic environment and MHD/electromagnetic generator and pumps, which are used for sodium coolant circulation in a sodium fast reactor (SFR), one of the future generation IV reactors, and liquid lithium circulation in the blanket of a nuclear fusion reactor. Students learn the magnetohydrodynamic principle of the metal fluid flow and its application.

NSE318 Nuclear Engineering Design and Lab I (원자력공학종합설계프로젝트 I)
In this course, students will have a chance to get the practical experience in nuclear fuels and fuel cycle, and nuclear fuel cladding and structural materials. In the nuclear fuels and fuel cycle area, students will first learn the fuel, fuel design criteria, fuel performance analysis code and then have a chance to analyze the in-reactor performance of the fuel. Then they will learn how to manufacture the fuel and have a chance to actually fabricate the fuel pellet with simulated material. Then they will be asked to analyze the results. In nuclear fuel cladding and structural materials area, students will learn the basic principles for the design and analysis of fuel cladding and structural components with commercial structural analysis code. And, material properties of fuel cladding and structural components will be reviewed and the proper material design and analysis using computational thermodynamics software will be practiced.

NSE327 Radioactive Waste Management (방사성폐기물관리)
The objectives of this course are to provide student with an understanding of radioactive waste management requirements and practices, to make them aware of social, economic, and environmental concerns as well as technical research needs. This course will cover both high level waste including spent nuclear fuel and low and intermediate level waste

including operation and decommissioning waste.

NSE328 Nuclear Engineering Design and Lab II (원자력공학종합설계프로젝트 II)
Design of various nuclear fission energy systems and fast reactor technology require a variety of knowledge such as reactor physics, neutron data, radiation measurement and liquid metal magnetohydrodynamics. Through this course, students will learn how to design and develop nuclear systems based on the above-mentioned knowledge. Students will participate in comprehensive design and lab activities such as 1) set up a design goal, 2) identify design parameters of the system and sketch the performance of the proposed system, 4) establish quantitative models and/or setup experimental devices that show the performance of the system, 5) identify multiple constraints in the project, and develop an optimized solution.

NSE325 Nuclear System Engineering & Experiment (원자로계통공학 및 실험)
In this course, a variety of design constraints such as design principles, requirements, functions and technical specifications that govern the overall phases of design processes will be introduced to point out drawbacks and enhancement directions of nuclear systems. In addition, through implementations of small-scale mockups, an engineering chance realizing new ideas that are created by students would be provided.

NSE326 Nuclear Reactor Numerical Analysis (원자로 수치해석)
The partial differential equations to be solved for real world nuclear engineering applications such as the nuclear reactor core design, core transient analysis, and core depletion calculations, cannot be solved analytically in most cases. Instead, computer can be utilized to obtain approximate solutions of the PDEs. This course covers techniques which can solve numerically the PDEs found in nuclear engineering, e.g., finite difference, finite element, and advanced nodal methods.

NSE329 Nuclear Engineering Design and Lab III (원자력공학종합설계프로젝트 III)
This course covers (1) practical engineering and design problems and (2) quantitative safety assessment of nuclear reactor systems. For the first half of this course, students will learn a core thermal-hydraulic code and a safety analysis code for nuclear reactors. As a more advanced and visualized approach, students will also learn a 3D computational fluid dynamics code. The second half of the course is about probabilistic safety assessment (PSA), which quantitatively evaluates the safety of a nuclear power plant. Students will understand the PSA by analyzing a nuclear power plant PSA model and get skills such as event tree/fault tree analysis, human reliability analysis, and risk-informed applications.

NSE330 Fundamentals of Plasma Physics (플라즈마 물리학 기초)

This is an introductory course of plasma physics for nuclear fusion. Objective of this course is for students to learn not only fundamental physics of plasmas and fusion but also continuous efforts of human being that have been made to achieve practical use of fusion energy. This course is focused on magnetohydrodynamic approach including plasma motion as fluids and waves, and diffusion of plasma, which is employed for nuclear fusion and MHD generation.

NSE350 Introduction to perturbation methods (섭동방법론기초)

This course covers practical ordering techniques to solve or reduce differential equations analytically using asymptotic methods. Subjects of this class include but are not limited to asymptotic series, WKB method, method of averaging, method of multiple scales, and near-identity transformation.

NSE351 Introduction to plasma kinetic theory and nonlinear physics (플라즈마운동이론기초)

This course covers fundamentals of kinetic theory and nonlinear physics for general plasmas. Specifically, microscopic phenomena in plasma are explored on account of particles' motion that are difficult to be handled and captured by fluid description. Also nonlinear physics explaining wave-particle interactions and wave-wave interactions is introduced. It is not necessary but recommended to take PHY427, "Introduction to Plasma Physics" first as prerequisite.

NSE400~404 Special Topics on Nuclear Engineering and Science I~ V (원자력공학 및 과학 특론 I ~ V)

This course introduces new research topics in nuclear engineering and science.

NSE411 Introduction to Radiation Materials Science (방사선 재료 과학 개론)

This course introduces fundamental theories and mechanisms of radiation interactions with materials assuming the students already took an introductory material science and engineering course. More specifically, the radiation damage process, the formalism for the prediction of the amount and spatial configuration of radiation damage produced by energetic particles, and eventual materials property degradation, will be covered.

NSE416 Nuclear Engineering Design and Lab IV (원자력공학종합설계프로젝트 IV)

For the first half of this course, the students will be introduced to experimental research of various nuclear fuel material, such as 1) advanced nuclear fuel fabrication, 2) phase diagram investigation based on phase transformation measurement and crystallography utilizing differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and high temperature X-ray diffraction (XRD), 3) microscale metallurgy utilizing optical microscopy (OM) and scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS). The second half of the course is about experimental techniques on decontaminating radioactive waste and partitioning spent nuclear fuel. Students will understand experimental electrochemistry such as linear sweep voltametry (LSV), cyclic voltammetry (CV), and rotating disk electrode (RDE). Also, partitioning experiment using non-radioactive alloys will be performed.

NSE421 Nuclear Reactor Lab (원자로실험)

Basic introduction to small research reactor will firstly given. Then experiments on important basic principles and to measure important physics parameters will be followed; basic reactor operation and criticality, measurement of reactor period and reactivity, experiment to measure critical mass, experiment to measure control rod worth, experiment to measure temperature coefficient of reactivity and experiment on neutron activation analysis.

NSE426 Nuclear Power Plant Instrumentation and Control Systems (원전계측제어시스템)

This course provides the fundamentals of instrumentation and control (I&C) systems in nuclear power plants. The basic electronic engineering and principles of I&C will be introduced. Students will get fundamental knowledge and skills of I&C from lectures and experiments.

NSE427 Fundamentals of Nuclear Fusion (핵융합개론)

This is an introductory course of nuclear fusion. This course covers necessity of harnessing fusion energy in facing energy crisis, principle of fusion reaction, design of magnetic fusion reactor, fusion plasma physics, plasma transport in the reactor, heating and current drive to sustain plasma, and future of fusion research.

NSE457 Principles of Nuclear Safety Design (원자력 안전 설계 원리)

This course will familiarize students with the key safety systems and their safety functions employed at pressurized water reactors (PWRs). The reference PWR design for the course is the OPR1000 (Optimized Power Reactor 1000 MWe), but key similarities and differences of safety system configurations across the operating PWR fleet in Korea (Westinghouse/Framatome plants and APR1400) will be discussed. The safety systems studied are the High Pressure Safety System, Safety Injection Tanks, and Low Pressure Safety Injection System for safety injection, recirculation cooling, and residual heat removal safety function modes, Auxiliary Feedwater System, and Containment Spray System. Students will learn the engineering justification component selections such as pump type (positive displacement, centrifugal, and Terry turbine) and valve design and actuation methods. The engineering basis for regulatory acceptance criteria and how technical specifications are established is discussed.

NSE480 Introduction to Nuclear Engineering IT (원자력 IT 개론)

This course covers basic computer and IT technology necessary for nuclear reactor physics analysis, thermal hydraulics system design, nuclear fuel performance analysis, nuclear material, radiation protection analysis, nuclear reactor safety analysis: Operating System (Windows, Linux), Computing Tools (Matlab, Mathematica, Labview), Programming Language (FORTRAN, C, JAVA), Script Language (Perl, Python, Batch File), Parallel Programming (OpenMP, MPI)

□ System Design and Control Engineering (SDC)

SDC201 Computational Tools for Engineers (공학전산기법)

This course studies essential and practical computational tools and methods for engineers and designers. Students will improve their understanding of computer programming and IT applications in engineering design. Practical laboratories and projects with MATLAB and LabView will complement the course.

SDC302 Circuit Theory & Lab (회로이론 및 실습)

The aims of this course are to develop understanding of the principles and the fundamental concepts of circuit analysis, and to extend the students'ability to apply system analysis to other branches of engineering. This course integrates a number of concepts introduced in other courses in the disciplines of physics and mathematics. Students will see how abstract theoretical ideas work in practice. The course will focus on both hands-on experience and design practice.

SDC304 Manufacturing System Design & Simulation (생산시스템설계 및 시뮬레이션)

This course studies manufacturing system configuration, process flow design and their evaluation. The student will learn the basic concepts and methods of simulation techniques to design and evaluate manufacturing systems in which all workcells, including robots, material handling systems and other auxiliary equipment are functioning to maximum efficiency and productivity.

SDC401 Introduction to Mechatronics (메카트로닉스개론)

This course covers the basic control, instrumentation, and electrical systems. The course starts with an overall view of basic theories of signal processing and control. Based on such knowledge, various sensors and actuators with a microcontroller will be introduced and used for lab experiments. MATLAB and Arduino will be intensively used for hands-on activities and class projects.

SDC306 System Dynamics (시스템 동역학)

This course covers systematic lumped-parameter modeling, analysis, and simulation of multi-energy domain systems including mechanical, fluid, electrical, and thermal systems in temporal and frequency domains. Students will learn how to model multi-energy domain systems in a systematic manner using an energetic approach based on bond graph with analogies found between the domains, and can analyze those systems' characteristics and confirm the characteristics with simulations.

SDC402 Applied Robotics (응용로봇공학)

This introduction to the basic modeling, design, planning, and control of robot systems provides a solid foundation for the principles behind robot design. Students will learn the basic methodologies and tools in robotics research and applications to move forward and experiment further in the robotics field.

SDC403 Project Lab (프로젝트 랩)

Students and strategic partners from industry will work in project teams and undertake innovative technology development or product design projects involving product specification, conceptual design, detailed design and prototype-making/testing. The teams must aim to disseminate completed project outcomes to industry. The progress of each project will be reviewed based on formal presentations

SDC405 3D Printing (3D 프린팅)

This course aims to introduce to the additive manufacturing (AM) technology and its applications. Students will examine various methods (i.g., Fused Deposition Method(FDM), Stereolithograpy(SLA), Selective Laser Sintering (SLS)) of additive manufacturing technologies, and understand the basic AM process from CAD models to the physical prototyping. In addition, contemporary issues in AM will be introduced, and assignments with FDM and SLS machines will be conducted during the course.

SDC410, 420 Special Topics in SDC I, II (SDC 특론 I, II)
In these courses contemporary topics in various areas related to system design and control engineering will be covered. Topic selection will be made based upon special interests.