

## 2025 SUBJECTS (Engineering)

Table (Article 10)

## Master's Program

## Common Subjects

AREAS OF STUDY	REQ OR ELEC.	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Common	REQUIRED	ESCM14010	Master's Thesis in Engineering I	1.5	3	1, 2	Spring, Fall	The subject teaches the research literacy necessary to carry out engineering research. In addition to methods for setting and solving problems, students will learn how to evaluate and consider the results of their research.
		ESCM14020	Master's Thesis in Engineering II	1.5	3	1, 2	Spring, Fall	The subject teaches the research literacy necessary to carry out engineering research. In addition to methods for setting and solving problems, students will learn how to evaluate and consider the results of their research.
		ESCM14030	Master's Thesis in Engineering III	1.5	3	1, 2	Spring, Fall	The subject teaches the research literacy necessary to carry out engineering research. In addition to methods for setting and solving problems, students will learn how to evaluate and consider the results of their research.
		ESCM14040	Master's Thesis in Engineering IV	1.5	3	1, 2	Spring, Fall	The subject teaches the research literacy necessary to carry out engineering research. In addition to methods for setting and solving problems, students will learn how to evaluate and consider the results of their research.
		ESCM14050	Special Seminars in Engineering I	1.5	3	1, 2	Spring, Fall	In conjunction with Master's Thesis in Engineering I, students will search and explore literature materials such as research papers or publications, that are related to their research fields and will do practical activities to formulate theories and methodologies.
		ESCM14060	Special Seminars in Engineering II	1.5	3	1, 2	Spring, Fall	In conjunction with Master's Thesis in Engineering II, students will search and explore literature materials such as research papers or publications, that are related to their research fields and will do practical activities to formulate theories and methodologies.
		ESCM14070	Special Seminars in Engineering III	1.5	3	1, 2	Spring, Fall	In conjunction with Master's Thesis in Engineering III, students will search and explore literature materials such as research papers or publications, that are related to their research fields and will do practical activities to formulate theories and methodologies.
		ESCM14080	Special Seminars in Engineering IV	1.5	3	1, 2	Spring, Fall	In conjunction with Master's Thesis in Engineering IV, students will search and explore literature materials such as research papers or publications, that are related to their research fields and will do practical activities to formulate theories and methodologies.
	ELECTIVE	ESCM11020	International Internship I	2	2	1, 2	Spring, Fall	Through practical activities such as survey and research work in foreign organizations, schools, government agencies, and similar institutions that speaks English, have experience in different field in Japan and understand various problems related to society and technology from an international perspective.
		ESCM13010	International Internship II	2	2	1, 2	Spring, Fall	Through practical activities such as survey and research work in foreign organizations, schools, government agencies, and similar institutions that speaks English, have experience in different field in Japan and understand various problems related to society and technology from an international perspective. (Training will be conducted at a different destination rather than International Internship I)
		ESCM11030	Internship I	1	1	1	Spring	The actual development and participation of projects activities at companies, government agencies, schools and other organizations etc., will give understanding of ; the behavior of members of the society, the structure of the society and approach of work. (About 1 week)
		ESCM12010	Internship II	1	1	1	Fall	The actual development and participation of projects activities at companies, government agencies, schools and other organizations etc., will give understanding of ; the behavior of members of the society, the structure of the society and approach of work. (Training at a different destination from Internship I for about a week)
		ESCM11040	Internship III	2	2	1	Spring	The actual development and participation of projects activities at companies, government agencies, schools and other organizations etc., will give understanding of ; the behavior of members of the society, the structure of the society and approach of work. (About 2 week)
		ESCM12020	Internship IV	2	2	1	Fall	The actual development and participation of projects activities at companies, government agencies, schools and other organizations etc., will give understanding of ; the behavior of members of the society, the structure of the society and approach of work.(Training for about 2 weeks at a different destination from Internship III)

AREAS OF STUDY	REQ OR ELEC.	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Mechanical Systems Engineering	ELECTIVE	ESMS11020	Advanced Theory of Plasticity	2	2	1	Spring	Studies on continuum mechanics and plastic constitutive theory, Analysis of plastic large deformation of metals.
		ESMS11030	Solid Mechanics	2	2	1	Fall	Study of the continuum mechanics at the large deformation and its application in Finite Element Method exercises.
		ESMS12010	Theory of Elasticity	2	2	1	Spring	Study on stress analysis of two-dimensional problems and linear fracture mechanics.
		ESMS12020	Corrosion and Protection	2	2	1	Fall	Corrosion, Corrosion Protection.
		ESMS11040	Advanced Material Processing	2	2	1	Spring or Fall	Study of the rigid-plastic finite element method and computer programing.
		ESMS11050	Advanced Partial Differential Equation I	2	2	1	Spring	Advanced Partial Differential Equation
		ESMS12030	Advanced Partial Differential Equation II	2	2	1	Fall	Advanced Partial Differential Equation
		ESMS11060	Advanced Thermal Engineering	2	2	1	Spring	Applications of thermal dynamics in engineering
		ESMS11070	Advanced Transport Phenomena	2	2	1	Spring	Fundamentals of momentum, heat and mass transfer.
		ESMS11080	Advanced Fluid Mechanics	2	2	1	Spring	Study of numerical calculations of compressible flow by solving shock tube problems changing the initial and boundary conditions.
		ESMS11090	Advanced Multiphase Flow	2	2	1	Spring or Fall	Fundamental of multiphase flow with particles, droplets and bubbles
		ESMS11100	Advanced Heat Transfer Engineering	2	2	1	Spring	Study of heat and mass transfer on the heat conduction, the heat convection and the thermal radiation.
		ESMS12040	Advanced Thermal and Fluid Engineering	2	2	1	Fall	Study of heat transfer and its application, modeling of heat and mass transfer phenomena
		ESMS12050	Advanced Fluid Machinery	2	2	1	Fall	Airfoil performances, design for wind energy conversion systems.
		ESMS11110	Physical chemistry of multiphase and multicomponent systems	2	2	1	Spring or Fall	Basic and applied studies of physical chemistry of multiphase and multicomponent systems
		ESMS11120	Thermo-fluid dynamics in micro- and nano-scale	2	2	1	Spring or Fall	Basic and applied studies of thermo-fluid dynamics in micro- and nano-scale
		ESSC11010	Applied Control System Theory	2	2	1	Spring	PID control, Regulator, Observer, Fuzzy control, GA., Intelligent control.
		ESSC12010	Advanced Signal Processing in Mechanical Engineering	2	2	1	Fall	Digital signal processing, Fast Fourier Transform, Wavelet, Image processing and feature extraction
		ESSC12020	Intelligent Control Engineering	2	2	1	Fall	Genetic Algorithms, Neural Network, Design for Nonlinear Systems.
		ESMS14010	Special Lecture on Mechanical Systems Engineering Program I	2	Intensive Course			Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14020	Special Lecture on Mechanical Systems Engineering Program II	2				Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14030	Special Lecture on Mechanical Systems Engineering Program III	2				Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14040	Special Lecture on Mechanical Systems Engineering Program IV	2				Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14050	Special Lecture on Mechanical Systems Engineering Program A	1				Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14060	Special Lecture on Mechanical Systems Engineering Program B	1				Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14070	Special Lecture on Mechanical Systems Engineering Program C	1				Recent technological problems and topics in Mechanical Systems Engineering are lectured.
		ESMS14080	Special Lecture on Mechanical Systems Engineering Program D	1				Recent technological problems and topics in Mechanical Systems Engineering are lectured.

## Requirements:

Students must obtain a total of 30 or more credits including 6 credits from Master's Thesis in Engineering and further 6 credits from Special Seminars in Engineering. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and thesis.

## Method of taking courses:

Students must obtain a total of 18 or more credits from elective courses including 10 or more credits of specialized area courses in the Mechanical Systems Engineering Program and related subjects specified by the Mechanical Systems Engineering Program.

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## Electrical and Electronics Engineering

AREAS OF STUDY	REQ OR ELEC.	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Electrical and Electronics Engineering Program	ELECTIVE	ESEE11010	Advanced Power Energy Conversion	2	2	1	Spring	Power energy conversion, renewable energy, optimal operation.
		ESEE11020	Advanced Electric Machinery	2	2	1	Spring	The characteristic of electric machinery and the control and energy conversion for electric machinery with power electronics techniques are discussed.
		ESEE11030	Advanced Magnetic Materials	2	2	1	Spring	Ferromagnetic materials, magnetostriction, magnetic anisotropy.
		ESSC12050	Advanced Medical Electronics	2	2	1	Fall	Medical instrumentation, therapeutic and prosthetic devices.
		ESEE11040	Advanced Relativistic Electromagnetism	2	2	1	Spring	Special relativity, electromagnetism, tensor.
		ESEE12010	Advanced Power System Analysis	2	2	1	Fall	Computational methods for power system load flow, optimal power flow and stability analysis.
		ESEE12020	Advanced Power Electronics	2	2	1	Fall	DC/DC converter, PWM inverter, motor control, AC/DC converter, energy conversion, renewable energy, FACTS devices in power system, advanced control.
		ESEE12030	Advanced Plasma Engineering	2	2	1	Fall	Characteristics of plasma, plasma processing.
		ESSC12040	Advanced Nonlinear Control Theory	2	2	1	Fall	Geometric properties of nonlinear control systems, stability, nonlinear control system design.
		ESEE12040	Advanced Modern Control Theory	2	2	1	Fall	Subject of control, model error CAD system, design method of controlling system.
		ESEE11050	Advanced Thin Film Materials Engineering	2	2	1	Spring	Electronic materials, thin film materials processing for electronics.
		ESEE11060	Advanced Quantum Computer Engineering	2	2	1	Spring	Quantum algorithms, quantum gates, quantum devices.
		ESEE11070	VLSI Systems Design	2	2	1	Spring	VLSI architecture, VLSI layout, circuit simulation, VLSI CAD tools.
		ESEE11080	Optical Device Instrumentation Technology	2	2	1	Spring	Passive and Active fiber components using the ultra long optical transmission system based on light-wave phenomenon, "Maxwell's equations, transmission characteristics on optical fibers and fiber design".
		ESEE11090	Advanced Dependable Systems	2	2	1	Spring	Dependable computer systems, fault-tolerant systems and error detecting/correcting codes.
		ESSC11020	Advanced Wireless Communication Systems	2	2	1	Spring	Multiple Access techniques, Propagation and Noise, Modulation, Coding.
		ESSC11030	Advanced Image Processing	2	2	1	Spring	Image processing systems and its applications based on image analysis or inverse problems.
		ESEE11100	Telecommunication and Speech Signal Processing	2	2	1	Spring	Signal processing including ARMA filter and Linear Prediction, Speech Coding including PCM, ACELP and EVS.
		ESEE12050	Advanced Semiconductor Electronics	2	2	1	Fall	The structure, physical and chemical properties of electronic materials.
		ESEE12060	Advanced Vacuum Technology	2	2	1	Fall	Vacuum pumps and gauges, phenomena in vacuum, fabrication processes for semiconductor.
		ESEE12070	Organic Electronics Material Engineering	2	2	1	Fall	Organic functional materials, organic electronics devices.
		ESEE14010	Special Lecture on Electrical and Electronics Engineering Program I	2	Intensive Course			Will be given a theme by a supervisor.
		ESEE14020	Special Lecture on Electrical and Electronics Engineering Program II	2				Will be given a theme by a supervisor.
		ESEE14030	Special Lecture on Electrical and Electronics Engineering Program III	2				Will be given a theme by a supervisor.
		ESEE14040	Special Lecture on Electrical and Electronics Engineering Program IV	2				Will be given a theme by a supervisor.
		ESEE14050	Special Lecture on Electrical and Electronics Engineering Program V	2				Will be given a theme by a supervisor.
		ESEE14060	Special Lecture on Electrical and Electronics Engineering Program VI	1				Will be given a theme by a supervisor.
		ESEE14070	Special Lecture on Electrical and Electronics Engineering Program VII	1				Will be given a theme by a supervisor.
		ESEE14080	Special Lecture on Electrical and Electronics Engineering Program VIII	1				Will be given a theme by a supervisor.
		ESEE14090	Special Lecture on Electrical and Electronics Engineering Program IX	1				Will be given a theme by a supervisor.
		ESEE14100	Special Lecture on Electrical and Electronics Engineering Program X	1				Will be given a theme by a supervisor.

## Requirements:

Students must obtain a total of 30 or more credits including 6 credits from Master's Thesis in Engineering and further 6 credits from Special Seminars in Engineering. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and thesis.

## Method of taking courses:

Students must obtain a total of 18 or more credits from elective courses including 10 or more credits of specialized area courses in the Electrical and Electronics Engineering Program and related subjects specified by the Electrical and Electronics Engineering Program.

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## Master's Program

## Civil Engineering

AREAS OF STUDY	REQ OR ELEC.	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Civil Engineering	ELECTIVE	ESCE11010	Advanced Design Engineering of Steel Structures	2	2	1	Spring	Yield strength, tensile strength and load bearing properties. Mechanical properties and buckling. Steel structure design and strength evaluation method.
		ESSC11040	Advanced Numerical Methods for Fluid Dynamics	2	2	1	Spring	To learn the basics of fluid mechanics, computational fluid dynamics, programming techniques, simulation method and large-scale simulation.
		ESCE11040	Advanced Geotechnical and Geoenvironmental Engineering	2	2	1	Spring	This course covers mass transfer in soil, soil accumulation, leaching and bio-mediated geotechnics, and mathematical modeling for geo-materials.
		ESCE11060	Advanced Environment and Disaster Risk Management	2	2	1	Spring	Methodology and planning systems of natural disaster risk management and environmental creation for sustainable development
		ESCE12030	Advanced River Engineering	2	2	1	Fall	The course gives numerical simulations of flood flows and river bed variations in complicated boundary geometry by using depth integrated equations of flows in the curvilinear coordinate system.
		ESCE12040	Advanced Rock Mechanics	2	2	1	Fall	This course is concerned with the mechanics and engineering characteristics of discontinuous rock such as the slope stability, underground cavity.
		ESCE13010	Advanced Computational Solid Mechanics	2	2	1,2	Fall	The course gives the theory of the finite element method, a programming technique for the finite element method using FreeFEM, in addition, how to consider the obtained results.
		ESCE14010	Special Lecture on Civil Program I	2	Intensive Course			Will be given a theme by a supervisor.
		ESCE14020	Special Lecture on Civil Program II	2				Will be given a theme by a supervisor.
		ESCE14030	Special Lecture on Civil Program III	2				Will be given a theme by a supervisor.
		ESCE14040	Special Lecture on Civil Program IV	2				Will be given a theme by a supervisor.
		ESCE14050	Special Lecture on Civil Program V	2				Will be given a theme by a supervisor.
		ESCE14060	Special Lecture on Civil Program VI	1				Will be given a theme by a supervisor.
		ESCE14070	Special Lecture on Civil Program VII	1				Will be given a theme by a supervisor.
		ESCE14080	Special Lecture on Civil Program VIII	1				Will be given a theme by a supervisor.
		ESCE14090	Special Lecture on Civil Program IX	1				Will be given a theme by a supervisor.
		ESCE14100	Special Lecture on Civil Program X	1				Will be given a theme by a supervisor.

## Requirements:

Students must obtain a total of 30 or more credits including 6 credits from Master's Thesis in Engineering and further 6 credits from Special Seminars in Engineering. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and thesis.

## Method of taking courses:

Students must obtain a total of 18 or more credits from elective courses including 10 or more credits of specialized area courses in the Civil Engineering Program and related subjects specified by the Civil Engineering Program.

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Master's Program

Architecture & Building Engineering

AREAS OF STUDY	REQ OR ELEC.	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Architecture and Building Engineering	ELECTIVE	ESAB11020	Advanced Architectural Design	2	2	1	Spring	This class focuses on aims, concepts, methodologies, technologies, forms and effects in architectural design around the world.
		ESAB11030	Advanced Urban Planning	2	2	1	Spring	In this lecture, students will learn about planning theory and development design in urban development.
		ESAB11040	Advanced Structural Mechanics	2	2	1	Spring	Elastoplastic analysis, plastic moment, collapse load factor, collapse mechanism, limit states.
		ESAB11050	Advanced Structural Design in Natural Hazard Prone Areas	2	2	1,2	1st Quarter	This subject provides a detailed explanation of the mechanisms behind natural disasters and the design theories to address them. The aim is to deepen the understanding of design theories for disaster resilience.
		ESAB12010	Advanced Community Space Planning	2	2	1	3rd Quarter	City planning and neighborhood area planning from points of view of community preservation and development.
		ESAB12020	Advanced Environmental Noise	2	2	1	3rd Quarter	Lectures on environmental noise evaluation methods based on noise level and subjective evaluation and the concept of soundscape.
		ESAB12030	Advanced Building Materials	2	2	1,2	Fall	Learn the theory and current status of building life extension, concrete rheology and effective use of waste based on the latest research results.
		ESAB12040	Advanced Construction Data Mining	2	2	1	Fall	Focus on building materials and construction, it outlines the machine learning and big data utilization techniques needed to improve their production efficiency.
		ESAB14010	Special Lecture on Architecture Program I	2	Intensive Course			Will be given a theme by a supervisor.
		ESAB14020	Special Lecture on Architecture Program II	2				Will be given a theme by a supervisor.
		ESAB14030	Special Lecture on Architecture Program III	2				Will be given a theme by a supervisor.
		ESAB14040	Special Lecture on Architecture Program IV	2				Will be given a theme by a supervisor.
		ESAB14050	Special Lecture on Architecture Program V	2				Will be given a theme by a supervisor.
		ESAB14060	Special Lecture on Architecture Program VI	1				Will be given a theme by a supervisor.
		ESAB14070	Special Lecture on Architecture Program VII	1				Will be given a theme by a supervisor.
		ESAB14080	Special Lecture on Architecture Program VIII	1				Will be given a theme by a supervisor.
		ESAB14090	Special Lecture on Architecture Program IX	1				Will be given a theme by a supervisor.
		ESAB14100	Special Lecture on Architecture Program X	1				Will be given a theme by a supervisor.

Requirements:

Students must obtain a total of 30 or more credits including 6 credits from Master's Thesis in Engineering and further 6 credits from Special Seminars in Engineering. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and thesis.

Method of taking courses:

Students must obtain a total of 18 or more credits from elective courses including 10 or more credits of specialized area courses in the Architecture & Building Engineering Program and related subjects specified by the Architecture & Building Engineering Program.

## 2025 SUBJECTS (Engineering)

Table (Article 10)

Master's Program

## Systems and Computer Engineering

AREAS OF STUDY	REQ OR ELEC.	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Systems and Computer Engineering	ELECTIVE	ESSC11010	Applied Control System Theory	2	2	1	Spring	PID control, Regulator, Observer, Fuzzy control, GA., Intelligent control.
		ESSC12010	Advanced Signal Processing in Mechanical Engineering	2	2	1	Fall	Digital signal processing, Fast Fourier Transform, Wavelet, Image processing and feature extraction
		ESSC12020	Intelligent Control Engineering	2	2	1	Fall	Genetic Algorithms, Neural Network, Design for Nonlinear Systems.
		ESSC12040	Advanced Nonlinear Control Theory	2	2	1	Fall	Geometric properties of nonlinear control systems, stability, nonlinear control system design.
		ESSC12050	Advanced Medical Electronics	2	2	1	Fall	Medical instrumentation, therapeutic and prosthetic devices.
		ESSC11020	Advanced Wireless Communication Systems	2	2	1	Spring	Multiple Access techniques, Propagation and Noise, Modulation, Coding.
		ESSC11030	Advanced Image Processing	2	2	1	Spring	Image processing systems and its applications based on image analysis or inverse problems.
		ESCE13010	Advanced Computational Solid Mechanics	2	2	1,2	Fall	The course gives the theory of the finite element method, a programming technique for the finite element method using FreeFEM, in addition, how to consider the obtained results.
		ESSC11040	Advanced Numerical Methods for Fluid Dynamics	2	2	1	Spring	To learn the basics of fluid mechanics, computational fluid dynamics, programming techniques, simulation method and large-scale simulation.
		ESCE11040	Advanced Geotechnical and Geoenvironmental Engineering	2	2	1	Spring	This course covers mass transfer in soil, soil accumulation, leaching and bio-mediated geotechnics, and mathematical modeling for geo-materials.
		ESCE11060	Advanced Environment and Disaster Risk Management	2	2	1	Spring	Methodology and planning systems of natural disaster risk management and environmental creation for sustainable development
		ESCE12030	Advanced River Engineering	2	2	1	Fall	The course gives numerical simulations of flood flows and river bed variations in complicated boundary geometry by using depth integrated equations of flows in the curvilinear coordinate system.
		ESAB12040	Advanced Construction Data Mining	2	2	1	Fall	Focus on building materials and construction, it outlines the machine learning and big data utilization techniques needed to improve their production efficiency.
		ESAB11040	Advanced Structural Mechanics	2	2	1	Spring	Elastoplastic analysis, plastic moment, collapse load factor, collapse mechanism, limit states.
		ESAB11030	Advanced Urban Planning	2	2	1	Spring	In this lecture, students will learn about planning theory and development design in urban development.
		ESCI12040	Advanced Data Mining	2	2	1	Fall	Web inspired Research involving Search, Models of Search, Retrieval and Data Mining, Algorithm Design and Analysis
		ESSC14010	Special Lecture on Systems and Computer Engineering Program I	2	Intensive Course(30hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14020	Special Lecture on Systems and Computer Engineering Program II	2	Intensive Course(30hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14030	Special Lecture on Systems and Computer Engineering Program III	2	Intensive Course(30hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14040	Special Lecture on Systems and Computer Engineering Program IV	2	Intensive Course(30hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14050	Special Lecture on Systems and Computer Engineering Program V	2	Intensive Course(30hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14060	Special Lecture on Systems and Computer Engineering Program VI	1	Intensive Course(15hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14070	Special Lecture on Systems and Computer Engineering Program VII	1	Intensive Course(15hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14080	Special Lecture on Systems and Computer Engineering Program VIII	1	Intensive Course(15hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14090	Special Lecture on Systems and Computer Engineering Program IX	1	Intensive Course(15hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor
		ESSC14100	Special Lecture on Systems and Computer Engineering Program X	1	Intensive Course(15hr) (1,2) (Spring or Fall)			Will be given a theme by a supervisor

## Requirements:

Students must obtain a total of 30 or more credits including 6 credits from Master's Thesis in Engineering and further 6 credits from Special Seminars in Engineering. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and thesis.

## Method of taking courses:

Students must obtain a total of 18 or more credits from elective courses including 10 or more credits of specialized area courses in the Systems and Computer Engineering Program.

## 2025 SUBJECTS (Engineering)

Table (Article 10)

## Master's Program

## Computer Science and Intelligent Systems

AREAS OF STUDY	REQ OR ELEC.	CORE Subjects	SUBJECT CODE	SUBJECT	CREDITS	HOURS PER WEEK	YEARS	SEMESTERS	SUBJECT DESCRIPTION
Computer Science and Intelligent Systems	ELECTIVE	<input type="radio"/>	ESCI13010	Advanced Probabilistic Models	2	2	1,2	Spring	Mathematical Statistics, Computational Statistics, Data Science, and Human Behavior Modeling
		<input type="radio"/>	ESCI13020	Advanced Artificial Intelligence	2	2	1,2	Spring	Problem Solving, Knowledge Representation, Machine Learning, Evolutionary Computation and Intelligent Agents
		<input type="radio"/>	ESCI13030	Advanced Intelligent Robotics	2	2	1,2	Spring	Intelligence of Autonomous Robots, Learning Methods and Emergence of Robot behaviors. Behavior based AI Systems
		<input type="radio"/>	ESCI11020	Advanced Intelligent Information Processing	2	2	1,2	Spring	Design and Development of Intelligent Systems, Machine Learning, Signal Processing, Knowledge Representation
		<input type="radio"/>	ESCI12010	Advanced Biological Information Processing	2	2	1	Fall	Techniques for Bio signal Measurements, Analysis of Biological Time-Series Data, Nonlinear Time-Series Analysis
			ESCI11040	Practical Exercise I	2	2	1	Spring	Practical Exercise on Information Technology (The content of the exercise should be different from Practical Exercise II and III)
			ESCI12020	Practical Exercise II	2	2	1	Fall	Practical Exercise on Information Technology (The content of the exercise should be different from Practical Exercise I and III)
			ESCI13040	Practical Exercise III	2	2	2	Spring	Practical Exercise on Information Technology (The content of the exercise should be different from Practical Exercise I and II)
		<input type="radio"/>	ESCI14010	Advanced Algorithms	2	2	1,2	Fall	Graph Algorithms, Optimization Algorithms, and Related Applications
		<input type="radio"/>	ESCI12040	Advanced Data Mining	2	2	1	Fall	Web inspired Research involving Search, Models of Search, Retrieval and Data Mining, Algorithm Design and Analysis
		<input type="radio"/>	ESCI12050	Advanced Multimedia Information Processing	2	2	1	Fall	Digital Signal Processing, Intelligent Image Processing, Physiology and Cognitive Science for Human Perception, Neural Computing and Algorithms for Communication Systems
		<input type="radio"/>	ESCI12060	Advanced UI/UX	2	2	1	Fall	Human Computer Interaction, Usability Engineering, Interaction Design and User-Centered Design
			ESCI13050	Advanced Artificial Society & Multi-agent Systems	2	2	1,2	Spring	Multiagent Systems, Artificial Societies, Simulated Organizations and Interaction of Humans & Computational Agents
			ESCI13060	Advanced Human Augmentation Engineering	2	2	1,2	Spring	Studying Technologies and Elemental Technologies to extend and support Human Perception, Cognitive Abilities, and Physical Abilities from Engineering Perspective
			ESCI13070	Advanced Service Engineering	2	2	1,2	Spring	Service Engineering, Data Science, and Human Behavior Analysis
			ESCI14020	Advanced Parallel Processing	2	2	1,2	Fall	Parallel Programming, Parallel Algorithms, Distributed Algorithms, and Distributed systems
		<input type="radio"/>	ESCI14070	HCI Special Theory	2	2	1,2	Spring or Fall	HCI (Human-Computer Interaction), Research & Development of Interfaces, and Development of Information Science & Industry
		<input type="radio"/>	ESCI14080	Information and Coding Theory	2	2	1,2	Spring or Fall	Information Source Coding, Channel Coding and Applications to Media Compression & Transmission
			ESCI14030	Special Lecture on Computer Science & Intelligent Systems Program I	2	Intensive Course(30hr) (1,2) (Spring or Fall)		Will be given a theme by a supervisor	
			ESCI14040	Special Lecture on Computer Science & Intelligent Systems Program II	2	Intensive Course(30hr) (1,2) (Spring or Fall)		Will be given a theme by a supervisor	
			ESCI14050	Special Lecture on Computer Science & Intelligent Systems Program III	1	Intensive Course(15hr) (1,2) (Spring or Fall)		Will be given a theme by a supervisor	
			ESCI14060	Special Lecture on Computer Science & Intelligent Systems Program IV	1	Intensive Course(15hr) (1,2) (Spring or Fall)		Will be given a theme by a supervisor	

## Requirements:

Students must obtain a total of 30 or more credits including 10 credits from the CORE Subjects, 6 credits from Master's Thesis in Engineering and further 6 credits from Special Seminars in Engineering. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and thesis.

## Method of taking courses:

At least 18 credits of elective courses, of which at least 10 credits must be earned from the core courses of the Computer Science and Intelligent Systems.

Table (Article 10) Master's Program

Course: Chemistry, Biology and Marine Science

FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
BIOSCIENCE	REQUIRED	COMMON	ESSP11010	Advanced Seminar I	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11020	Advanced Seminar II	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13010	Advanced Seminar III	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13020	Advanced Seminar IV	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11030	Thesis Research I	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP11040	Thesis Research II	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13030	Thesis Research III	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13040	Thesis Research IV	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
	ELECTIVE	COMMON	ESSP13090	International Field Course	2	30	1,2	Spring	Field and laboratory work at field stations to learn techniques of marine and environmental sciences related to LA MER program.
			ESSP13120	Cross-Disciplinary Seminar	2	30	1,2	Fall	Students will learn how to plan, organize, manage, open, and run a small conference.
		SPECIAL	ESBI13160	Advanced Topics in Marine Animal Behavior	2	30	1,2	Fall	Topics in behavioral studies for marine animals, such as biotelemetry measurement, ethology and comparative psychology. This class deals mainly with cephalopods as a model animals for this field.
			ESBI13020	Plant Phylogeny and Evolution	2	30	1,2	Fall	Recent advances in flowering plant phylogeny and evolution.
			ESBI13090	Life of Tunicates	2	30	1,2	Spring	Introduction to specific features and functions supporting the life of marine invertebrates, dealing with tunicates.
			ESBI13070	Stress Physiology	2	30	1,2	Fall	Introduction to basic principles of stress physiology, including the production and scavenging mechanisms of active oxygen and active nitrogen in living organisms.
			ESBI13080	Advanced Cell Biology	2	30	1,2	Spring	Current topics in cell biology, with emphasis on the biogenesis of organelles and cytoskeleton.
			ESBI13100	Advanced Molecular Physiology	2	30	1,2	Spring	Fundamentals of molecular biology, cellular physiology, developmental biology, immunology, and neurobiology. Focuses on mammalian and insect systems.
			ESBI13310	Advanced Ichthyology	2	30	1,2	Fall	Recent advances in fish research will be introduced. Students will also introduce research papers or books in a seminar format.



FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
BIOSCIENCE	ELECTIVE	SPECIAL	ESBI13130	Advanced Scientific Manuscript Writing	2	30	1,2	Spring	Structure and organization of scientific publications, as well as how to organize and write manuscripts will be discussed. Special attention will be put on logical organization and troublesome grammar points.
			ESBI13180	Advanced Comparative Endocrinology	2	30	1,2	Fall	Endocrine organs and various hormones in vertebrates. Roles of hormones in metabolism, reproduction, and behavior.
			ESBI13170	Marine Molecular Ecology	2	30	1,2	Fall	Principles and fundamental methods in aquatic animals using molecular and population genetics. Practical method on DNA analysis.
			ESBI13200	Systematic Zoology	2	30	1,2	Spring	Principles and practices of taxonomy, systematics, and phylogenetics of animals, with reference to contemporary discussions on relevant conceptual issues.
			ESBI13120	Responses in Plant Morphogenesis to Environmental Signals	2	30	1,2	Fall	Current topics about the signal cascades of plant morphogenesis caused by environmental signals.
			ESBI13050	Animal Evolution and Diversity	2	30	1,2	Fall	Introduction to evolution and diversity in vertebrates.
			ESBI13060	Advanced Animal Ecology	2	30	1,2	Fall	Overview of animal ecology, animal–plant interaction, and island biology.
			ESBI13220	Advanced Marine Biology	2	30	1,2	Fall	After reviewing marine biology concepts through lectures and readings of scientific papers, the class will discuss ocean environments and various marine ecosystems.
			ESBI13230	Molecular Biochemistry of Plant Biodegradation	2	30	1,2	Fall	Reviews on the current topics in biodegradation of plants with special reference to the mechanisms by which lignocellulolytic enzymes are involved in breakdown of plant cell walls.
			ESBI13210	Advanced Evolutionary Ecology	2	30	1,2	Spring	Evolutionary analysis of form and function, life–history, and sexual dimorphism in animals.
			ESBI13040	Marine Environmental Biology and Ecology	2	30	1,2	Fall	Overview of current research on marine environmental biology.
			ESBI13030	Advanced Coral Reef Ecology	2	30	1,2	Fall	Reviews on current topics in coral reef ecology.
			ESBI13240	Advanced Marine Zootaxonomy	2	30	1,2	Spring	Practices of zootaxonomy of marine invertebrates.
			ESBI13250	Advanced Seminar of Evolutionary Reproductive Biology	2	30	1,2	Spring	Instruction of reproductive biology in terms of evolutionary aspects and practice of analyses with laptop computer.
			ESBI13260	Advanced Plant Taxonomy and Phytogeography	2	30	1,2	Spring	Principles and fundamental methods in plant taxonomy and phytogeography with special reference to the diversity of flowering plants.
			ESBI13110	Advanced Molecular and Cellular Biology	2	30	1,2	Spring	Topics in organelle dynamics and function. Focuses on single membrane bound organelles such as endoplasmic reticulum, Golgi apparatus, peroxisomes, and lysosomes.
			ESBI13020	Advanced Plant Ecology	2	30	1,2	Fall	Review of current topics on the maintenance and origin of biodiversity patterns based on taxonomic, functional and phylogenetic properties.
			ESBI13290	Basics of Symbiosis	2	30	1,2	Spring	Introduction of current topics about the symbiotic relationship between corals and algae.
			ESBI13300	Advanced Biodiversity and Evolution Sciences	2	30	1,2	Fall	Overview of current research on evolution and biodiversity, focusing mainly on molecular phylogeny and population genetics.
			ESBI13320	Methodology for Field Ecology	2	30	1,2	Fall	Students will learn statistical sampling techniques to detect patterns in biological communities in the field. Intended for beginners.

Requirements for course completion:
Students must obtain a total of 30 or more credits including 6 credits from Advanced Seminar and 12 credits from Thesis Research on Bioscience Field. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and Master's thesis.

Table (Article 10) Master's Program

Course: Chemistry, Biology and Marine Science  
Physics and Earth Sciences

Physics and Earth Sciences									
FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
ENVIRONMENTAL SCIENCE	REQUIRED	COMMON	ESSP11050	Advanced Seminar I	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11060	Advanced Seminar II	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13050	Advanced Seminar III	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13060	Advanced Seminar IV	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11070	Thesis Research I	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP11080	Thesis Research II	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13070	Thesis Research III	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13080	Thesis Research IV	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
	ELECTIVE	COMMON	ESSP13100	International Field Course	2	30	1,2	Spring	Field and laboratory work at field stations to learn techniques of marine and environmental sciences related to LA MER program.
			ESSP13130	Cross-Disciplinary Seminar	2	30	1,2	Fall	Students will learn how to plan, organize, manage, open, and run a small conference.
		SPECIAL	ESCH11140	Introduction to Atmospheric Chemistry	2	30	1,2	Spring	This course provides an overview of atmospheric chemistry and a working knowledge of the critical issues that atmospheric chemists face today.
			ESCH11090	Environmental Analytical Chemistry I	2	30	1,2	Spring	This course deals with qualitative and quantitative analytical chemistry, especially principles and procedures of chemical analyses of environmental water sample.
			ESCH11110	Practical Skills in Presentation, Publication and Patent Application	2	30	1,2	Spring	Learning and training presentation/writing skills for research outputs such as: (1) oral presentation at conference (2) poster presentation at conference (3) patent search and submission (4) scientific paper
			ESCH11150	Introduction to Natural Product Chemistry	2	30	1,2	Spring	This course deals with isolation, structure determination and biological activities of natural products.
			ESCH13020	Advanced Environmental Analytical Chemistry	2	30	1,2	Fall or Spring	Lectures on air pollution will be given on the characteristics of air pollutants that affect climate change and our health.
			ESCH13010	Advanced Crustal Hydrosphere Geochemistry	2	30	1,2	Spring	Reviews of geochemical studies about fluids and gasses beneath the seafloor.
			ESCH11080	Biochemistry of Metal Ions	2	30	1,2	Spring	Lecture on roles of metal irons in biology.
			ESCH11120	Catalytic Chemistry	2	30	1,2	Spring	This course describes the preparation methods, basic theories, and latest topics of catalysts used in chemical reactions that cause energy conversion between electrical and chemical energy.
			ESCH11060	Advanced Stereochemistry	2	30	1,2	Fall	This lecture will be about basic knowledge and information how to control stereochemistry on organic reactions.
			ESCH11010	Molecular Spectroscopy I	2	30	1,2	Spring	Spectroscopies to characterize molecular properties and the applications in biophysical chemistry.

Table (Article 10) Master's Program

Course: Chemistry, Biology and Marine Science  
Physics and Earth Sciences

Physics and Earth Sciences									
FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
ENVIRONMENTAL SCIENCE	ELECTIVE	SPECIAL	ESEA13130	Advanced Ocean Remote Sensing I	2	30	1,2	Spring	Principles of ocean remote sensing such as radiometer, scatterometer and altimeter. Applications of ocean remote sensing to physical oceanography.
			ESEA13140	Advanced Ocean Remote Sensing II	2	30	1,2	Spring	Principles of ocean remote sensing such as radiometer, scatterometer and altimeter. Applications of ocean remote sensing to physical oceanography.
			ESEA13230	Numerical Weather Prediction I	2	30	1,2	Fall	Acquire knowledge of numerical weather prediction and its applications through series of lectures and seminars.
			ESEA13240	Numerical Weather Prediction II	2	30	1,2	Spring	Acquire knowledge of numerical weather prediction and its applications through series of lectures and seminars.
			ESEA13210	Advanced Climate Dynamics I	2	30	1,2	Fall	Acquire knowledge of climate changes from past to the future and their dynamics through series of lectures and seminars.
			ESEA13220	Advanced Climate Dynamics II	2	30	1,2	Spring	Acquire knowledge of climate changes from past to the future and their dynamics through series of lectures and seminars.
			ESEA13090	Advanced Metamorphic Petrology I	2	30	1,2	Fall	Petrogenesis and dynamics of metamorphic rocks and its geotectonic implications.
			ESEA13100	Advanced Metamorphic Petrology II	2	30	1,2	Spring	Petrogenesis and dynamics of metamorphic rocks and its geotectonic implications.
			ESEA13110	Advanced Geomorphology I	2	30	1,2	Fall	Principles and applications of geomorphological processes such as weathering, erosion, transportation and sedimentation
			ESEA13120	Advanced Geomorphology II	2	30	1,2	Spring	Principles and applications of geomorphological processes such as weathering, erosion, transportation and sedimentation
			ESEA13030	Advanced Geochemistry I	2	30	1,2	Fall	Isotopic and trace element geochemistry of igneous rocks and its geotectonic implications.
			ESEA13040	Advanced Geochemistry II	2	30	1,2	Spring	Isotopic and trace element geochemistry of igneous rocks and its geotectonic implications.
			ESEA13050	Advanced Seismology I	2	30	1,2	Fall	This course constitutes an overview of observational and theoretical seismology and the utilization of seismic waves for the study of the earth's interior. Topics include elastic wave propagation, seismic ray theory, interpretation of travel times, surface wave, and seismic tomography.
			ESEA13060	Advanced Seismology II	2	30	1,2	Spring	This course constitutes an overview of observational and theoretical seismology and the utilization of seismic waves for the study of the earth's interior. Topics include elastic wave propagation, seismic ray theory, interpretation of travel times, surface wave, and seismic tomography.
			ESEA13070	Earth History and Palaeontology I	2	30	1,2	Fall	This lecture will help you develop key knowledge and research skills in the field of earth history and palaeontology. Lecture on basic training in earth sciences, with a specialisation in stratigraphy and palaeontology.
			ESEA13080	Earth History and Palaeontology II	2	30	1,2	Spring	This lecture will help you develop key knowledge and research skills in the field of earth history and palaeontology. Lecture on basic training in earth sciences, with a specialisation in stratigraphy and palaeontology.

Requirements for course completion:

Students must obtain a total of 30 or more credits including 6 credits from Advanced Seminar and 12 credits from Thesis Research on Environmental Science Field. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and Master's thesis.

Table (Article 10) Master's Program

**Course: Chemistry, Biology and Marine Science**

FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
BIOSCIENCE	REQUIRED	COMMON	ESSP11010	Advanced Seminar I	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11020	Advanced Seminar II	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13010	Advanced Seminar III	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13020	Advanced Seminar IV	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11030	Thesis Research I	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP11040	Thesis Research II	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13030	Thesis Research III	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13040	Thesis Research IV	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
	ELECTIVE	COMMON	ESSP13090	International Field Course	2	30	1,2	Spring	Field and laboratory work at field stations to learn techniques of marine and environmental sciences related to G-OCEANS program.
			ESSP13120	Cross-Disciplinary Seminar	2	30	1,2	Fall	Students will learn how to plan, organize, manage, open, and run a small conference.
		SPECIAL	ESBI13160	Advanced Topics in Marine Animal Behavior	2	30	1,2	Fall	Topics in behavioral studies for marine animals, such as biotelemetry measurement, ethology and comparative psychology. This class deals mainly with cephalopods as a model animals for this field.
			ESBI13020	Plant Phylogeny and Evolution	2	30	1,2	Fall	Recent advances in flowering plant phylogeny and evolution.
			ESBI13090	Life of Tunicates	2	30	1,2	Spring	Introduction to specific features and functions supporting the life of marine invertebrates, dealing with tunicates.
			ESBI13070	Stress Physiology	2	30	1,2	Fall	Introduction to basic principles of stress physiology, including the production and scavenging mechanisms of active oxygen and active nitrogen in living organisms.
			ESBI13080	Advanced Cell Biology	2	30	1,2	Spring	Current topics in cell biology, with emphasis on the biogenesis of organelles and cytoskeleton.
			ESBI13100	Advanced Molecular Physiology	2	30	1,2	Spring	Fundamentals of molecular biology, cellular physiology, developmental biology, immunology, and neurobiology. Focuses on mammalian and insect systems.
			ESBI13310	Advanced Ichthyology	2	30	1,2	Fall	Recent advances in fish research will be introduced. Students will also introduce research papers or books in a seminar format.

Table (Article 10) Master's Program

**Course: Chemistry, Biology and Marine Science**

FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
BIOSCIENCE	ELECTIVE	SPECIAL	ESBI13130	Advanced Scientific Manuscript Writing	2	30	1,2	Spring	Structure and organization of scientific publications, as well as how to organize and write manuscripts will be discussed. Special attention will be put on logical organization and troublesome grammar points.
			ESBI13180	Advanced Comparative Endocrinology	2	30	1,2	Fall	Endocrine organs and various hormones in vertebrates. Roles of hormones in metabolism, reproduction, and behavior.
			ESBI13170	Marine Molecular Ecology	2	30	1,2	Fall	Principles and fundamental methods in aquatic animals using molecular and population genetics. Practical method on DNA analysis.
			ESBI13200	Systematic Zoology	2	30	1,2	Spring	Principles and practices of taxonomy, systematics, and phylogenetics of animals, with reference to contemporary discussions on relevant conceptual issues.
			ESBI13120	Responses in Plant Morphogenesis to Environmental Signals	2	30	1,2	Fall	Current topics about the signal cascades of plant morphogenesis caused by environmental signals.
			ESBI13050	Animal Evolution and Diversity	2	30	1,2	Fall	Introduction to evolution and diversity in vertebrates.
			ESBI13060	Advanced Animal Ecology	2	30	1,2	Fall	Overview of animal ecology, animal-plant interaction, and island biology.
			ESBI13220	Advanced Marine Biology	2	30	1,2	Fall	After reviewing marine biology concepts through lectures and readings of scientific papers, the class will discuss ocean environments and various marine ecosystems.
			ESBI13230	Molecular Biochemistry of Plant Biodegradation	2	30	1,2	Fall	Reviews on the current topics in biodegradation of plants with special reference to the mechanisms by which lignocellulolytic enzymes are involved in breakdown of plant cell walls.
			ESBI13210	Advanced Evolutionary Ecology	2	30	1,2	Spring	Evolutionary analysis of form and function, life-history, and sexual dimorphism in animals.
			ESBI13040	Marine Environmental Biology and Ecology	2	30	1,2	Fall	Overview of current research on marine environmental biology.
			ESBI13030	Advanced Coral Reef Ecology	2	30	1,2	Fall	Reviews on current topics in coral reef ecology.
			ESBI13240	Advanced Marine Zootaxonomy	2	30	1,2	Spring	Practices of zootaxonomy of marine invertebrates.
			ESBI13250	Advanced Seminar of Evolutionary Reproductive Biology	2	30	1,2	Spring	Instruction of reproductive biology in terms of evolutionary aspects and practice of analyses with laptop computer.
			ESBI13260	Advanced Plant Taxonomy and Phytogeography	2	30	1,2	Spring	Principles and fundamental methods in plant taxonomy and phytogeography with special reference to the diversity of flowering plants.
			ESBI13110	Advanced Molecular and Cellular Biology	2	30	1,2	Spring	Topics in organelle dynamics and function. Focuses on single membrane bound organelles such as endoplasmic reticulum, Golgi apparatus, peroxisomes, and lysosomes.
			ESBI13020	Advanced Plant Ecology	2	30	1,2	Fall	Review of current topics on the maintenance and origin of biodiversity patterns based on taxonomic, functional and phylogenetic properties.
			ESBI13290	Basics of Symbiosis	2	30	1,2	Spring	Introduction of current topics about the symbiotic relationship between corals and algae.
			ESBI13300	Advanced Biodiversity and Evolution Sciences	2	30	1,2	Fall	Overview of current research on evolution and biodiversity, focusing mainly on molecular phylogeny and population genetics.
			ESBI13320	Methodology for Field Ecology	2	30	1,2	Fall	Students will learn statistical sampling techniques to detect patterns in biological communities in the field. Intended for beginners.

Requirements for course completion:

Students must obtain a total of 30 or more credits including 6 credits from Advanced Seminar and 12 credits from Thesis Research on Bioscience Field. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and Master's thesis.

Table (Article 10) Master's Program

Physics and Earth Sciences									
FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
ENVIRONMENTAL SCIENCE	REQUIRED	COMMON	ESSP11050	Advanced Seminar I	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11060	Advanced Seminar II	1.5	22.5	1	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13050	Advanced Seminar III	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP13060	Advanced Seminar IV	1.5	22.5	2	Fall & Spring	Present and discuss research information such as original academic papers, as well as research plans and findings, in a seminar format.
			ESSP11070	Thesis Research I	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP11080	Thesis Research II	3	90	1	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13070	Thesis Research III	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
			ESSP13080	Thesis Research IV	3	90	2	Fall & Spring	For each individual research objective and phase, provide guidance concerning research methods and development.
	ELECTIVE	COMMON	ESSP13100	International Field Course	2	30	1,2	Spring	Field and laboratory work at field stations to learn techniques of marine and environmental sciences related to G-OCEANS program.
			ESSP13130	Cross-Disciplinary Seminar	2	30	1,2	Fall	Students will learn how to plan, organize, manage, open, and run a small conference.
		SPECIAL	ESCH11140	Introduction to Atmospheric Chemistry	2	30	1,2	Spring	This course provides an overview of atmospheric chemistry and a working knowledge of the critical issues that atmospheric chemists face today.
			ESCH11090	Environmental Analytical Chemistry I	2	30	1,2	Spring	This course deals with qualitative and quantitative analytical chemistry, especially principles and procedures of chemical analyses of environmental water sample.
			ESCH11110	Practical Skills in Presentation, Publication and Patent Application	2	30	1,2	Spring	Learning and training presentation/writing skills for research outputs such as: (1) oral presentation at conference (2) poster presentation at conference (3) patent search and submission (4) scientific paper
			ESCH11150	Introduction to Natural Product Chemistry	2	30	1,2	Spring	This course deals with isolation, structure determination and biological activities of natural products.
			ESCH13020	Advanced Environmental Analytical Chemistry	2	30	1,2	Fall or Spring	Lectures on air pollution will be given on the characteristics of air pollutants that affect climate change and our health.
			ESCH13010	Advanced Crustal Hydrosphere Geochemistry	2	30	1,2	Spring	Reviews of geochemical studies about fluids and gasses beneath the seafloor.
			ESCH11080	Biochemistry of Metal Ions	2	30	1,2	Spring	Lecture on roles of metal irons in biology.
			ESCH11120	Catalytic Chemistry	2	30	1,2	Spring	This course describes the preparation methods, basic theories, and latest topics of catalysts used in chemical reactions that cause energy conversion between electrical and chemical energy.
			ESCH11060	Advanced Stereochemistry	2	30	1,2	Fall	This lecture will be about basic knowledge and information how to control stereochemistry on organic reactions.
			ESCH11010	Molecular Spectroscopy I	2	30	1,2	Spring	Spectroscopies to characterize molecular properties and the applications in biophysical chemistry.

Table (Article 10) Master's Program

Physics and Earth Sciences									
FIELD	SUBJECT		Subject Code	SUBJECT	CREDITS	HOURS	YEARS	SEMESTERS	SUBJECT DESCRIPTION
ENVIRONMENTAL SCIENCE	ELECTIVE	SPECIAL	ESEA13130	Advanced Ocean Remote Sensing I	2	30	1,2	Spring	Principles of ocean remote sensing such as radiometer, scatterometer and altimeter. Applications of ocean remote sensing to physical oceanography.
			ESEA13140	Advanced Ocean Remote Sensing II	2	30	1,2	Spring	Principles of ocean remote sensing such as radiometer, scatterometer and altimeter. Applications of ocean remote sensing to physical oceanography.
			ESEA13230	Numerical Weather Prediction I	2	30	1,2	Fall	Acquire knowledge of numerical weather prediction and its applications through series of lectures and seminars.
			ESEA13240	Numerical Weather Prediction II	2	30	1,2	Spring	Acquire knowledge of numerical weather prediction and its applications through series of lectures and seminars.
			ESEA13210	Advanced Climate Dynamics I	2	30	1,2	Fall	Acquire knowledge of climate changes from past to the future and their dynamics through series of lectures and seminars.
			ESEA13220	Advanced Climate Dynamics II	2	30	1,2	Spring	Acquire knowledge of climate changes from past to the future and their dynamics through series of lectures and seminars.
			ESEA13090	Advanced Metamorphic Petrology I	2	30	1,2	Fall	Petrogenesis and dynamics of metamorphic rocks and its geotectonic implications.
			ESEA13100	Advanced Metamorphic Petrology II	2	30	1,2	Spring	Petrogenesis and dynamics of metamorphic rocks and its geotectonic implications.
			ESEA13110	Advanced Geomorphology I	2	30	1,2	Fall	Principles and applications of geomorphological processes such as weathering, erosion, transportation and sedimentation
			ESEA13120	Advanced Geomorphology II	2	30	1,2	Spring	Principles and applications of geomorphological processes such as weathering, erosion, transportation and sedimentation
			ESEA13030	Advanced Geochemistry I	2	30	1,2	Fall	Isotopic and trace element geochemistry of igneous rocks and its geotectonic implications.
			ESEA13040	Advanced Geochemistry II	2	30	1,2	Spring	Isotopic and trace element geochemistry of igneous rocks and its geotectonic implications.
			ESEA13050	Advanced Seismology I	2	30	1,2	Fall	This course constitutes an overview of observational and theoretical seismology and the utilization of seismic waves for the study of the earth's interior. Topics include elastic wave propagation, seismic ray theory, interpretation of travel times, surface wave, and seismic tomography.
			ESEA13060	Advanced Seismology II	2	30	1,2	Spring	This course constitutes an overview of observational and theoretical seismology and the utilization of seismic waves for the study of the earth's interior. Topics include elastic wave propagation, seismic ray theory, interpretation of travel times, surface wave, and seismic tomography.
			ESEA13070	Earth History and Palaeontology I	2	30	1,2	Fall	This lecture will help you develop key knowledge and research skills in the field of earth history and palaeontology. Lecture on basic training in earth sciences, with a specialisation in stratigraphy and palaeontology.
			ESEA13080	Earth History and Palaeontology II	2	30	1,2	Spring	This lecture will help you develop key knowledge and research skills in the field of earth history and palaeontology. Lecture on basic training in earth sciences, with a specialisation in stratigraphy and palaeontology.

Requirements for course completion:

Students must obtain a total of 30 or more credits including 6 credits from Advanced Seminar and 12 credits from Thesis Research on Environmental Science Field. In addition to receiving the necessary instruction, the student must also receive a passing grade on final examinations and Master's thesis.

【Master's Program Engineering）】 List of related subjects specified by the program

Program	Related subject names specified by the program		CREDITS
Mechanical Systems Engineering	※There are no related subjects		
Electrical and Electronics Engineering	※There are no related subjects		
Civil Engineering	Mechanical Systems Engineering	Solid Mechanics	2
		Theory of Elasticity	2
		Corrosion and Protection	2
	Architecture & Building Engineering	Advanced Architectural Design	2
		Advanced Urban Planning	2
		Advanced Structural Mechanics	2
		Advanced Structural Design in Natural Hazard Prone Areas	2
		Advanced Community Space Planning	2
		Advanced Environmental Noise	2
		Advanced Building Materials	2
		Advanced Construction Data Mining	2
Architecture & Building Engineering	Civil Engineering	Advanced Design Engineering of Steel Structures	2
		Advanced Numerical Methods for Fluid Dynamics	2
		Advanced Geotechnical and Environmental Engineering	2
		Advanced Environment and Disaster Risk Management	2
		Advanced River Engineering	2
		Advanced Rock Mechanics	2
		Advanced Computational Solid Mechanics	2
Systems and Computer Engineering	※There are no related subjects		
Computer Science and Intelligent Systems	※There are no related subjects		