

[Interdisciplinary Foundation Courses] Engineering Mechanics and Energy Associated Courses

Course Number	Course Name	Instructional Type	Credits	standard registration on year	Term	Meeting Days, Period etc.	Classroom	Instructor	Course Overview	Remarks	Japanese (English) Course Name
OAH0203	Renewable Energy Engineering	1	2.0	1, 2	Fall/AB	Wed1, 2	3B303	Aki Hirohisa	This course provides discussions on renewable energy from various viewpoints: fundamental principle, technology development and challenges, and expected roles in energy system, social impact including state holders.	Students from various departments are welcome. Identical to O1CM440. Online (partially face-to-face)	再生可能エネルギー工学
OAH0210	Basis and practical training of machining	5	1.0	1, 2	Sum Vac	Intensive		Enami Kazuhiro	This course describes the basis of machining and cutting in order to enrich the knowledge and experience of machining, which is the base of manufacturing. Students learn the basic operation of machines by practical training of turning and milling at the workshop. Successful candidates get permission to use the open workshop of engineering workshop division.	face-to-face 講義と実習は対面形式で行う。なお、実習の制限より本科目の受講定員を8名とし、8名を超える受講希望者が出た場合は、抽選によって受講者を決定する。	機械工作序論と実習

[Degree Programs' Common Courses] Engineering Mechanics and Energy Associated Courses (Foundation Subjects for Major)

Course Number	Course Name	Instructional Type	Credits	standard registration on year	Term	Meeting Days, Period etc.	Classroom	Instructor	Course Overview	Remarks	Japanese (English) Course Name
OAL0600	Energy System Engineering	1	2.0	1, 2	Spr/AB	Tue1, 2	3B303	Okajima Keiichi, Ishida Masayoshi	This course focuses on a systematic overview of energy supply, power infrastructure, and gas infrastructure for energy problems and technologies that have a wide range of aspects. It also explains how the supply and demand adjustment of the power system, frequency control, voltage control, and supply reliability are ensured.	Core subject face-to-face	エネルギーシステム原論
OAL0601	Advanced Solid Mechanics	1	2.0	1, 2	Spr/AB	Fri3, 4	3A410	Kameda Toshihiro, Matsu da Akihiro	This course describes the solid mechanics for elastic and plastic materials with fundamental framework of tensor analysis. Application to engineering issues are provided as some exercises.	Core subject face-to-face (partially online)	固体力学特論
OAL0602	Advanced Structural Mechanics	1	2.0	1, 2	Spr/AB	Wed1, 2	3B302	Isobe Daigoro, Yamamoto Kyosuke	This course focuses on behaviors of beams and plates with geometrical and material nonlinearities, which are popularly used as structural components in civil, architectural and mechanical fields.	Core subject Lectures are conducted in English if requested. face-to-face (partially online)	構造力学特論
OAL0603	Advanced Vibration Analysis	1	2.0	1, 2	Spr/AB	Fri1, 2	3B405	Asai Takehiko, Morita Naoki	The course provides the foundations and advanced topics on dynamics in structures and mechanical systems, focusing onto the study of vibration theory associated with modal analysis, numerical method, and random vibration.	Core subject Lectures are conducted in English if requested. face-to-face	振動学特論
OAL0605	Disaster Information	1	2.0	1, 2	Spr/AB	Thu5, 6	3B304	Shoji Gaku, Kawamura Youhei	This course provides students with a practical understanding of the application of disaster control informatics based on fundamental theories from the perspective of risk assessment, information gathering (handling) and various core technologies such as Geographic Information System (GIS).	Class days from the 6th week to the 8th week will be treated as an intensive lecture in late-May. Identical to O2RB238. Lecture is conducted in English. face-to-face (partially online)	災害情報学
OAL0611	Advanced Space Exploration Engineering Workshop 2023	2	2.0	1, 2	Spr/AB, Fall/AB	Fri7		Kameda Toshihiro	It is a workshop style project based class, handling space exploration engineering mission proposal and realization. During the class, students are expected to propose their own space mission and provide some prototype equipment for the mission, including space environment test. Collaboration with foreign space engineering teams such as cubesat development project is strongly encouraged.	Lecture is conducted in English. face-to-face Students can register this course even if they took previous Advanced Space Exploration Engineering courses, however, up to two credit hours can be provided in total for graduation requirement.	宇宙開発工学特別演習 2023
OAL0620	Advanced Civil Engineering Workshop	2	2.0	1, 2	Spr/AB, Fall/AB	Wed7	3B406	Yamamoto Kyosuke	This is a PBL-style course, in which students participate group workshops on the theme of new civil engineering systems that contribute to solving global issues.	Lectures are conducted in English if requested. face-to-face (partially online)	インフラ開発工学特別演習

OAL0621	Advanced Exercises for Planning and Designing	2	1.0	1, 2	SprC Sum Vac	Mon2 Intensive	3B407	Kanakubo Toshiyuki, Yasojima Akira	The exercises of planning, designing, and drafting for the definite topics in designing of buildings and housing are conducted. The field works are also conducted for actual structures and introducing presentations for them are assigned.	face-to-face	建築設計計画特別演習
OAL0622	Advanced Electromagnetics	1	1.0	1, 2	FallA	Fri1,2	3B302	Fujino Takayasu	In this course, we study the characteristics of static and dynamic electromagnetic fields on the basis of Maxwell's equations.	Cannot be taken by students who have already taken Engineering of Electromagnetic Energy. Core subject. face-to-face	電磁気学特論
OAL0623	Smart Grid	1	1.0	1, 2	FallB	Fri1,2	3B302	Kodaira Daisuke	This lecture will explain the basic principles of the main components of the electricity supply system as well as the future development of the system.	Cannot be taken by students who have already taken Engineering of Electromagnetic Energy. Core subject. face-to-face	スマートグリッド特論
OAL0624	Advanced Fluid Mechanics	1	3.0	1, 2	SprABC	Thu1,2	3B303	Takewaka Satoshi, Shirakawa Naoki, Kyotoh Harumichi	Potential theory in fluid mechanics, derivation of Navier-Stokes equations, and effects of viscosity, turbulence, and others will be explained. (Potential Theory) Velocity potential, Bernoulli's theorem, flow function, complex potential, isometric mapping, eddy motion, wing theory, and others will be explained. (Navier-Stokes equation) Derivations of laminar boundary layer problems and their solutions, momentum integral equations and their solutions, and viscosity effects will be discussed. (Turbulence) The Reynolds equation and the logarithmic law will be derived for turbulent duct flow and planar boundary layer flow. The mean velocity distribution and drag law are obtained. The course also introduces methods for predicting the occurrence of turbulence in the boundary layer, Kolmogorov theory of uniformly isotropic turbulence, and the structure of anisotropic turbulence.	Cannot be taken by students who have already taken Advanced Fluid Mechanics 1 or Advanced Fluid Mechanics 2. Core subject. face-to-face (partially online)	流体力学特論
OAL0625	Advanced Fluid Mechanics 1 - 2023	1	2.0	1, 2	SprAB	Thu1,2	3B303	Takewaka Satoshi, Shirakawa Naoki	(Potential Theory) Velocity potential, Bernoulli's theorem, flow function, complex potential, isometric mapping, eddy motion, wing theory, and others will be explained. (Navier-Stokes equation) Derivations of laminar boundary layer problems and their solutions, momentum integral equations and their solutions, and viscosity effects will be discussed.	Lecture is conducted only in 2023. Cannot be taken by students who have already taken Advanced Fluid Mechanics 1. Core subject face-to-face (partially online)	流体力学特論1-2023
OAL0626	Advanced Fluid Mechanics 2 - 2023	1	1.0	1, 2	SprC	Thu1,2	3B303	Kyotoh Harumichi	(Turbulence) The Reynolds equation and the logarithmic law will be derived for turbulent duct flow and planar boundary layer flow. The mean velocity distribution and drag law are obtained. The course also introduces methods for predicting the occurrence of turbulence in the boundary layer, Kolmogorov theory of uniformly isotropic turbulence, and the structure of anisotropic turbulence.	Lecture is conducted only in 2023. Cannot be taken by students who have already taken Advanced Fluid Mechanics 2. Core subject face-to-face (partially online)	流体力学特論2-2023

[Degree Programs' Common Courses] Engineering Mechanics and Energy Associated Courses (Major Subjects)

Course Number	Course Name	Instruc-tional Type	Credits	stand-ard regis-tration year	Term	Meeting Days, Period etc.	Classroom	Instructor	Course Overview	Remarks	Japanese (English) Course Name
OAL5600	Micromechanics	1	2.0	1, 2	SprAB	Thu5, 6	3A409	Matsuda Tetsuya	The course aims to give the theoretical knowledge of the mechanics of a class of heterogeneous solids with an emphasis on the micro-macro transition in mechanical properties. This includes the crystal plasticity for metals and the analytical and numerical homogenizations for composite materials of different kinds. A generalized continuum mechanics for higher-order materials is also explained.	face-to-face (partially online)	マイクロメカニクス
OAL5601	Advanced Dynamics of Compressible Flow	1	2.0	1, 2	FallAB	Wed5, 6	3B303	Yokota Shigeru	We cover several unique concepts and applications of compressible flow, including: speed of sound and Mach number, isentropic 1-D flow in variable area ducts, converging nozzles, choking, converging-diverging nozzles, moving shocks, shock tubes, normal and oblique shock waves, expansion fans, and small perturbation theory.	Sub-core subject Online (Asynchronous)	圧縮性流れの力学
OAL5602	Advanced Space-Development Technology	1	1.0	1, 2	FallC	Intensive		Matsumoto Satoshi, Sugita Hiroyuki, Mizutani Tadahito	This course provides lectures on spacecraft thermal control technology, structure and material technology, space environment utilization technology, and lunar and planetary exploration technology.	Coordinator: Prof. Fujino Online (Asynchronous)	宇宙開発工学特論
OAL5604	Advanced Computational Mechanics	1	2.0	1, 2	FallAB	Tue3, 4	3B302	Matsushima Takashi, Shintaku Yuichi	This course provides the theoretical basis, formulation, and implementation of Finite Element Method (FEM). Theoretical basis includes variational method, weighted-residual method and virtual work principle. Also, the FE formulation and implementation of 2-dimensional Poisson equation and elastic continuum are described in details.	Sub-core subject face-to-face (partially online)	計算力学特論
OAL5605	Structure Design of Nuclear Plant	1	2.0	1, 2	SprAB	Tue5, 6	3B406	Matsuda Akihiro	This course describes the high temperature structural design for nuclear power plants and thermal power plants. Assessment methods for high temperature materials in some design topics of the power plants are provided.	face-to-face (partially online)	原子炉構造設計
OAL5606	Structural Design Methodology	4	2.0	1, 2	FallAB	Wed4, 5	3B401	Yasojima Akira	The procedures of the seismic design method for reinforced concrete structures are explained. Furthermore, the exercises on structural design of buildings are conducted based on allowable stress concept and lateral load-carrying capacity calculation.	face-to-face	構造物設計法論
OAL5607	Multiphase Flow Engineering	1	2.0	1, 2	FallAB	Fri5, 6	3A304	Monji Hideaki, Kaneko Akiko, Kanagawa Tetsuya	Focusing on the features and dynamics of multiphase flows as important role in thermo-fluid machinery, environmental field, and so on, basic property and concept, flow behavior, wave propagation, measurement technique, and recent progress and topic are introduced.	face-to-face	混相流工学
OAL5608	Strength and Fracture of Solids	1	2.0	1, 2	FallAB	Fri1, 2	3B406	Kawai Masamichi	The course aims to give students the theoretical and practical knowledges of the strength of solids. This includes the phenomena and mechanisms of elasticity, plasticity and fracture for a class of metallic materials, and the mechanics for these behaviors, respectively, emphasizing the interdiscipline of the practical approach to the strength of solid materials.	Coordinator: Prof. T. Matsuda face-to-face	材料強度学特論
OAL5609	Advanced Reliability Engineering	4	2.0	1, 2	SprAB	Wed3, 4	3B406	Nishio Mayuko	In this course, the basics of structural reliability theory and reliability design are first explained, including the associated probability theory. In addition, exercises using Matlab programming will be taken to understand numerical methods for analyzing structural reliability and safety.	Sub-core subject Lectures are conducted in English if requested. Online (partially face-to-face)	信頼性工学特論
OAL5610	Computational Fluid Dynamics	1	2.0	1, 2	FallAB	Fri3, 4	3A403	Mitsume Naoto	This course focuses on computer simulation of fluid dynamics, and introduces fundamental and applied mathematical models and numerical methods related to the computational fluid dynamics (CFD). Recent research trends on CFD is also introduced in this course.	Sub-core subject face-to-face (partially online)	数値流体力学
OAL5611	Advanced Earthquake Engineering	1	2.0	1, 2	FallAB	Tue1, 2	3B203	Shoji Gaku, Asai Takehiko	In this course, you will study the fundamental and advanced topics on earthquake engineering. The first part describes the mechanism of fault ruptures, wave propagation process, and strong ground motion occurrence, and the evaluation method of seismic hazards. The latter part describes the relationship between ground motion intensity and structural damage, nonlinear seismic response analysis of structures, and seismic design of structures.	face-to-face	耐震工学特論

OAL5612	Advanced Geotechnical Engineering	1	2.0	1, 2	SprAB	Tue3, 4	3A207	Matsushima Takashi	This course describes complicated mechanical response of geomaterials as a mixture of solid grain, pore water and air, basic framework of the governing equation including typical constitutive models, and various numerical methods for engineering design.	Lectures are conducted in English if requested. face-to-face (partially online)	地盤工学特論
OAL5613	Transport Phenomena	1	2.0	1, 2	SprAB	Fri1, 2	3B302	Nishioka Makihito	Transport phenomena of mass and heat will be explained theoretically from a macroscopic viewpoint. Examples of actual phenomena related to mass diffusion and/or heat conduction, and their practical applications will also be introduced.	Sub-core subject Online (Asynchronous)	輸送現象論
OAL5614	Thermo-Fluids Measurement Techniques	1	2.0	1, 2	SprAB	Wed5, 6	3B303	Monji Hideaki, Kaneko Akiko, Fujino Takayasu, Yokota Shigeru, SHEN Biao	Hot-wire anemometer, laser anemometer, image processing anemometer, spectroscopy, probe method, schlieren method, laser-induced fluorescence method, etc. are introduced as the, laser-induced fluorescence method, etc. can be obtained as the latest measurement methods for the speed, temperature, concentration, pressure, etc. of thermal fluid. Discussed with data processing methods.	Sub-core subject face-to-face	熱・流体計測法
OAL5615	Advanced Composite Structural Engineering	1	2.0	1, 2	SprAB	Mon1, 2	3B401	Kanakubo Toshiyuki	Outline, construction method, and design method of reinforced concrete structures are introduced. Structural behavior of beams, columns, walls, beam-column joints, and so on, of reinforced concrete is explained based on the limit stress design method and ultimate state design method.	face-to-face	複合構造特論
OAL5616	Topics in Engineering Mechanics and Energy I	1	1.0	1, 2	SprBC	Intensive		OHSUMI Michio, AWATA Teruhisa, Fukushima Masaki, 穂積良和, 牛島 栄	This course will be taught by visiting lecturers who are specialized in infrastructure systems, civil construction, disaster prevention and management, energy systems and related fields. In the classes, followings will be discussed: technology development, project management, maintenance of infrastructures, overseas projects etc.	Coordinator: Profs. S. Takewaka and G. Shoji face-to-face (partially online)	構造エネルギー工学特別講義I
OAL5617	Topics in Engineering Mechanics and Energy II	1	1.0	1, 2	Sum Vac	Intensive		Sakakita Hajime	In this course, technologies on plasma processing are described. For human being, "Plasma" is very important, since it is related on many natural phenomena (Stellar such as sun, ionosphere, aurora, and lightning). Moreover, the plasma is utilized in fluorescent light, semiconductor processing, space propulsion and so on. Academic background and technologies are studied, and many of novel development trends such as a medical application are introduced.	Coordinator: Prof. Toshihiro Kameda Online (Synchronous)	構造エネルギー工学特別講義II
OAL5618	Topics in Engineering Mechanics and Energy III	1	1.0	1, 2	FallAB	Intensive		Ichikawa Kazuyoshi	Japan relies on fossil-fueled thermal power generation for about 80% of its electricity generation and the reduction of greenhouse gases which is a major factor in climate change is an urgent issue. This lecture will focus on the latest thermal power technologies for low carbon, and will cover the latest energy situation, basics of thermal power generation, innovative power generation technologies, biomass energy utilization technologies, and zero-emission technologies (e.g., CO2 capture, utilization, storage, and hydrogen utilization technologies). In addition, based on the above, we will discuss the future of Japan's energy system.	Coordinator: Prof. Akiko Kaneko face-to-face	構造エネルギー工学特別講義III
OAL5619	Topics in Engineering Mechanics and Energy IV	1	1.0	1, 2	FallC	Intensive		Sato Hiroyuki	In this course, students can learn High Temperature Gas-cooled Reactor (HTGR) technologies, a Generation IV nuclear system with superior safety and capability of high temperature heat supply of 1,000 deg C. Topics also includes the HTGR heat application technologies such as high efficiency helium gas turbine power generation and CO2-free massive hydrogen production. The course also deals with energy situation in Japan and trends of development in nuclear and hydrogen energies.	Coordinator: Prof. Akiko Kaneko Online (Asynchronous)	構造エネルギー工学特別講義IV
OAL5620	Topics in Engineering Mechanics and Energy V	1	1.0	1, 2	FallC	Intensive		Yoshida Hiroyuki	This course provides, at first, an outline of a light water reactor (boiling water reactor and pressurized water reactor) that is used as electricity generation systems, focusing on the light water reactor design procedures related to thermal-hydraulics phenomena. In the second part of this topic, numerical simulation related to thermal-hydraulics will be introduced. In this part, a multi-phase computational fluid dynamics simulation methodology will be explained briefly. Finally, this course provides issues in the application of CFD to design works of the nuclear reactor.	Coordinator: Prof. Akiko Kaneko face-to-face	構造エネルギー工学特別講義V

OAL5621	Learning from Disasters: Extreme events and their impact on infrastructure, engineering and society	2	2.0	1, 2	FallC, Spr Vac	Intensive		Matsushima Takashi, Shoji Gaku	Extreme events such as hurricanes Maria, Irma and Harvey in 2017, Katrina in 2005, or the 2011 Tohoku earthquake and Tsunami in Japan, have resulted in high death tolls, and devastating damage to housing units, urban infrastructure, and lifelines (water, power ...). Emergency response to extreme events is difficult due to their large impacts, and recovery often very slow. In developing countries, where resources tend to be limited, extreme events such as earthquakes and typhoons often result in medical threats from infectious diseases due to the limited availability of clean water and emergency medical services. Since many global warming models predict a sharp increase in the number, as well as severity, of extreme events it is important to learn from past disaster, in order to reduce their potential for destruction. In this course, we will examine several major disasters, including local case histories, and discuss engineering design methods/concepts, as well as, their effects in terms of preparedness, vulnerability, robustness, flexibility, and resilience.	The course is designed as PBL (Project-Based Learning) style online course open both in University of Tsukuba and Ohio State University. Participants are supposed to belong to a small group, work together, and make a presentation as the group. Lecture is conducted in English. Online (Synchronous)	災害から学ぶ: 巨大災害が社会基盤施設, 工学や社会システム全般に及ぼす影響
OAL5622	Advanced Exercise for Thermo-fluid Engineering	2	2.0	1, 2	FallIAB	Thu1, 2	3L206	Kaneko Akiko, SHEN Biao	This PBL course will introduce you to advanced measurement techniques in the field of thermofluid engineering, with a focus on nuclear safety applications. You will learn practical knowledge about and gain hands-on experience in hydrodynamic and heat transfer measurements in a workshop environment.	face-to-face	熱流体計測工学特別演習
OAL5623	Advanced Exercise for Structure and Solid Mechanics	2	2.0	1, 2	FallIAB	Tue5, 6		Matsuda Akihiro, Shoji Gaku, Shintaku Yuichi, Morita Naoki	This course provide workshop-style projects for issues related to structural mechanics and solid mechanics in the nuclear engineering fields. MS students select equipment for nuclear power plants and nuclear-related facilities, and conduct performance and safety evaluations related to structural mechanics and solid mechanics using advanced numerical simulation software.	Online (Synchronous)	構造・固体CAE特別演習
OAL5624	Environmental Fluid Engineering	1	1.0	1, 2	SprC	Thu3, 4	3B302	Shirakawa Naoki, Denda Masatoshi, Takewaka Satoshi, Dairaku Koji	The engineering approaches to various environmental problems in the hydrosphere will be discussed, ranging from local riverine environment to global-scale environment.	Lectures are conducted in English if requested. face-to-face	環境流体工学特論

[Program's Courses] Engineering Mechanics and Energy Associated Courses (Foundation Subjects for Major)

Course Number	Course Name	Instructional Type	Credits	standard registration on year	Term	Meeting Days, Period etc.	Classroom	Instructor	Course Overview	Remarks	Japanese (English) Course Name
OALF000	Internship	3	1.0	1, 2	Annual	by request		構造エネルギー工学学位プログラム専任教員	The purpose of this course is to provide opportunities for students to work in private companies, public institutions, NGOs, etc. for weeks and help them to develop fundamental business skills and knowledge through practical experience. The students must apply both to the host organization and to the department (graduate program) of EME by themselves in advance, and submit the final report after the internship.		インターンシップ

[Program's Courses] Engineering Mechanics and Energy Associated Courses (Major Subjects)

Course Number	Course Name	Instructional Type	Credits	standard registration on year	Term	Meeting Days, Period etc.	Classroom	Instructor	Course Overview	Remarks	Japanese (English) Course Name
OALF500	Seminar in Engineering Mechanics and Energy I	2	2.0	1	Annual	by appointment		構造エネルギー工学学位プログラム専任教員	This course provides an overview of any research field of Engineering Mechanics and Energy for first-year MS students. Presentation of the individual research project is required.		構造エネルギー工学前期特別演習I
OALF501	Seminar in Engineering Mechanics and Energy II	2	2.0	2	Annual	by appointment		構造エネルギー工学学位プログラム専任教員	This course provides an overview of any research field of Engineering Mechanics and Energy and evaluates the individual research project for second-year MS students. Presentation of the individual research project is required.		構造エネルギー工学前期特別演習II
OALF502	Research in Engineering Mechanics and Energy I	3	4.0	1	Annual	by request		構造エネルギー工学学位プログラム専任教員	This course is for individual research projects in Engineering Mechanics and Energy emphasizing fundamental knowledge for first-year MS students. This course is approved by advisors.		構造エネルギー工学前期特別研究I
OALF503	Research in Engineering Mechanics and Energy II	3	4.0	2	Annual	by request		構造エネルギー工学学位プログラム専任教員	This course is for individual research projects in Engineering Mechanics and Energy emphasizing advanced knowledge for second-year MS students. This course is approved by advisors, aiming to complete MS theses.		構造エネルギー工学前期特別研究II
OALF504	Seminar in Engineering Mechanics and Energy Ia	2	1.0	1	SprABC	by appointment		構造エネルギー工学学位プログラム専任教員	This course provides an overview of any research field of Engineering Mechanics and Energy for first-year MS students. Presentation of the individual research project is required.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別演習Ia
OALF505	Seminar in Engineering Mechanics and Energy Ib	2	1.0	1	FallABC	by appointment		構造エネルギー工学学位プログラム専任教員	This course provides an overview of any research field of Engineering Mechanics and Energy for first-year MS students. Presentation of the individual research project is required.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別演習Ib
OALF506	Seminar in Engineering Mechanics and Energy IIa	2	1.0	2	SprABC	by appointment		構造エネルギー工学学位プログラム専任教員	This course provides an overview of any research field of Engineering Mechanics and Energy and evaluates the individual research project for second-year MS students. Presentation of the individual research project is required.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別演習IIa
OALF507	Seminar in Engineering Mechanics and Energy IIb	2	1.0	2	FallABC	by appointment		構造エネルギー工学学位プログラム専任教員	This course provides an overview of any research field of Engineering Mechanics and Energy and evaluates the individual research project for second-year MS students. Presentation of the individual research project is required.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別演習IIb
OALF508	Research in Engineering Mechanics and Energy Ia	3	2.0	1	SprABC	by request		構造エネルギー工学学位プログラム専任教員	This course is for individual research projects in Engineering Mechanics and Energy emphasizing fundamental knowledge for first-year MS students. This course is approved by advisors.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別研究Ia
OALF509	Research in Engineering Mechanics and Energy Ib	3	2.0	1	FallABC	by request		構造エネルギー工学学位プログラム専任教員	This course is for individual research projects in Engineering Mechanics and Energy emphasizing fundamental knowledge for first-year MS students. This course is approved by advisors.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別研究Ib
OALF510	Research in Engineering Mechanics and Energy IIa	3	2.0	2	SprABC	by request		構造エネルギー工学学位プログラム専任教員	This course is for individual research projects in Engineering Mechanics and Energy emphasizing advanced knowledge for second-year MS students. This course is approved by advisors, aiming to complete MS theses.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別研究IIa
OALF511	Research in Engineering Mechanics and Energy IIb	3	2.0	2	FallABC	by request		構造エネルギー工学学位プログラム専任教員	This course is for individual research projects in Engineering Mechanics and Energy emphasizing advanced knowledge for second-year MS students. This course is approved by advisors, aiming to complete MS theses.	Only students enrolled in the fall and those approved by the program leader can take this course.	構造エネルギー工学前期特別研究IIb