

Course Number	Course Name	授業方法	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
0AH0203	Renewable Energy Engineering	1	2.0	1, 2	Fall/AB	Wed1, 2	3B303	Hirohisa Aki	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 01CM440.
0AH0210	Basis and practical training of machining	5	1.0	1, 2	SprC Sum Vac	Intensive by appointment		Kazuhiro Enami, Hideaki Monji	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.	
0AL0600	Energy System Engineering	1	2.0	1, 2	Spr/AB	Tue1, 2	3B303	Keiichi Okajima, Masayoshi Ishida	This course focuses on interdisciplinary theory of energy demand and supply systems. You will be introduced to a variety of analytical methods of energy system evaluation, especially on technological and environmental aspects.	Core subject Identical to 01CM401.
0AL0601	Advanced Solid Mechanics	1	2.0	1, 2	Spr/AB	Tue3, 4	3B302	Toshihiro Kameda, Akihiro Matsuda	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 Identical to 01CM201.
0AL0602	Advanced Structural Mechanics	1	2.0	1, 2	Fall/AB	Tue1, 2	3B305	Daigoro Isobe, Kyosuke Yamamoto	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 Identical to 01CF408 and 01CM101. 要望があれば英語で授業
0AL0603	Advanced Vibration Analysis	1	2.0	1, 2	Spr/AB	Fri1, 2	3B406	Gaku Shoji, Yuki Sakai	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 Identical to 01CM102.
0AL0604	Engineering of Electromagnetic Energy	1	2.0	1, 2	Fall/AB	Fri1, 2	3B302	Takayasu Fujino, Toru Takahashi	This course focuses on the reviews of Maxwell's equations written in integral and differential forms, generation, conversion, and transmission of electric energy. Power storage and electric equipment/system are also described.	Core subject Identical to 01CM403.
0AL0605	Disaster Information	1	2.0	1, 2	Fall/AB	Fri1, 2	3B304	Gaku Shoji, Youhei Kawamura	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).	11/13(金)1, 2時限及び 11/14(土)1~4時限を集中講義扱い(川村)とする。 Identical to 01CM129 and 02RB238. 英語による授業
0AL0606	Advanced Fluid Mechanics 1	1	2.0	1, 2	Spr/AB	Thu1, 2	3B303	Satoshi Takewaka, Naoki Shirakawa	We will explore Potential Theory, derivation of Navier-Stokes equation and its solutions.  Keywords: Velocity potential, Bernoulli theorem, complex velocity potential, wing theory, effect of viscosity, Navier-Stokes equation	Core subject Identical to 01CM301.

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OAL0607	Advanced Fluid Mechanics 2	1	2.0	1, 2	Fall IAB	Thu4, 5	3B302	Naoki Shirakawa, Harumi chi Kyotoh	The laminar boundary layer solution and the momentum integral equation is derived from the Navier-Stokes equation. For turbulent flows, the Reynolds equation and the logarithmic law are explained, and the average flow velocity and resistance law of the pipe and turbulent boundary layer are derived. A method of predicting the occurrence of turbulence in the boundary layer and the structure of anisotropic turbulence are introduced. In a fully-developed turbulence, the Kolmogorov theory is explained.	Core subject Identical to O1CM302.
OAL0608	Advanced Space Exploration Engineering Workshop 2020	2	2.0	1, 2	SprAB, Fall IAB	Mon7	3B406	Toshihiro Kameda	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.	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. During breaks, students must participate in foreign study at least for two weeks. Further information will be provided on the first day of the class. Identical to O1CM436. Lectures are conducted in English.
OAL0620	Advanced Civil Engineering Workshop	2	2.0	1, 2	SprAB, Fall IAB	Wed7	3B406	Kyosuke Yamamoto	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.	Identical to O1CM130. 要望があれば英語で授業
OAL0621	Advanced Exercises for Planning and Designing	2	1.0	1, 2	Sum Vac	Intensive	3B407	Toshiyuki Kanakubo, Akira Yasojima	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.	Identical to O1CM131.
OAL5600	Micromechanics	1	2.0	1, 2	SprAB	Thu5, 6	3A409	Masamichi Kawai, Tetsuya Matsuda	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.	Identical to O1CM223.
OAL5601	Advanced Dynamics of Compressible Flow	1	2.0	1, 2	Fall IAB	Wed5, 6	3B303	Shigeru Yokota	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 Identical to O1CM311.
OAL5602	Advanced Space-Development Technology	1	1.0	1, 2	Fall IC	Intensive	3B401	Satoshi Matsumoto, Hiroyuki Sugita, Tadahito Mizutani	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. Takayasu Fujino Identical to O1CM428.

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OAL5603	Environmental Fluid Engineering	1	2.0	1, 2	SprAB	Fri5, 6	3B302	Naoki Shirakawa, Masatoshi Denda, Harumichi Kyotoh, Satoshi Takewaka, Koji Dairaku	Presents the basic concepts of hydraulics for open channel flow and hydrology. Some recent topics on river and coastal engineering are also introduced.	Identical to O1CM323. 要望があれば英語で授業
OAL5604	Advanced Computational Mechanics	1	2.0	1, 2	FallAB	Mon3, 4	3B303	Takashi Matsushima, Yuichi Shintaku	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 Identical to O1CM211.
OAL5605	Structure Design of Nuclear Plant	1	2.0	1, 2	FallAB	Tue5, 6	3B402	Akihiro Matsuda	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.	Identical to O1CM221.
OAL5606	Structural Design Methodology	4	2.0	1, 2	FallAB	Thu1, 2	3B401	Akira Yasojima, Mayuko Nishio	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.	Identical to O1CM127.
OAL5607	Multiphase Flow Engineering	1	2.0	1, 2	FallAB	Wed3, 4	3A304	Hideaki Monji, Akiko Kaneko, Tetsuya Kanagawa	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.	Identical to O1CM427.
OAL5608	Strength and Fracture of Solids	1	2.0	1, 2	FallAB	Fri1, 2	3B406	Masamichi Kawai	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.	Identical to O1CM222.
OAL5609	Advanced Reliability Engineering	4	2.0	1, 2	FallAB	Tue3, 4	3B406	Mayuko Nishio	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 Identical to O1CF406 and O1CM111.
OAL5610	Computational Fluid Dynamics	1	2.0	1, 2	FallAB	Fri3, 4	3B402	Naoto Mitsume	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 Identical to O1CM312.
OAL5611	Advanced Earthquake Engineering	1	2.0	1, 2	SprAB	Fri3, 4	3B406	Gaku Shoji, Yuki Sakai, Naoto Mitsume	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.	Identical to O1CF409 and O1CM121.

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OAL5612	Advanced Geotechnical Engineering	1	2.0	1, 2	SprAB	Mon3, 4	3A214	Takashi Matsushima	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.	Given in English if requested Identical to 01CM128.
OAL5613	Transport Phenomena	1	2.0	1, 2	SprAB	Fri1, 2	3B302	Makihito Nishioka	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 Identical to 01CM411.
OAL5614	Thermo-Fluids Measurement Techniques	1	2.0	1, 2	SprAB	Thu3, 4	3B303	Hideaki Monji, Kohei Shimamura	Hot-wire anemometer, laser anemometer, image processing anemometer, holographic anemometer, NMR, 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 Identical to 01CM412.
OAL5615	Advanced Composite Structural Engineering	1	2.0	1, 2	SprAB	Mon1, 2	3B401	Toshiyuki Kanakubo	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.	Identical to 01CM125.
OAL5616	Topics in Engineering Mechanics and Energy I	1	1.0	1, 2	SprBC	Intensive	3B304	Minoru Tanaka, Shigeru Nagata, Masaki Fukushima, 良和穂積, 栄牛島	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 Identical to 01CM901.
OAL5617	Topics in Engineering Mechanics and Energy II	1	1.0	1, 2	Sum Vac	Intensive	3B401	Hajime Sakakita	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 Identical to 01CM907.
OAL5618	Topics in Engineering Mechanics and Energy III	1	1.0	1, 2	FallC	Intensive		Kazuyoshi Ichikawa	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 Identical to 01CM909.

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OAL5619	Topics in Engineering Mechanics and Energy IV	1	1.0	1, 2	Fall/C	Intensive	3B401	Hiroyuki Sato	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 Identical to O1CM904.
OAL5620	Topics in Engineering Mechanics and Energy V	1	1.0	1, 2	Fall/C	Intensive	3B204	Hiroyuki Yoshida	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 Identical to O1CM905.
OALF000	Internship	3	1.0	1, 2	Annual	by request		Takashi Matsushima	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.	Identical to O1CM911.
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.	Identical to O1CM011.
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.	Identical to O1CM012.
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.	Identical to O1CM021.
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.	Identical to O1CM022.