

Department of Mechanical Systems and Design

<p>Presentation & Discussion 2 credits Elective Required Adjunct Instructor Yoshimasa Ono</p>	<p>Management of Research and Development 2 credits Elective Required Professor Hideo Miura Professor Yutaka Watanabe</p>
<p>Students learn presentation basics and ways to prepare and deliver presentations in English. Students are asked to give short presentations in English either individually or in groups and to review their own video-taped presentations. In order to familiarize students with discussion modes in English and maximize their use of the target language, English and maximize their use of the target language, English is the primary language for lectures and discussion.</p>	
<p>History of Modern Technology 2 credits Elective Required Professor Shiuji Tanaka</p>	<p>Intellectual Property 2 credits Elective Required Professor Hideo Miura Adjunct Instructor Minoru Watanabe</p>
<p>Learning the history of technology leads to understanding the origin and genealogy of the technology, the inevitable factors of technological development, the relationship between society and the technology, the process and consequence of try-and-errors, the successes and failures of engineers and researchers etc. This intensive class introduces the development and partially decline of familiar devices and technologies such as automobile engines, memory devices, communication tools and semiconductor integrated circuits. The history of each technology includes the philosophy and lessons which are also useful for other research and development, and thus attendee are expected to consider them for their doctoral theses and future research and development. The lectures are partially given by visiting lecturers, and fully given in Japanese.</p>	
<p>Venture Management 2 credits Elective Required Professor Akio Nagahira</p>	<p>Venture Strategy 2 credits Elective Required Adjunct Instructor Toru Degawa Adjunct Instructor Takumi Kumagai</p>
<p>Advanced Intelligence and Systems Engineering 2 credits Elective Required Professor Kazuo Hokkirigawa Associate Professor Takeshi Yamaguchi</p>	<p>Advanced Intelligent Design 2 credits Elective Required Professor Tsunemoto Kuriyagawa Professor Takahito Ono</p>
<p>In order to realize significant increase in performance of mechanical systems such as micro-machine, robots, and space equipment, it is necessary to develop new materials and to establish new design approaches using the materials. This course will provide all students with the fundamental technologies for material development and the advanced knowledge and concept associated with intelligence and systems engineering.</p>	<p>Nanotechnology-based nano-precision mechanical manufacturing and micro-nanomachining, and integration technologies of various components are lectured. Precision machines based on above technologies and micro-nanomachines, the design and modeling of those mechanical elements, recent researches on applications to information technologies, energy, and medical fields are also lectured.</p>
<p>Advanced Energy Systems Engineering 2 credits Elective Required Professor Hiroo Yugami Professor Yu Fukunishi Professor Tetsushi Biwa</p>	<p>Fracture Mechanics and Mechanisms 2 credits Elective Required Professor Kazuhiro Ogawa Professor Toshio Yonezawa Associate Professor Yoichi Takeda</p>
	<p>Although a fracture is a well-known phenomenon since early times, the unsolved problem has been left because of the diversity of the influential factors. Therefore, the elucidation of fracture mechanics and mechanisms are desired. For the elucidation of fracture mechanics and mechanisms, it is necessary that understanding of the interaction and synergistic effect of the diversified influential factors. In this lecture, fractures of the structures, which are induced by high-temperature oxidation and the environmental assisted cracking, are lectured. Moreover, examples of failure accidents in structures and materials are introduced, its suppression and prevention techniques are discussed.</p>

Intelligent Fluid Systems 2 credits Elective Required Professor Hideya Nishiyama Professor Shigenao Maruyama Professor Kaoru Maruta	Advanced Mechanical Systems Maintenance Engineering 2 credits Elective Required Professor Toshiyuki Takagi Associate Professor Tetsuya Uchimoto
	Maintenance activities play an important role to secure the safety and long-life of various artifacts such as industrial plants, commercial aircrafts. Optimization of the maintenance activities in view of both system safety and economic performance is placed as a major key challenge. In this course, we outline recent progresses of disciplines composing maintenance engineering such as reliability engineering, risk evaluation, nondestructive testing, failure analysis, at first. In addition, we discuss the quantitative evaluation of reliability and risk for optimization of the maintenance activities such as inspection and repair.
Multidisciplinary Research and Application of Solid-State Ionic Devices 2 credits Elective Required Professor Koji Amezawa	Advanced Damage Tolerance and Design 2 credits Elective Required Professor Toshimitsu Yokobori Professor Hitoshi Soyama Professor Masumi Saka
In this lecture, topics related to basics and applications of ion transport phenomena in solids and on solid surface and/or interface are introduced and discussed from the viewpoints of materials chemistry and solid state physics. More details, such as the style of the lecture, will be announced in the beginning of the semester.	Lecture will deal with various aspects of design concepts and estimations of damage tolerance. Furthermore, to avoid various accidents for aircraft, electric power plant, electric device and nuclear engineering, new concepts on the prediction of fracture life and the estimation of damage accumulation are discussed from the view points of advanced adaptive engineering.
Frontiers of Mechanical Science 2 credits Elective Required Professor Gao Wei Professor Hiroki Kuwano Professor Hitoshi Soyama Professor Masumi Saka Professor Toshimitsu Yokobori Professor Koshi Adachi	Advanced Mechanical System and Design 2 credits Elective Required Professors of Mechanical Systems and Design course
	This course is prepared for learning various subjects and topics related to the specific field of mechanical systems and design course. The scope covers wide fields related to mechanical system technologies, including intelligent system, engineering design, energy system, and multidisciplinary fields.
IMAC-G Special Seminar on Mechanical Systems and Design 2 credits Elective Required This seminar is prepared for learning various subjects and topics related to the specific field of the course.	Special Lecture on Mechanical Systems and Design B Elective Required A special lecture on leading-edge academic research in the major area, or on the creation and development of knowledge in relation to the major area.
Advanced Seminar on Mechanical Systems and Design B Elective Required The problem-posing ability is acquired by integrating advanced expertise through the training.	Doctor Course Seminar on Mechanical Systems and Design 8 credits Elective Students engage in experiments and seminars, including research presentations, discussion and literature reviews.

Department of Nanomechanics

Presentation & Discussion 2 credits Elective Required Adjunct Instructor Yoshimasa Ono	Management of Research and Development 2 credits Elective Required Professor Hideo Miura Professor Yutaka Watanabe
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History of Modern Technology 2 credits Elective Required Professor Shiuji Tanaka	Intellectual Property 2 credits Elective Required Professor Hideo Miura Adjunct Instructor Minoru Watanabe
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Venture Management 2 credits Elective Required Professor Akio Nagahira	Venture Strategy 2 credits Elective Required Adjunct Instructor Toru Degawa Adjunct Instructor Takumi Kumagai
Nano-Photonic Mechanical Systems 2 credits Elective Required Professor Kazuhiro Hane Assistant Professor Yoshiaki Kanamori	Advanced Mechanics of Materials 2 credits Elective Required Professor Hitoshi Soyama Professor Masumi Saka Professor Toshimitsu Yokobori
The research field of Mechanical engineering extends to micro/nano scale science and technology. Optical technology is indispensable for investigation and control in micro/nano regions. In this lecture, interactions between photons and atoms/molecules, principles of lasers and their systems, and photonic devices using nano/micro structures are explained and discussed.	Lecture will deal with methodological explorations about extension of life time and enhancement of strength of various materials systems from small systems such as IC packages to large mechanical components and structures, in order to use the systems at severe conditions and/or long time. Microscopic key factors of functional characteristics and performance of the systems are variety of atoms and molecules, their sequences in nanoscale and microstructure in meso-scale. On the basis of these factors, analysis of microscopic characteristics and effects of the microscopic characteristics on macroscopic characteristics will be reviewed including their measurement and evaluation methods, and some real examples will be described in the lecture.
Advanced Nano/Technology 2 credits Elective Required Professor Gao Wei Professor Hiroki Kuwano Professor Koshi Adachi	Advanced Design Methods for Improving Reliability of Microstructures and Devices 2 credits Elective Required Professor Hideo Miura
Nano-Flow Science 2 credits Elective Required Professor Seiji Samukawa Associate Professor Takashi Tokumasu Associate Professor Tomohiro Kubota	Advanced Nano-Physics, Analysis and Control of Surfaces 2 credits Elective Required Professor Yuji Takakuwa
	This lecture deals with physical phenomena, analyses and controls of solid surfaces and interfaces in a nanometer-scale. Especially, the novel properties of surfaces and interfaces of materials under well controlled conditions, such as under ultra-high-vacuum, are dealt with. In particular, recent topics in the analyses and controls of surfaces and interfaces of silicon and carbon materials will be introduced.
Advanced Damage Tolerance and Design 2 credits Elective Required Professor Toshimitsu Yokobori Professor Hitoshi Soyama Professor Masumi Saka	Advanced Mechanical System and Design 2 credits Elective Required Professors of Mechanical Systems and Design course
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Advanced Seminar on Nanomechanics B Elective Required	Doctor Course Seminar on Nanomechanics 8 credits Elective
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Department of Aerospace Engineering

Presentation & Discussion 2 credits Elective Required Adjunct Instructor Yoshimasa Ono	Management of Research and Development 2 credits Elective Required Professor Hideo Miura Professor Yutaka Watanabe
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Venture Management 2 credits Elective Required Professor Akio Nagahira	Venture Strategy 2 credits Elective Required Adjunct Instructor Toru Degawa Adjunct Instructor Takumi Kumagai
Advanced Aerospace Systems 2 credits Elective Required Professor Hisao Fukunaga	Advanced Simulation Science 2 credits Elective Required Professor Keisuke Sawada Professor Keisuke Asai
This lecture covers structural mechanics, design methods and related topics of thin-walled structures used in aircrafts, rockets and space structures. 1. Structures and materials of aircrafts, rockets and space structures 2. Structural dynamics of aircrafts, rockets and space structures 3. Vibration analysis and control of aerospace structures 4. Finite element modelling and analysis of structures 5. Optimum design method of structures 6. Structural health monitoring of aerospace structures	

<p>Advanced Space Technology 2 credits Elective Required Professor Kazuya Yoshida</p>	<p>Advanced Space Fluid Dynamics 2 credits Elective Required Professor Shigeru Obyashi Professor Hideaki Kobayashi Professor Katsuhide Ohira</p> <p>From the aerospace engineering and the related fields, this lecture delivers extensive and deep technical knowledge about the extreme flows such as the propulsion of the spacecraft, flows with various flights, supersonic combustion, shock waves and cryogenic flows. The principal objective of the lecture is the cultivation of the ability of the doctoral course students for problem discovery and proposition of a new solution method.</p>
<p>Shock Wave in Complex Media and their Interdisciplinary Applications 2credits Elective Required Associate Professor Mingyu Sun</p> <p>Shock wave research was initiated and developed mainly due to tremendous needs from aerospace industry in the past. In recent years, shock wave research is revived especially in complex media encountered in interdisciplinary applications. In this course, their recent applications will be presented. Applications will include shock wave therapy, geophysical applications such as volcanology, underwater shock waves in asteroid impacts on mass extinction, physics of hypervelocity impacts.</p>	<p>IMAC-G Special Seminar on Mechanical Systems and Design 2 credits Elective Required</p> <p>This seminar is prepared for learning various subjects and topics related to the specific field of the course.</p>
<p>Special Lecture on Aerospace Engineering B Elective Required</p> <p>A special lecture on leading-edge academic research in the major area, or on the creation and development of knowledge in relation to the major area.</p>	<p>Advanced Seminar on Nanomechanics B Elective Required</p> <p>The problem-posing ability is acquired by integrating advanced expertise through the training.</p>
<p>Doctor Course Seminar on Nanomechanics 8 credits Elective</p> <p>Students engage in experiments and seminars, including research presentations, discussion and literature reviews.</p>	

Department of Bioengineering and Robotics

<p>Presentation & Discussion 2 credits Elective Required Adjunct Instructor Yoshimasa Ono</p> <p>Students learn presentation basics and ways to prepare and deliver presentations in English. Students are asked to give short presentations in English either individually or in groups and to review their own video-taped presentations. In order to familiarize students with discussion modes in English and maximize their use of the target language, English and maximize their use of the target language, English is the primary language for lectures and discussion.</p>	<p>Management of Research and Development 2 credits Elective Required Professor Hideo Miura Professor Yutaka Watanabe</p>
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Venture Management 2 credits Elective Required Professor Akio Nagahira	Venture Strategy 2 credits Elective Required Adjunct Instructor Toru Degawa Adjunct Instructor Takumi Kumagai
Advanced Bio-Nanotechnology 2 credits Elective Required Professor Matsuhiko Nishizawa Professor Tetsu Tanaka	Advanced Bio-Mechanics 2 credits Elective Required Professor Yoichi Haga
Advanced Robotics 2 credits Elective Required Professor Kazuhiro Kosuge Professor Satoshi Murata Professor Mami Tanaka	Intelligent Mechanosystem Engineering 2 credits Elective Required Professor Toshiyuki Hayase
Advanced Mechanical System and Design 2 credits Elective Required Professors of Mechanical Systems and Design course This course is prepared for learning various subjects and topics related to the specific field of mechanical systems and design course. The scope covers wide fields related to mechanical system technologies, including intelligent system, engineering design, energy system, and multidisciplinary fields.	IMAC-G Special Seminar on Bioengineering and Robotics 2 credits Elective Required This seminar is prepared for learning various subjects and topics related to the specific field of the course.
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Department of Quantum Science and Energy Engineering

Presentation & Discussion 2 credits Elective Required Adjunct Instructor Yoshimasa Ono	Management of Research and Development 2 credits Elective Required Professor Hideo Miura Professor Yutaka Watanabe
Students learn presentation basics and ways to prepare and deliver presentations in English. Students are asked to give short presentations in English either individually or in groups and to review their own video-taped presentations. In order to familiarize students with discussion modes in English and maximize their use of the target language, English is the primary language for lectures and discussion.	
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Advanced Quantum Energy Engineering 2 credits Elective Required Professor Makoto Takahashi	Advanced Nuclear Engineering 2 credits Elective Required Professor Keizo Ishii Associate Professor Keitaro Hitomi In this course, we learn the most advanced particle beam technology such as a high current accelerator to enable the extinction of nuclear waste, the nano-beam technology to enable 3D nano-machining, photon factory to provide high intensity monochromatic X-rays, particle beam therapy, and its application technologies. The fundamentals on nano- and micro-beam formation technology, storage ring, high current particle acceleration, a medical application of accelerator are mainly lectured. Through this lecture, the ability to find, setup, analyze and solve problems is developed.
Advanced Safety Engineering of Nuclear Systems 2 credits Elective Required Professor Hitoshi Mimura Professor Yutaka Watanabe Professor Yuichi Niibori Professor Makoto Takahashi	Advanced Energy Physics Engineering 2 credits Elective Required Professor Hidetoshi Hashizume Professor Tomohiko Iwasaki This class provides advanced technology and its basic knowledge in terms of energy system and neutronics of fusion and fission reactors. Several forefront topics are introduced on the advanced reactor engineering, energy flow dynamics, neutron utilization and fusion plasma confinement to learn how to pick up crucial issues and then how to solve the problems.
Advanced Particle Beam Engineering 2 credits Elective Required Professor Akira Hasegawa	Advanced Energy Material Engineering 2 credits Elective Required Professor Hiroaki Abe
Advanced Energy Chemical Engineering 2 credits Elective Required Professor Nobuaki Sato Associate Professor Akira Kirishima	Advanced Quantum Material Engineering 2 credits Elective Required Professor Yasuyoshi Nagai Professor Dai Aoki The state-of-the-art actinide physics and chemistry, radiation damage and the techniques to analyze the material properties, electronic and atomic structures will be reviewed as fundamentals of quantum material engineering.
Advanced Accelerator and Radiation Engineering 2 credits Elective Required To be announced	Medical Molecular Engineering 2 credits Elective Required Professor Hoshi Ohtsu 1.Introduction: Overview of technology used in the medical science. 2.Cell and cellular chemistry. 3.The flow of genetic information (The organization and sequences of cellular genomes, replication, maintenance , and rearrangements of genomic DNA,RNA synthesis and processing Protein synthesis , processing and regulation) 4.Cell structure and function. 5.Cell regulation.
Advanced Quantum Science and Energy Engineering 2 credits Elective Required Professors of Quantum Science and Engineering	Advanced Mechanical System and Design 2 credits Elective Required Professors of Mechanical Systems and Design coarse This course is prepared for learning various subjects and topics related to the specific field of mechanical systems and design course. The scope covers wide fields related to mechanical system technologies, including intelligent system, engineering design, energy system, and multidisciplinary fields.

<p>IMAC-G Special Seminar on Quantum Science and Engineering 2 credits Elective Required</p> <p>This seminar is prepared for learning various subjects and topics related to the specific field of the course.</p>	<p>Special Lecture on Quantum Energy Engineering B Elective Required</p> <p>A special lecture on leading-edge academic research in the major area, or on the creation and development of knowledge in relation to the major area.</p>
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