

2023 Enrollment

Course List and Summary

Doctoral Degree Program

授業科目表 (DC) List of Courses

Department of Mechanical Systems Engineering

区分 Category	授業科目 Subject	開講時期 Schedule	使用 言語 Langu age	単位 Credit			備考 Remarks
				必須 Required	選択必須 Elective Required	選択 Elective	
学際基盤科目 Interdisciplinary Basic Subjects	近代技術史学 History of Modern Technology	毎年 Every year	J		2		左記の学際基盤科目、 特別講義 B、特別研修 B、及び関連科目の内 から 4 科目以上を選択 履修し、8 単位以上を 修得すること。なお、 特別講義 B と特別研修 B 及び関連科目で修得 した単位は 4 単位まで 本要件に含めることが できる。 A student has to earn 8 or more credits from the Interdisciplinary basic subjects listed in the left column. However, a total of 4 credits at most, obtained from Advanced seminar B, Special lecture B, and Related subjects are included in this requirement.
	新事業創造論 New Business Creation	毎年 Every year	J		2		
	ベンチャー企業戦略 Venture Strategy		J		2		
	知的デザイン学特論 Advanced Intelligent Design		E		2		
	エネルギーシステム工学特 論 Advanced Energy Systems Engineering		E		2		
	破壊機構学特論 Fracture Mechanics and Mechanisms	毎年 Every year	E		2		
	知能流体システム学特論 Intelligent Fluid Systems		E		2		
	機械システム保全学特論 Advanced Mechanical Systems Maintenance Engineering		E		2		
	多元物質応用システム工学 特論 Multidisciplinary Research and Application of Solid- State Ionic Devices	隔年 Every second year	E		2		
	ナノテクノロジー特論 Advanced Nano/Technology		E		2		
バイオナノテクノロジー特 論 Advanced Bio- Nanotechnology	隔年 Every second year	E		2			
専門科目 Major General Subjects	機械機能創成特別講義 B Special Lecture on Mechanical Systems Engineering B				1~4		
	機械機能創成特別研修 B Advanced Seminar on Mechanical Systems Engineering B				1~4		
関連科目 Related Subjects of Other Majors	本研究科委員会において関連科目として認められたもの。 Those approved by the Educational Committee of the Graduate School of Engineering						
専門科目 Major General Subjects	機械機能創成博士研修 Doctoral Thesis Research in Mechanical Systems and Engineering			8			

1, 上記科目の単位数を合わせて 16 単位以上を修得すること。(自専攻の学際基盤科目から 4 単位以上履修すること。ただし、特別講義 B、特別研修 B 及び他専攻・他研究科の関連科目の内から 4 単位以上を選択履修することもできる)

Students must acquire 16 or more credits from the subjects above. (Students must acquire 4 or more credits from the Interdisciplinary Basic subjects of their own department and can also select 4 or more credits from Special Lecture B, Advanced Seminar B and Related subjects of other departments or other schools.)

2, 『開講時期』については、現時点におけるものであり、変更になることもある。開講年度などは授業時間割などで確認すること。

“Schedule” is currently tentative and may be subject to change.

Make sure to check the fiscal years when each class is offered with the time schedule of the classes, program syllabus, etc.

3, 「使用言語」欄のアルファベット記号について

Language Key

E:英語開講科目 (Lectures given in English)

JE:準英語開講科目 (Lectures basically given in Japanese, with English explanations)

J:日本語開講科目 (Lectures given in Japanese)

<p>History of Modern Technology 2 credits</p> <p>Elective Required Professor Shuji Tanaka</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 is 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>New Business Creation 2 credits</p> <p>Elective Required Professor Shuichi Ishida</p> <p>This course covers business creation theory based on business administration from theoretical and case study perspectives. The domain extends not only to management strategy but also to entrepreneurship theory. The course is designed to be accessible to engineering graduate students who have never studied business administration.</p>
<p>Venture Strategy 2 credits</p> <p>Elective Required</p>	<p>Advanced Intelligent Design 2 credits</p> <p>Elective Required Professor Takahito Ono Associate Professor Masayoshi Mizutani</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 research on applications to information technologies, energy, and medical fields are also lectured.</p>
<p>Advanced Energy Systems Engineering 2 credits</p> <p>Elective Required Professor Hiroo Yugami Professor Tetsushi Biwa Professor Masaya Shigeta Associate Professor Makoto Shimizu</p> <p>This course provides students with deep knowledge on the broad topics selected from energy conversion engineering and related fields, such as the control and application methods of heat and fluid energy, as well as renewable energy technology and thermoacoustics. Students will acquire the ability to find out the problems and to pursue the solutions through this lecture.</p>	<p>Fracture Mechanics and Mechanisms 2 credits</p> <p>Elective Required Professor Kazuhiro Ogawa 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>
<p>Intelligent Fluid Systems 2 credits</p> <p>Elective Required Professor Kaoru Maruta Professor Takehiko Sato Professor Atsuki Komiya</p> <p>Fundamentals and applications for intelligent control of thermo-fluid flows under the various conditions including microgravity and electro-magnetic field, and its optimized simulation method are discussed. The construction of intelligent fluid systems with sensing, processing, control and actuation and its applications to energy conversion, plasma medicine and material processing are discussed. Prof. K. Maruta: Fundamental and applications of combustion dynamics Prof. T. Sato: Plasma medicine and plasma flows Prof. A. Komiya: Sensing and control of micro-nano scale thermos-fluid flows.</p>	<p>Advanced Mechanical Systems Maintenance Engineering 2 credits</p> <p>Elective Required Professor Tetsuya Uchimoto</p> <p>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.</p>

<p>Multidisciplinary Research and Application of Solid-State Ionic Devices 2 credits</p> <p>Elective Required Professor Koji Amezawa</p> <p>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.</p>	<p>Advanced Nano/Technology 2 credits</p> <p>Elective Required Professor Gao Wei Professor Koshi Adachi</p>
<p>Advanced Bio-Nanotechnology 2 credits</p> <p>Elective Required Professor Matsuhiko Nishizawa Professor Tetsu Tanaka Associate Professor Takafumi Fukushima</p> <p>Recent trends and perspective on Bio-nanotechnology, including the progress in micromachining techniques and LSI techniques, will be lectured in order to educate ability for engineering innovative devices for advanced medicines.</p>	<p>Special Lecture on Mechanical Systems Engineering B 1~4 credits</p> <p>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>Special Seminar on Mechanical Systems Engineering B 1~4 credits</p> <p>Elective Required Professor Shuichi Ishida</p> <p>The problem-posing ability is acquired by integrating advanced expertise through the training.</p>	<p>Doctoral Thesis Research in Mechanical Systems and Engineering 8 credits</p> <p>Required</p> <p>Students engage in experiments and seminars, including research presentations, discussion, and literature reviews.</p>

授業科目表 (DC) List of Courses

Department of Finemechanics

区分 Category	授業科目 Subject	開講時期 Schedule	使用 言語 Langu age	単位 Credit			備考 Remarks
				必須 Required	選択必須 Elective Required	選択 Elective	
学際基盤科目 Interdisciplinary Basic Subjects	近代技術史学 History of Modern Technology	毎年 Every year	J		2		左記の学際基盤科目, 特別講義 B, 特別研修 B, 及び関連科目の内 から4科目以上を選択 履修し, 8単位以上を 修得すること. なお, 特別講義Bと特別研修 B及び関連科目で修得 した単位は4単位まで 本要件に含めることが できる. A student has to earn 8 or more credits from the Interdisciplinary basic subjects listed in the left column. However, a total of 4 credits at most, obtained from Advanced seminar B, Special lecture B, and Related subjects are included in this requirement.
	新事業創造論 New Business Creation	毎年 Every year	J		2		
	ベンチャー企業戦略 Venture Strategy		J		2		
	材料メカニクス特論 Advanced Mechanics of Materials	隔年 Every second year	E		2		
	ナノテクノロジー特論 Advanced Nano/Technology		E		2		
	ナノ流動学特論 Nano-Flow Science	隔年 Every second year	E		2		
	知能システム工学特論 Advanced Intelligence and Systems Engineering		E		2		
	破壊機構学特論 Fracture Mechanics and Mechanisms	毎年 Every year	E		2		
	バイオナノテクノロジー特 論 Advanced Bio- Nanotechnology	隔年 Every second year	E		2		
	バイオメカニクス特別講義 II Special Lecture Series on Integrated Biomechanics II		E		2		
	知的メカノシステム工学特 論 Intelligent Mechanosystem Engineering		E		2		
表面ナノ・マイクロ計測制 御学特論 Advanced Nano-and Micro- Surface Metrology and Engineering	隔年 Every second year	E		2			
専門科目 Major General Subjects	ファインメカニクス特別講 義B Special Lecture on Finemechanics B				1~4		
	ファインメカニクス特別研 修B Advanced Seminar on Finemechanics B				1~4		
関連科目 Related Subjects of Other Majors	本研究科委員会において関連科目として認められたもの。 Those approved by the Educational Committee of the Graduate School of Engineering						
専門科目 Major General Subjects	ファインメカニクス博士研 修 Doctoral Thesis Research in Finemechanics			8			

1, 上記科目の単位数を合わせて 16 単位以上を修得すること。(自専攻の学際基盤科目から 4 単位以上履修すること。ただし、特別講義B、特別研修B及び他専攻・他研究科の関連科目の内から 4 単位以上を選択履修することもできる)

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<p>History of Modern Technology 2 credits</p> <p>Elective Required Professor Shuji Tanaka</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 is 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>New Business Creation 2 credits</p> <p>Elective Required Professor Shuichi Ishida</p> <p>This course covers business creation theory based on business administration from theoretical and case study perspectives. The domain extends not only to management strategy but also to entrepreneurship theory. The course is designed to be accessible to engineering graduate students who have never studied business administration.</p>
<p>Venture Strategy 2 credits</p> <p>Elective Required</p>	<p>Advanced Mechanics of Materials 2 credits</p> <p>Elective Required Professor Hitoshi Soyama Professor Hironori Tomyoh</p> <p>Lecture will deal with methodological explorations about extension of lifetime 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.</p>
<p>Advanced Nano/Technology 2 credits</p> <p>Elective Required Professor Gao Wei Professor Koshi Adachi</p>	<p>Nano-Flow Science 2 credits</p> <p>Elective Required Professor Takahito Ono Professor Takashi Tokumasu Professor Kazuhiko Endo</p> <p>To realize higher performance and lower energy consumption of advanced green nano-devices such as ULSI, TFT, MEMS/NEMS, sensors, optical devices, solar cells, secondary batteries, thermoelectric conversion devices, and so on, a process technology with atomic-layer-level control of device materials and structure is inevitable. Process technologies (such as etching, thin film deposition, surface modification) are basis of nanotechnology and are realized by utilization and control of plasma, beam, biomolecules, and so on. This course will introduce the principle of these nano-processes which is needed for research and development of green nano-devices. Examples of devices fabricated by these processes are also introduced.</p>

<p>Advanced Intelligence and Systems Engineering 2 credits</p> <p>Elective Required Professor Kazuo Hokkirigawa Associate Professor Takeshi Yamaguchi</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>Fracture Mechanics and Mechanisms 2 credits</p> <p>Elective Required Professor Kazuhiro Ogawa 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.</p> <p>For the elucidation of fracture mechanics and mechanisms, it is necessary that understanding of the interaction and synergistic effect of the diversified influential factors.</p> <p>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>
<p>Advanced Bio-Nanotechnology 2 credits</p> <p>Elective Required Professor Matsuhiko Nishizawa Professor Tetsu Tanaka Associate Professor Takafumi Fukushima</p> <p>Recent trends and perspective on Bio-nanotechnology, including the progress in micromachining techniques and LSI techniques, will be lectured in order to educate ability for engineering innovative devices for advanced medicines.</p>	<p>Special Lecture Series on Integrated Biomechanics II 2 credits</p> <p>Elective Required Professor Yoichi Haga Professor Takuji Ishikawa Professor Makoto Ohta Associate Professor Makoto Kanzaki</p>
<p>Intelligent Mechatronics Engineering 2 credits</p> <p>Elective Required Professor Makoto Ohta Associate Professor Kenichi Funamoto</p> <p>To realize intelligent mechano-systems that autonomously adapt to their environment, it is essential to understand the structure and the mechanisms of sensing and decision-making of intelligent systems in living organisms. This lecture focuses on problems related to the fundamentals and applications of optimization of complex dynamic systems, and aims to develop an intuitive understanding of the most common methods of optimization theory by functional analysis.</p>	<p>Advanced Nano-and Micro-Surface Metrology and Engineering 2 credits</p> <p>Elective Required Professor Wataru Yashiro</p> <p>Measurement and control are the two wheels of manufacturing. The aim of this lecture is to learn the most advanced measurement and control methods covering a wide range of spatial scales from atomic to macroscopic scales of surfaces and interfaces that govern the functions of materials. The ultimate goal of this course is to enable students to gain insight into the current state of measurement and control technology, its limitations, and the potential for opening up new frontiers in materials and life sciences.</p>
<p>Special Lecture on Finemechanics B 1~4 credits</p> <p>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 Finemechanics B 1~4 credits</p> <p>Elective Required</p> <p>The problem-posing ability is acquired by integrating advanced expertise through the training.</p>

Doctoral Thesis Research in Finemechanics

8 credits

Required

Students engage in experiments and seminars, including research presentations, discussion, and literature reviews.

授業科目表 (DC) List of Courses

Department of Robotics

区分 Category	授業科目 Subject	開講時期 Schedule	使用 言語 Langu age	単位 Credit			備考 Remarks
				必須 Required	選択必須 Elective Required	選択 Elective	
	近代技術史学 History of Modern Technology	毎年 Every year	J		2		左記の学際基盤科目、特別講義 B、特別研修 B、及び関連科目の内から 4 科目以上を選択履修し、8 単位以上を修得すること。なお、特別講義 B と特別研修 B 及び関連科目で修得した単位は 4 単位まで本要件に含めることができる。 A student has to earn 8 or more credits from the Interdisciplinary basic subjects listed in the left column. However, a total of 4 credits at most, obtained from Advanced seminar B, Special lecture B, and Related subjects are included in this requirement.
	新事業創造論 New Business Creation	毎年 Every year	J		2		
	ベンチャー企業戦略 Venture Strategy		J		2		
	バイオナノテクノロジー特論 Advanced Bio- Nanotechnology	隔年 Every second year	E		2		
	バイオメカニクス特別講義 II Special Lecture Series on Integrated Biomechanics II		E		2		
	ロボティクス特論 Advanced Robotics	隔年 Every second year	E		2		
	知的メカノシステム工学特論 Intelligent Mechanosystem Engineering		E		2		
	知的デザイン学特論 Advanced Intelligent Design		E		2		
	ナノテクノロジー特論 Advanced Nano/Technology		E		2		
専門科目 Major General Subjects	ロボティクス特別講義 B Special Lecture on Robotics B				1~4		
	ロボティクス特別研修 B Advanced Seminar on Robotics B				1~4		
関連科目 Related Subjects of Other Majors	本研究科委員会において関連科目として認められたもの。 Those approved by the Educational Committee of the Graduate School of Engineering						
専門科目 Major General Subjects	ロボティクス博士研修 Doctoral Thesis Research in Robotics			8			

1, 上記科目の単位数を合わせて 16 単位以上を修得すること。(自専攻の学際基盤科目から 4 単位以上履修すること。ただし、特別講義 B、特別研修 B 及び他専攻・他研究科の関連科目の内から 4 単位以上を選択履修することもできる)

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<p>Venture Strategy 2 credits</p> <p>Elective Required</p>	<p>Advanced Bio-Nanotechnology 2 credits</p> <p>Elective Required Professor Matsuhiko Nishizawa Professor Tetsu Tanaka Associate Professor Takafumi Fukushima</p> <p>Recent trends and perspective on Bio-nanotechnology, including the progress in micromachining techniques and LSI techniques, will be lectured in order to educate ability for engineering innovative devices for advanced medicines.</p>
<p>Special Lecture Series on Integrated Biomechanics II 2 credits</p> <p>Elective Required Professor Yoichi Haga Professor Takuji Ishikawa Professor Makoto Ohta Associate Professor Makoto Kanzaki</p>	<p>Advanced Robotics 2 credits</p> <p>Elective Required Professor Satoshi Murata Professor Shuji Tanaka Professor Yasuhisa Hirata Professor Mitsuhiro Hayashibe Professor Yoshiaki Kanamori Professor Yoichi Haga Professor Mami Tanaka Associate Professor Naoki Inomata Associate Professor Yusuke Tamura Associate Professor Shin-ichiro Nomura Associate Professor Takashiro Tsukamoto Associate Professor Dai Owaki Associate Professor Takeshi Okuyama</p> <p>A robot system can be constructed by organically integrating actuators that realize motion, mechanical elements, microprocessors and sensors that are necessary for realizing intelligent motion. In this lecture, we will focus on cultivating the ability to conceptualize, find problems, and solve problems, which are necessary for the integration of robot systems. Intelligent robots, bio-mechatronics, intelligent mechatronics, micro/nano-mechatronics, etc. will be the subject of concrete research, and lectures and discussions will be held.</p>

<p>Intelligent Mechatronics Engineering 2 credits</p> <p>Elective Required Professor Makoto Ohta Associate Professor Kenichi Funamoto</p> <p>To realize intelligent mechatronics systems that autonomously adapt to their environment, it is essential to understand the structure and the mechanisms of sensing and decision-making of intelligent systems in living organisms. This lecture focuses on problems related to the fundamentals and applications of optimization of complex dynamic systems, and aims to develop an intuitive understanding of the most common methods of optimization theory by functional analysis.</p>	<p>Advanced Intelligent Design 2 credits</p> <p>Elective Required Professor Takahito Ono Associate Professor Masayoshi Mizutani</p> <p>Nanotechnology-based nano-precision mechanical manufacturing and micro-nanomanufacturing, and integration technologies of various components are lectured. Precision machines based on above technologies and micro-nanomanufacturing, the design and modeling of those mechanical elements, recent research on applications to information technologies, energy, and medical fields are also lectured.</p>
<p>Advanced Nano/Technology 2 credits</p> <p>Elective Required Professor Gao Wei Professor Koshi Adachi</p>	<p>Special Lecture on Robotics B 1~4 credits</p> <p>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>Special Seminar on Robotics B 1~4 credits</p> <p>Elective Required</p> <p>The problem-posing ability is acquired by integrating advanced expertise through the training.</p>	<p>Doctoral Thesis Research in Robotics 8 credits</p> <p>Required</p> <p>Students engage in experiments and seminars, including research presentations, discussion, and literature reviews.</p>

授業科目表 (DC) List of Courses

Department of Aerospace Engineering

区分 Category	授業科目 Subject	開講時期 Schedule	使用 言語 Langu age	単位 Credit			備考 Remarks
				必須 Required	選択必須 Elective Required	選択 Elective	
学際基盤科目 Interdisciplinary Basic Subjects	近代技術史学 History of Modern Technology	毎年 Every year	J		2		左記の学際基盤科目、 特別講義 B、特別研修 B、及び関連科目の内 から 4 科目以上を選択 履修し、8 単位以上を 修得すること。なお、 特別講義 B と特別研修 B 及び関連科目で修得 した単位は 4 単位まで 本要件に含めることが できる。 A student has to earn 8 or more credits from the Interdisciplinary basic subjects listed in the left column. However, a total of 4 credits at most, obtained from Advanced seminar B, Special lecture B, and Related subjects are included in this requirement.
	新事業創造論 New Business Creation	毎年 Every year	J		2		
	ベンチャー企業戦略 Venture Strategy		J		2		
	航空システム特論 I Advanced Aero Systems I		E		2		
	航空システム特論 II Advanced Aero Systems II		E		2		
	宇宙システム特論 I Advanced Space Systems I	毎年 Every year	E		2		
	宇宙システム特論 II Advanced Space Systems II	毎年 Every year	E		2		
	航空宇宙流体工学特論 Advanced Space Fluid Dynamics		E		2		
専門科目 Major General Subjects	航空宇宙工学特別講義 B Special Lecture on Aerospace Engineering B				1~4		
	航空宇宙工学特別研修 B Advanced Seminar on Aerospace Engineering B				1~4		
関連科目 Related Subjects of Other Majors	本研究科委員会において関連科目として認められたもの。 Those approved by the Educational Committee of the Graduate School of Engineering						
専門科目 Major General Subjects	航空宇宙工学博士研修 Doctoral Thesis Research in Aeronautics and Space Engineering			8			

1, 上記科目の単位数を合わせて 16 単位以上を修得すること。(自専攻の学際基盤科目から 4 単位以上履修すること。ただし、特別講義 B、特別研修 B 及び他専攻・他研究科の関連科目の中から 4 単位以上を選択履修することもできる)

Students must acquire 16 or more credits from the subjects above. (Students must acquire 4 or more credits from the Interdisciplinary Basic subjects of their own department and can also select 4 or more credits from Special Lecture B, Advanced Seminar B and Related subjects of other departments or other schools.)

2, 『開講時期』については、現時点におけるものであり、変更になることもある。開講年度などは授業時間割などで確認すること。

“Schedule” is currently tentative and may be subject to change.

Make sure to check the fiscal years when each class is offered with the time schedule of the classes, program syllabus, etc.

3, 「使用言語」欄のアルファベット記号について

Language Key

E: 英語開講科目 (Lectures given in English)

JE: 準英語開講科目 (Lectures basically given in Japanese, with English explanations)

J: 日本語開講科目 (Lectures given in Japanese)

<p>History of Modern Technology 2 credits Elective Required Professor Shuji Tanaka</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 is 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>New Business Creation 2 credits Elective Required Professor Shuichi Ishida</p> <p>This course covers business creation theory based on business administration from theoretical and case study perspectives. The domain extends not only to management strategy but also to entrepreneurship theory. The course is designed to be accessible to engineering graduate students who have never studied business administration.</p>
<p>New Business Creation 2 credits Elective Required Professor Shuichi Ishida</p>	<p>Advanced Aero Systems I 2 credits Elective Required Professor Tomonaga Okabe Professor Soshi Kawai</p> <p>This course covers computational methods used in aerospace engineering problems and includes the following topics:</p> <ol style="list-style-type: none"> 1. Introduction to the continuum mechanics for the application of structural analysis and computational fluid dynamics 2. Finite element methods for structural analysis and nonlinear problems. 3. Mathematical foundations of modern computational fluid dynamics and the application to aircraft design processes. 4. Mathematical formulation of multidisciplinary design problems and overview of gradient-based and gradient-free algorithms. 5. Dynamic mode decomposition for modelling of complex and interactive problems.
<p>Advanced Aero Systems II 2 credits Elective Required Professor Tomonaga Okabe Professor Soshi Kawai</p> <p>This course provides the topics of advanced fluid mechanics research in aerospace engineering and its related fields, such as aircraft aerodynamic design processes, etc., to study the existing advanced knowledge and remaining issues in the areas of fluid mechanics. The topics will broadly include numerical and experimental research in fluid mechanics and how fluid mechanics research applies to aircraft design processes. Students are expected to acquire the ability to problem-finding and set as doctoral course students through the various topics of fluid mechanics research provided.</p>	<p>Advanced Space Systems I 2 credits Elective Required Professor Kazuya Yoshida Professor Naofumi Ohnishi Professor Kanjuro Makihara Associate Professor Toshinori Kuwahara</p> <p>This course covers advanced issues on space flight systems, which are useful for elaborating PhD level studies of space engineering:</p> <ul style="list-style-type: none"> • The scope of the course is the design, development, launch and operation of space flight systems for Earth-orbiting missions and/or interplanetary missions. • Depending on the availability of the lecturers, a specific focus will be made on the topics from propulsion systems, space structures, orbital mechanics, attitude dynamics and control, and space robotics. • Lectures can be conducted by invited international lectures.

<p>Advanced Space Systems II 2 credits</p> <p>Elective Required</p> <p>Professor Kazuya Yoshida Professor Naofumi Ohnishi Professor Kanjuro Makihara Associate Professor Toshinori Kuwahara</p> <p>This course provides extensive advanced lectures on space flight systems, particularly the issues not covered by Advanced Space Systems I:</p> <ul style="list-style-type: none"> • The scope of the course is the design, development, launch and operation of space flight systems for Earth-orbiting missions and/or interplanetary missions. • Depending on the availability of the lecturers, a specific focus will be made on the topics from propulsion systems, space structures, orbital mechanics, attitude dynamics and control, and space robotics. • Lectures can be conducted by invited international lectures. • All lectures are given in English. 	<p>Advanced Space Fluid Dynamics 2 credits</p> <p>Elective Required</p> <p>Professor Hiroki Nagai Professor Shigeru Obayashi</p> <p>From aerospace engineering and the related fields, this lecture delivers extensive and deep technical knowledge about extreme flows such as the hypersonic flow, propulsion of the spacecraft, flows with various flights. The principal objective of the lecture is the cultivation of the ability of the doctoral course students for problem discovery and the proposition of a new solution method.</p>
<p>Special Lecture on Aerospace Engineering B 1~4 credits</p> <p>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>Special Seminar on Aerospace Engineering B 1~4 credits</p> <p>Elective Required</p> <p>The problem-posing ability is acquired by integrating advanced expertise through the training.</p>
<p>Doctoral Thesis Research in Aeronautics and Space Engineering 8 credits</p> <p>Required</p> <p>Students engage in experiments and seminars, including research presentations, discussion, and literature reviews.</p>	