

# **Syllabus**

**International Doctoral Degree  
Program  
(2016-Spring Term)**

**(D51010010)Advanced Seminar on Mechanical Engineering 1[Advanced Seminar on Mechanical Engineering 1]**

<b>Subject name[English]</b>	Advanced Seminar on Mechanical Engineering 1[Advanced Seminar on Mechanical Engineering 1]				
<b>Schedule number</b>	D51010010	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	4
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b> The seminar aims to enhance the ability of each student to plan and accomplish research in the field of mechanical engineering through reviewing, reading, and discussing technical papers related to his/her doctor thesis research topic.					
<b>Contents of class</b> Each student reads English technical papers related to his/her doctor thesis, introduces the contents of the papers and discusses them with other students and his/her supervisor.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b> Inquire this of your supervisor.					
<b>Notes for textbook</b> Inquire this of your supervisor.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b> To acquire the ability of each student to discuss his/her doctor thesis research topic and topics related to his/her research field with his/her supervisor and specialists in his/her field. To acquire the ability to write English technical papers.					
<b>Evaluation of achievement</b> The achivement is evaluated based on the results of paper introduction, understanding of papers, answers to questions, and on the contribution to discussion.					
<b>Examination</b> その他 None during exam period					
<b>Details of examination</b>					
<b>Other information</b> Inquire this of your supervisor.					
<b>Reference URL</b>					
<b>Office hours</b> Inquire this of your supervisor.					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(D51010020)Advanced Seminar on Mechanical Engineering 2[Advanced Seminar on Mechanical Engineering 2]**

<b>Subject name[English]</b>	Advanced Seminar on Mechanical Engineering 2[Advanced Seminar on Mechanical Engineering 2]				
<b>Schedule number</b>	D51010020	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	2~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>	The seminar aims to enhance the ability of each student to plan and accomplish his/her research in the field of mechanical engineering through reviewing, reading, and discussing technical papers related to his/her doctor thesis research topic.				
<b>Contents of class</b>	Each student reads English technical papers related to his/her doctor thesis, introduces the contents of the papers and discusses them with other students and his/her supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Inquire this of your supervisor.				
<b>Notes for textbook</b>	Inquire this of your supervisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire the ability of each student to discuss his/her doctor thesis research topic and topics related to his/her research field with his/her supervisor and specialists in his/her field. To acquire the ability to write English technical papers.				
<b>Evaluation of achievement</b>	The achivement is evaluated based on the results of paper introduction, understanding of papers, answers to questions, and on the contribution to discussion.				
<b>Examination</b>	その他 None during exam period				
<b>Details of examination</b>					
<b>Other information</b>	Inquire this of your supervisor.				
<b>Reference URL</b>					
<b>Office hours</b>	Inquire this of your supervisor.				
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(D51030010)Advanced Mechanical Systems[Advanced Mechanical Systems]**

<b>Subject name[English]</b>	Advanced Mechanical Systems[Advanced Mechanical Systems]				
<b>Schedule number</b>	D51030010	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Mon.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	河村 庄造, 足立 忠晴, 竹市 嘉紀, 伊勢 智彦 KAWAMURA Shozo, ADACHI Tadaharu, TAKEICHI Yoshinori, ISE Tomohiko				
<b>Numbering</b>					
<b>Objectives of class</b>					
The class aims to give advanced knowledge on solid mechanics, vibration engineering or tribology. The class aims to give advanced knowledge on solid mechanics, vibration engineering or tribology.					
<b>Contents of class</b>					
Prof. S. Kawamura From 01 to 04 week Vibration engineering of machines and structures is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the vibration engineering, and must present them. Practical modeling and simulation of structural vibration are understood through discussion based on the presentations. Topics: Vibration engineering, Modeling and simulation of dynamic phenomena and so on.					
Prof. T. Adachi From 05 to 8 week Mechanics of solids and structures including materials science is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the mechanics, and must present them. Practical mechanics and design of engineering materials and mechanical structures are understood through discussion based on the presentations. Topics: Mechanics of solids and structures, Mechanical properties of materials, Design of mechanical components and so on.					
Prof. Y. Takeichi From 9 to 12 week Fundamentals of tribology including materials science are lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the tribology, and must present them. Practical lubrication engineering and design of sliding mechanical components are understood through discussion based on the presentations. Topics: Tribology, Lubrication engineering, Surface properties, Wear of materials, Tribological coatings and so on.					
Lecturer T. Ise From 13 to 15 week Vibration engineering of structures and machine elements is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the vibration engineering, and must present them. Practical data analysis and simulation of vibration are understood through discussion based on the presentations. Topics: Vibration engineering, Vibrarion data analysis, Fluid film lubrication and so on. 01 week: Guidance of this lecture					
From 02 to 04 week: Prof. S. Kawamura Vibration engineering of machines and structures is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the vibration engineering, and must present them. Practical modeling and simulation of structural vibration are understood through discussion based on the presentations. Topics: Vibration engineering, Modeling and simulation of dynamic phenomena and so on.					
From 05 to 07 week: Prof. T. Adachi Mechanics of solids and structures including materials science is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the mechanics, and must present them. Practical mechanics and design of engineering materials and mechanical structures are understood through discussion based on the presentations. Topics: Mechanics of solids and structures, Mechanical properties of materials, Design of mechanical components and so on.					
From 08 to 10 week: Prof. Y. Takeichi					

Fundamentals of tribology including materials science are lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the tribology, and must present them. Practical lubrication engineering and design of sliding mechanical components are understood through discussion based on the presentations.  
Topics: Tribology, Lubrication engineering, Surface properties, Wear of materials, Tribological coatings and so on.

From 11 to 13 week: Lecturer T. Ise

Vibration engineering of structures and machine elements is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the vibration engineering, and must present them. Practical data analysis and simulation of vibration are understood through discussion based on the presentations.  
Topics: Vibration engineering, Vibrarion data analysis, Fluid film lubrication and so on.

From 14 to 15 week: Discussion

**Self Preparation and Review**

Self-preparation and review are necessary.

**Related subjects**

Fundamental knowledge on solid mechanics, vibration engineering or tribology.

Fundamental knowledge on solid mechanics, vibration engineering or tribology.

**Notes for textbook**

Handouts will be prepared

Handouts will be prepared

**Notes for reference**

**Goals to be achieved**

get advanced knowledge on solid mechanics, vibration engineering or tribology.

get advanced knowledge on solid mechanics, vibration engineering or tribology.

**Evaluation of achievement**

A comprehensive report(70%) and discussion(30%)

Method: A comprehensive report(70%) and discussion(30%)

Level: achievement in the case upper 55 points.

Level A: upper 80 points, Level B: upper 65 points, Level C: upper 55 points

**Examination**

レポートで実施

By Report

**Details of examination**

**Other information**

Tadaharu Adachi: Room D-305, E-mail: adachi@me.tut.ac.jp

Shozo Kawamura: Room D-404, E-Mail: kawamura@me.tut.ac.jp

Yoshinori Takeichi: Room D-304, E-Mail: takeichi@tut.jp

Tomohiko Ise: Room D-403, E-Mail: ise@me.tut.ac.jp

Tadaharu Adachi: Room D-305, E-mail: adachi@me.tut.ac.jp

Shozo Kawamura: Room D-404, E-Mail: kawamura@me.tut.ac.jp

Yoshinori Takeichi: Room D-304, E-Mail: takeichi@tut.jp

Tomohiko Ise: Room D-403, E-Mail: ise@me.tut.ac.jp

**Reference URL**

**Office hours**

ask us by E-Mail

ask us by E-Mail

**Relations to attainment objectives of learning and education**

**Key words**

solid mechanics, vibration engineering, tribology

solid mechanics, vibration engineering, tribology

**(D51030030)Advanced Manufacturing Processes[Advanced Manufacturing Processes]**

<b>Subject name[English]</b>	Advanced Manufacturing Processes[Advanced Manufacturing Processes]				
<b>Schedule number</b>	D51030030	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Tue.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	福本 昌宏, 安井 利明, 伊崎 昌伸, 横山 誠二 FUKUMOTO Masahiro, YASUI Toshiaki, IZAKI Masanobu, YOKOYAMA Seiji				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>To understand fundamentals of advanced technology in materials joining, especially both with high performance coating formation by particles deposition and with non-melting diffusion bonding by Friction Stir Welding.</p> <p>To understand fundamental science of physics and chemistry on inorganic thin film and the production, especially solution process.</p> <p>To understand fundamentals of advanced technology in materials joining, especially both with high performance coating formation by particles deposition and with non-melting diffusion bonding by Friction Stir Welding.</p> <p>To understand fundamental science of physics and chemistry on inorganic thin film and the production, especially solution process.</p>					
<b>Contents of class</b>					
<ol style="list-style-type: none"> <li>1. Fundamental of thermal spray process, Splat formation problem</li> <li>2. Process control with Transition temperature &amp; Transition pressure</li> <li>3. Cold spray and Aero-sol deposition process</li> <li>4. Fundamental of Friction Stir Welding, Joining between dissimilar materials by FSW</li> <li>5. Friction spot welding, practical applications of FSW</li> <li>6. Fundamentals of thin film deposition</li> <li>7. Related technology for dry process, PVD, CVD</li> <li>8. Advanced deposition process</li> </ol> <p>Laboratory tour will be arranged to experience the actual process.</p> <ol style="list-style-type: none"> <li>9. Thermodynamics and thermochemistry in solution processing</li> <li>10. Fundamental solid state physics-electronic state</li> <li>11. Fundamental solid state physics-crystal structure and symmetry</li> <li>12. Soft-solution processing for the inorganic thin film production</li> <li>13. Vapor pressure and activity.</li> <li>14. Dissolution of gases in metals. Thermodynamics and kinetics.</li> <li>15. Phase stability diagram in various solution.</li> <li>16. Extraction of valuable substances and hazards from industrial wastes.</li> </ol> <ol style="list-style-type: none"> <li>1. Fundamental of thermal spray process, Splat formation problem</li> <li>2. Process control with Transition temperature &amp; Transition pressure</li> <li>3. Cold spray and Aero-sol deposition process</li> <li>4. Fundamental of Friction Stir Welding, Joining between dissimilar materials by FSW</li> <li>5. Friction spot welding, practical applications of FSW</li> <li>6. Fundamentals of thin film deposition</li> <li>7. Related technology for dry process, PVD, CVD</li> <li>8. Advanced deposition process</li> </ol> <p>Laboratory tour will be arranged to experience the actual process.</p> <ol style="list-style-type: none"> <li>9. Thermodynamics and thermochemistry in solution processing</li> <li>10. Fundamental solid state physics-electronic state</li> <li>11. Fundamental solid state physics-crystal structure and symmetry</li> <li>12. Soft-solution processing for the inorganic thin film production</li> <li>13. Vapor pressure and activity.</li> <li>14. Dissolution of gases in metals. Thermodynamics and kinetics.</li> <li>15. Phase stability diagram in various solution.</li> <li>16. Extraction of valuable substances and hazards from industrial wastes.</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					

Basic knowledge on materials joining process, solid state physics and chemistry and solution chemistry is desirable.

Basic knowledge on materials joining process, solid state physics and chemistry and solution chemistry is desirable.

#### **Notes for textbook**

Handouts will be prepared for participants.

(Reference)

Required readings will be taken from a variety of reference books and research papers.

Handouts will be prepared for participants.

(Reference)

Required readings will be taken from a variety of reference books and research papers.

#### **Notes for reference**

#### **Goals to be achieved**

Understand following items,

- Joining mechanism between dissimilar materials
- Features and mechanism of various joining methods
- Features and mechanism of thick and thin film coating
- Features of functionally gradient material and composite material
- Fundamental thermodynamics in thin film production
- Fundamental solid state physics in thin film
- Fundamentals of physical chemistry for material processing

Understand following items,

- Joining mechanism between dissimilar materials
- Features and mechanism of various joining methods
- Features and mechanism of thick and thin film coating
- Features of functionally gradient material and composite material
- Fundamental thermodynamics in thin film production
- Fundamental solid state physics in thin film
- Fundamentals of physical chemistry for material processing

#### **Evaluation of achievement**

Interim report & presentation (40%) and term-end report (60%).

Interim report & presentation (40%) and term-end report (60%).

#### **Examination**

レポートで実施

By Report

#### **Details of examination**

#### **Other information**

Masahiro Fukumoto:

Room: D-503, ext.: 6692, e-mail: fukumoto@tut.jp

Toshiaki Yasui:

Room: D-601, ext:6703, e-mail: yasui@tut.jp

Masanobu Izaki

Room: D-505, ext:6694, e-mail:m-izaki@me.tut.ac.jp

Seiji Yokoyama:

Room: D-507, ext:6696, e-mail: yokoyama@me.tut.jp

Masahiro Fukumoto:

Room: D-503, ext.: 6692, e-mail: fukumoto@tut.jp

Toshiaki Yasui:

Room: D-601, ext:6703, e-mail: yasui@tut.jp

Masanobu Izaki

Room: D-505, ext:6694, e-mail:m-izaki@me.tut.ac.jp

Seiji Yokoyama:

Room: D-507, ext:6696, e-mail: yokoyama@me.tut.jp

#### **Reference URL**

<http://isf.me.tut.ac.jp/>

<http://tf.me.tut.ac.jp>

<http://isf.me.tut.ac.jp/>

<http://tf.me.tut.ac.jp>

**Office hours**

Masahiro Fukumoto: Wednesday 18:00–18:30

Toshiaki Yasui: Monday 17:00–18:00

Masanobu Izaki: any time, but to contact me before visit

Seiji Yokoyama: Monday 17:00–18:00

Masahiro Fukumoto: Wednesday 18:00–18:30

Toshiaki Yasui: Monday 17:00–18:00

Masanobu Izaki: any time, but to contact me before visit

Seiji Yokoyama: Monday 17:00–18:00

**Relations to attainment objectives of learning and education**

**Key words**

Joining in dissimilar materials, FSW, Surface modification, Thermal spraying, Cold spraying, Thin film, Oxide, Thermodynamics, Band structure, Crystal structure, Reaction kinetics, Waste management.

Joining in dissimilar materials, FSW, Surface modification, Thermal spraying, Cold spraying, Thin film, Oxide, Thermodynamics, Band structure, Crystal structure, Reaction kinetics, Waste management.



**(D51030050)Engineering of Intelligent Robotics[Engineering of Intelligent Robotics]**

<b>Subject name[English]</b>	Engineering of Intelligent Robotics[Engineering of Intelligent Robotics]				
<b>Schedule number</b>	D51030050	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Thu.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Begginging grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	寺嶋 一彦, 鈴木 新一, 三好 孝典, 佐野 滋則, 真下 智昭 TERASHIMA Kazuhiko, SUZUKI Shinichi, MIYOSHI Takanori, SANNO Shigenori, MASHIMO Tomoaki				
<b>Numbering</b>					
<b>Objectives of class</b>					
Understand design, measurement and control methods for intelligent robots such as autonomous mobile robots with human-like ability.					
Understand design, measurement and control methods for intelligent robots such as autonomous mobile robots with human-like ability.					
<b>Contents of class</b>					
We provide the following schedule. Because this course is for PhD students, we can consider the requests from the PhD students.					
1st week: Modeling for robot system					
2nd week: System identification and validation					
3rd week: Observer and State Estimation					
4th week: Control system design based on model					
5th week: Report 1					
6th week: Modelling of robot mechanism					
7th week: Theory of tele-control					
8th week: Stability for delayed system					
9th week: Example of tele-operation					
10th week: Report 2					
11th week: Intelligent mechanism					
12th week: Enviromental recognition and map building					
13th week: Path planning and trajectory generation					
14th week: Motion control					
15th week: Report 3					
16th week: Discussion and conclusion					
We provide the following schedule. Because this course is for PhD students, we can consider the requests from the PhD students.					
1st week: Modeling for robot system					
2nd week: System identification and validation					
3rd week: Observer and State Estimation					
4th week: Control system design based on model					
5th week: Report 1					
6th week: Modelling of robot mechanism					
7th week: Theory of tele-control					
8th week: Stability for delayed system					
9th week: Example of tele-operation					
10th week: Report 2					
11th week: Intelligent mechanism					
12th week: Enviromental recognition and map building					
13th week: Path planning and trajectory generation					
14th week: Motion control					
15th week: Report 3					
16th week: Discussion and conclusion					

**Self Preparation and Review**

Read the handouts before and after the lecture.

Read the handouts before and after the lecture.

**Related subjects**

Fundamentals of linear algebra, differential equation, mechanics, measurement and control theory, and robotics.

Fundamentals of linear algebra, differential equation, mechanics, measurement and control theory, and robotics.

**Notes for textbook**

Handouts will be prepared.

Handouts will be prepared.

<b>Reference1</b>	<b>Book title</b>	Introduction to Autonomous Mobile Robots (Intelligent Robotics and Autonomous Agents series)			<b>ISBN</b>	
	<b>Author</b>	Roland Siegwart and Illah R. Nourbakhsh	<b>Publisher</b>	MIT Press	<b>Publish year</b>	2004

**Notes for reference****Goals to be achieved**

- (1) Understand the design methods of intelligent robots
- (2) Understand the environmental recognition and measurement methods for intelligent robots
- (3) Understand the motion planning methods for intelligent robots
- (4) Understand the control methods for intelligent robots

- (1) Understand the design methods of intelligent robots
- (2) Understand the environmental recognition and measurement methods for intelligent robots
- (3) Understand the motion planning methods for intelligent robots
- (4) Understand the control methods for intelligent robots

**Evaluation of achievement**

Report (100 %)

A: Score of the report is 80 or higher.

B: Score of the report is 65 or higher.

C: Score of the report is 55 or higher.

Report (100 %)

A: Score of the report is 80 or higher.

B: Score of the report is 65 or higher.

C: Score of the report is 55 or higher.

**Examination**

レポートで実施

By Report

**Details of examination****Other information**

Shinichi Suzuki, D-408, 6678, shinichi@las.tut.ac.jp

Kazuhiko Terashima, D-510, 6699, terasima@me.tut.ac.jp

Takanori Miyoshi, D-509, 6698, miyoshi@me.tut.ac.jp

Shigenori Sano, D2-306, 6684, sano@me.tut.ac.jp

Shinichi Suzuki, D-408, 6678, shinichi@las.tut.ac.jp

Kazuhiko Terashima, D-510, 6699, terasima@me.tut.ac.jp

Takanori Miyoshi, D-509, 6698, miyoshi@me.tut.ac.jp

Shigenori Sano, D2-306, 6684, sano@me.tut.ac.jp

**Reference URL**

Basic knowledge on robotics and control are required.

Basic knowledge on robotics and control are required.

**Office hours**

Contact the professors by e-mail first.

Contact the professors by e-mail first.

**Relations to attainment objectives of learning and education**

**Key words**

Robot, Control, Sensor, Actuator, Mechanism, Mechanical system

Robot, Control, Sensor, Actuator, Mechanism, Mechanical system

**(D51030070)Advanced Energy Engineering[Advanced Energy Engineering]**

<b>Subject name[English]</b>	Advanced Energy Engineering[Advanced Energy Engineering]				
<b>Schedule number</b>	D51030070	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Fri.4~4	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	北村 健三, 鈴木 孝司, 中村 祐二 KITAMURA Kenzo, SUZUKI Takashi, NAKAMURA Yuji				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>The aim of the present lecture is to obtain advanced knowledge on the transport and effective utilization of thermal energy, on the combustion of gases and solids, and on the atomization of liquids.</p> <p>The aim of the present lecture is to obtain advanced knowledge on the transport and effective utilization of thermal energy, on the combustion of gases and solids, and on the atomization of liquids.</p>					
<b>Contents of class</b>					
1st week Introduction 2nd week Introduction of combustion 3rd week Physics and chemistry of diffusion flame 4th week Physics and chemistry of premixed flame 5th week Analytical treatment of combustion 6th week Experimental techniques of combustion 7th week Introduction of heat transfer 8th week Heat transfer by conduction 9th week Heat transfer by convection (1) 10th week Heat transfer by convection (2) 11th week Heat transfer by radiation 12th week Introduction of atomization 13th week Physics of atomization 14th week Experimental techniques for atomization 15th week Analytical treatment of atomization 16th week Final examination  1st week Introduction 2nd week Introduction of combustion 3rd week Physics and chemistry of diffusion flame 4th week Physics and chemistry of premixed flame 5th week Analytical treatment of combustion 6th week Experimental techniques of combustion 7th week Introduction of heat transfer 8th week Heat transfer by conduction 9th week Heat transfer by convection (1) 10th week Heat transfer by convection (2) 11th week Heat transfer by radiation 12th week Introduction of atomization 13th week Physics of atomization 14th week Experimental techniques for atomization 15th week Analytical treatment of atomization 16th week Final examination					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
The knowledge on "Fluid dynamics", "Combustion engineering" and "Heat transfer" is necessary. Otherwise, students will feel difficulty to catch up with the lecture. The knowledge on "Fluid dynamics", "Combustion engineering" and "Heat transfer" is necessary. Otherwise, students will feel					

difficulty to catch up with the lecture.

**Notes for textbook**

(Textbooks)

K.K.Kuo, "Principles of Combustion", John Wiley & Sons, 2005.

W.S. Janna, "Engineering Heat Transfer (3rd Edition)", CRC Press, 2009

(Textbooks)

K.K.Kuo, "Principles of Combustion", John Wiley & Sons, 2005.

W.S. Janna, "Engineering Heat Transfer (3rd Edition)", CRC Press, 2009

**Notes for reference**

**Goals to be achieved**

To understand the analytical and experimental techniques to solve the practical problems concerning with Combustion, Heat Transfer and Atomization.

To understand the analytical and experimental techniques to solve the practical problems concerning with Combustion, Heat Transfer and Atomization.

**Evaluation of achievement**

Evaluation will be based on the score of final examination.

Evaluation will be based on the score of final examination.

**Examination**

レポートで実施

By Report

**Details of examination**

**Other information**

Room: D3-201, Phone: 6666 E-mail: kitamura@me.tut.ac.jp

Room: D-308, phone:6667, E-mail:takashi@me.tu.ac.jp

Room:D-311, phone:6647, E-mail:yuji@me.tut.ac.jp

Room: D3-201, Phone: 6666 E-mail: kitamura@me.tut.ac.jp

Room: D-308, phone:6667, E-mail:takashi@me.tu.ac.jp

Room:D-311, phone:6647, E-mail:yuji@me.tut.ac.jp

**Reference URL**

**Office hours**

Every Friday, after the lecture to 6:00PM.

Every Friday, after the lecture to 6:00PM.

**Relations to attainment objectives of learning and education**

**Key words**

Combustion, Heat Transfer, Spray and Atomization

Combustion, Heat Transfer, Spray and Atomization

**(D52010020)Seminar on Electrical and Electronic Information Engineering 2[Seminar on Electrical and Electronic Information Engineering 2]**

<b>Subject name[English]</b>	Seminar on Electrical and Electronic Information Engineering 2[Seminar on Electrical and Electronic Information Engineering 2]				
<b>Schedule number</b>	D52010020	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	4
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S2系教務委員 2kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>					
The seminar aims to provide a broad understanding of theoretical and experimental approaches related to the electrical and electronic engineering for the research work of his/her master thesis.					
<b>Contents of class</b>					
The class provides both of fundamental knowledge on the research work of master thesis and the most advanced results in the related field by reading research papers and monographs. Contents of the class depend on the supervisor. To be announced by individual supervisors.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Textbook or material will be made available from the supervisor. To be announced by individual supervisors.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To acquire fundamental knowledge on individual research fields. To acquire the ability of finding a problem, the ability of solving the problem and the presentation skill.					
<b>Evaluation of achievement</b>					
Coursework, presentation and/or report.					
<b>Examination</b>					
その他 None during exam period					
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(D52010030)Seminar on Electrical and Electronic Information Engineering 3[Seminar on Electrical and Electronic Information Engineering 3]**

<b>Subject name[English]</b>	Seminar on Electrical and Electronic Information Engineering 3[Seminar on Electrical and Electronic Information Engineering 3]				
<b>Schedule number</b>	D52010030	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	2~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S2系教務委員 2kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>					
The seminar aims to provide a broad understanding of theoretical and experimental approaches related to the electrical and electronic information engineering for the research work of his/her master thesis.					
<b>Contents of class</b>					
The class provides both of fundamental knowledge on the research work of master thesis and the most advanced results in the related field by reading research papers and monographs. Contents of the class depend on the supervisor. To be announced by individual supervisors.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Textbook or material will be made available from the supervisor. To be announced by individual supervisors.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To acquire fundamental knowledge on individual research fields. To acquire the ability of finding a problem, the ability of solving the problem and the presentation skill.					
<b>Evaluation of achievement</b>					
Coursework, presentation and/or report.					
<b>Examination</b>					
その他 None during exam period					
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(D52030010)Advanced Electronic Materials 1[Advanced Electronic Materials 1]**

<b>Subject name[English]</b>	Advanced Electronic Materials 1[Advanced Electronic Materials 1]				
<b>Schedule number</b>	D52030010	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Wed.4~4	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	福田 光男, 中村 雄一, 内田 裕久 FUKUDA Mitsuo, NAKAMURA Yuichi, UCHIDA Hironaga				
<b>Numbering</b>					
<b>Objectives of class</b>					
Objective of this subject is to learn about the forefront research and development on thermoelectronics and photonics in electronic materials. Objective of this subject is to learn about the forefront research and development on thermoelectronics and photonics in electronic materials.					
<b>Contents of class</b>					
1. Thermoelectronics. You will learn about advanced thermoelectronic materials and area from fundamentals to applications of thermoelectronics. 1) thermoelectronic materials, 2) Applications and processing of thermoelectronic materials, 3) Thermoelectronic devices and systems.					
2. Photonics. You will learn about photonic materials and devices. 1) photonic materials and 2) (nano-) photonic devices.					
3. Powder processing technologies You will learn about powder processing techniques for electronic devices. 1) sintering, 2) microstructure of ceramics and 3) nanocomposite					
1. Thermoelectronics. You will learn about advanced thermoelectronic materials and area from fundamentals to applications of thermoelectronics. 1) thermoelectronic materials, 2) Applications and processing of thermoelectronic materials, 3) Thermoelectronic devices and systems.					
2. Photonics. You will learn about photonic materials and devices. 1) photonic materials and 2) (nano-) photonic devices.					
3. Powder processing technologies You will learn about powder processing techniques for electronic devices. 1) sintering, 2) microstructure of ceramics and 3) nanocomposite					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Lecture materials will be distributed. Lecture materials will be distributed.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
It aims at acquiring the broad knowledge of research and development by learning about the bases of recent research and					



development in various fields.

It aims at acquiring the broad knowledge of research and development by learning about the bases of recent research and development in various fields.

**Evaluation of achievement**

The reports or tests will be set in each categories.

The result is evaluated from the sum of those marks.

Grades: A:80-100, B:65-79, C:55-64.

The reports or tests will be set in each categories.

The result is evaluated from the sum of those marks.

Grades: A:80-100, B:65-79, C:55-64.

**Examination**

レポートで実施

By Report

**Details of examination**

**Other information**

**Reference URL**

**Office hours**

Please make an appointment via e-mail.

Please make an appointment via e-mail.

**Relations to attainment objectives of learning and education**

**Key words**

photonics, thermelectronics

photonics, thermelectronics

**(D52030040)Advanced Electrical Systems 2[Advanced Electrical Systems 2]**

<b>Subject name[English]</b>	Advanced Electrical Systems 2[Advanced Electrical Systems 2]				
<b>Schedule number</b>	D52030040	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Wed.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	須田 善行, 稲田 亮史, 村上 義信 SUDA Yoshiyuki, INADA Ryoji, MURAKAMI Yoshinobu				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>This lecture is implemented as an introduction to electrical energy systems and intended for students and other engineering disciplines. It is being useful as reference and self-study guide for the professional dealing with this important area. There are following three sub courses to choose from.</p> <p>This lecture is implemented as an introduction to electrical energy systems and intended for students and other engineering disciplines. It is being useful as reference and self-study guide for the professional dealing with this important area. There are following three sub courses to choose from.</p>					
<b>Contents of class</b>					
<p>Sub Course 1(Y. Suda)</p> <ol style="list-style-type: none"> <li>1. Fundamental concept of electrical energy engineering</li> <li>2. Three-phase systems</li> <li>3. Power electronics</li> </ol> <p>Sub Course 2(R. Inada)</p> <ol style="list-style-type: none"> <li>1. Introduction of Electrochemical Energy Conversion Devices</li> <li>2. Lithium-Ion Secondary Batteries</li> <li>3. Recent Trend in Electrochemical Energy Conversion Devices</li> </ol> <p>Sub Course 3(Yo. Murakami)</p> <ol style="list-style-type: none"> <li>1. Introduction of Electric Energy Systems</li> <li>2. High Voltage Engineering and Electrical Insulation</li> <li>3. Fundamental Properties of Dielectrics and Electrical Insulating Materials.</li> </ol> <p>Sub Course 1(Y. Suda)</p> <ol style="list-style-type: none"> <li>1. Fundamental concept of electrical energy engineering</li> <li>2. Three-phase systems</li> <li>3. Power electronics</li> </ol> <p>Sub Course 2(R. Inada)</p> <ol style="list-style-type: none"> <li>1. Introduction of Electrochemical Energy Conversion Devices</li> <li>2. Lithium-Ion Secondary Batteries</li> <li>3. Recent Trend in Electrochemical Energy Conversion Devices</li> </ol> <p>Sub Course 3(Yo. Murakami)</p> <ol style="list-style-type: none"> <li>1. Introduction of Electric Energy Systems</li> <li>2. High Voltage Engineering and Electrical Insulation</li> <li>3. Fundamental Properties of Dielectrics and Electrical Insulating Materials.</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<p>Basic electrical power engineering course is prerequisite.</p> <p>Basic electrical power engineering course is prerequisite.</p>					
<b>Notes for textbook</b>					
<p>Materials will be prepared by the lecturer.</p> <p>Materials will be prepared by the lecturer.</p>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					

<p><b>Evaluation of achievement</b>  Marks are based on examinations(100%).  Marks are based on examinations(100%).</p>
<p><b>Examination</b>  定期試験を実施(対面)  Examination(Face to Face)</p>
<p><b>Details of examination</b></p>
<p><b>Other information</b></p>
<p><b>Reference URL</b>  (1) J. Larminie and A. Dicks: Fuel Cell Systems Explained (Wiley)  (2) M. Yoshio, R.J. Brodd and A. Kozawa: Lithium Ion Batteries: Science and Technologies (Springer-Verlag)  (3) E. Kuffel, W. Zaengel and J. Kuffel: High Voltage Engineering (Newnes)</p> <p>(1) J. Larminie and A. Dicks: Fuel Cell Systems Explained (Wiley)  (2) M. Yoshio, R.J. Brodd and A. Kozawa: Lithium Ion Batteries: Science and Technologies (Springer-Verlag)  (3) E. Kuffel, W. Zaengel and J. Kuffel: High Voltage Engineering (Newnes)</p>
<p><b>Office hours</b></p>
<p><b>Relations to attainment objectives of learning and education</b></p>
<p><b>Key words</b></p>

**(D52030050)Advanced Microelectronics 1[Advanced Microelectronics 1]**

<b>Subject name[English]</b>	Advanced Microelectronics 1[Advanced Microelectronics 1]				
<b>Schedule number</b>	D52030050	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Mon.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	澤田 和明, 村上 裕二, 関口 寛人, 高橋 一浩 SAWADA Kazuaki, MURAKAMI Yuji, SEKIGUCHI Hiroto, TAKAHASHI Kazuhiro				
<b>Numbering</b>					
<b>Objectives of class</b>					
From the viewpoint of deep understanding of advanced microelectronics, physics of semiconductors including material design and an example of latest device will be lectured.					
From the viewpoint of deep understanding of advanced microelectronics, physics of semiconductors including material design and an example of latest device will be lectured.					
<b>Contents of class</b>					
a) Physics and Properties of Semiconductors					
Crystal growth and device processing					
Energy band engineering					
Alloy semiconductor					
Strain effect					
Superlattice					
Carrier transport phenomena					
Tummeling effect					
b)Metal-Semiconductor Contacts					
Schottky barrier					
Current transport processes					
Ohmic contact					
c) Integrated circuits					
device processing					
MEMS/NEMS					
Latest MOS FETs					
Current topics in IC/MEMS					
a) Physics and Properties of Semiconductors					
Crystal growth and device processing					
Energy band engineering					
Alloy semiconductor					
Strain effect					
Superlattice					
Carrier transport phenomena					
Tummeling effect					
b)Metal-Semiconductor Contacts					
Schottky barrier					
Current transport processes					
Ohmic contact					
c) Integrated circuits					
device processing					
MEMS/NEMS					
Latest MOS FETs					
Current topics in IC/MEMS					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					

The basic knowledge on the quantum mechanics, thermodynamics, and electronics are desirable.

Semiconductor Physics, Master course

The basic knowledge on the quantum mechanics, thermodynamics, and electronics are desirable.

Semiconductor Physics, Master course

**Notes for textbook**

Physics of Semiconducotr Devices

S.M.Sze, Willy

Physics of Semiconducotr Devices

S.M.Sze, Willy

**Notes for reference**

**Goals to be achieved**

(1) To understand fundamental aspects on microelectronics, and physics of semiconductors including material design.

(2) To get the knowledge on the latest technologies on microelectronics.

(1) To understand fundamental aspects on microelectronics, and physics of semiconductors including material design.

(2) To get the knowledge on the latest technologies on microelectronics.

**Evaluation of achievement**

Reports (100%)

Reports (100%)

**Examination**

レポートで実施

By Report

**Details of examination**

**Other information**

K.Sawada (C-605)

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H. Sekiguchi (C-610)

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K. Takahashi (C-406)

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ext. 6755

**Reference URL**

<http://www.tut.ac.jp/english/introduction/02EE.pdf>

(department)

<http://www.int.ee.tut.ac.jp/>

(devisision)

[http://www.tut.ac.jp/english/research/research\\_highlights.html](http://www.tut.ac.jp/english/research/research_highlights.html)

(research activities)

<http://www.tut.ac.jp/english/introduction/02EE.pdf>

(department)

<http://www.int.ee.tut.ac.jp/>  
(division)

[http://www.tut.ac.jp/english/research/research\\_highlights.html](http://www.tut.ac.jp/english/research/research_highlights.html)  
(research activities)

**Office hours**

book an appointment by e-mail, phone, etc.  
book an appointment by e-mail, phone, etc.

**Relations to attainment objectives of learning and education**

**Key words**

**(D52030070)Advanced Information and Communication Systems 1[Advanced Information and Communication Systems 1]**

<b>Subject name[English]</b>	Advanced Information and Communication Systems 1[Advanced Information and Communication Systems 1]				
<b>Schedule number</b>	D52030070	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Mon.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	大平 孝, 上原 秀幸, 竹内 啓悟 OHIRA Takashi, UEHARA Hideyuki, TAKEUCHI Keigo				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>Students select between the following two courses:</p> <p>The first course is intended for learning how to design microwave circuits needed for advanced wireless communication systems and wireless power transmission systems. The distributed constant element theory is addressed to characterize linear circuits at high frequencies. Based on this technique, students challenge synthesis of a variety of microwave signal and power processing functions.</p> <p>The second course is intended for learning mainly medium access control, multi-hop communications and other topics related to wireless networks. Students are required to give solutions of the problems which cause performance degradation.</p> <p>Students select between the following two courses:</p> <p>The first course is intended for learning how to design microwave circuits needed for advanced wireless communication systems and wireless power transmission systems. The distributed constant element theory is addressed to characterize linear circuits at high frequencies. Based on this technique, students challenge synthesis of a variety of microwave signal and power processing functions.</p> <p>The second course is intended for learning mainly medium access control, multi-hop communications and other topics related to wireless networks. Students are required to give solutions of the problems which cause performance degradation.</p>					
<b>Contents of class</b>					
<p>Course 1 provided by Prof. Ohira:</p> <ol style="list-style-type: none"> <li>1. Transmission lines</li> <li>2. Scattering matrix</li> <li>3. Mizuhashi Smith chart</li> </ol> <p>Course 2 provided by Prof. Uehara:</p> <ol style="list-style-type: none"> <li>1. Medium access control protocols</li> <li>2. Multi-hop communications</li> <li>3. Ad hoc and sensor networks</li> </ol> <p>Course 1 provided by Prof. Ohira:</p> <ol style="list-style-type: none"> <li>1. Transmission lines</li> <li>2. Scattering matrix</li> <li>3. Mizuhashi Smith chart</li> </ol> <p>Course 2 provided by Prof. Uehara:</p> <ol style="list-style-type: none"> <li>1. Medium access control protocols</li> <li>2. Multi-hop communications</li> <li>3. Ad hoc and sensor networks</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<p>Course 1:</p> <p>Deep understanding on electromagnetic field theory, linear passive and reciprocal circuit theory, and sophisticated experience on complex and matrix mathematics are prerequisite.</p> <p>Course 2:</p> <p>The students who will take this course are supposed to have sufficient knowledge about the following; wireless digital</p>					

modulation and demodulation, radio propagation characteristic, signal processing, probability, random variables and stochastic process.

Course 1:

Deep understanding on electromagnetic field theory, linear passive and reciprocal circuit theory, and sophisticated experience on complex and matrix mathematics are prerequisite.

Course 2:

The students who will take this course are supposed to have sufficient knowledge about the following; wireless digital modulation and demodulation, radio propagation characteristic, signal processing, probability, random variables and stochastic process.

#### Notes for textbook

Course 1: Lecture on the blackboard without resorting to textbooks.

Course 2: Instruct in 1st class.

Course 1: Lecture on the blackboard without resorting to textbooks.

Course 2: Instruct in 1st class.

#### Notes for reference

#### Goals to be achieved

Course 1:

- Understand the distributed constant elements and concept of scattering matrix.
- Derive frequency responses on linear RF circuits exploiting Mizuhashi Smith chart.
- Characterize various kinds of high frequency functional circuits and compose them based upon given specifications.

Course 2:

- Understand the mechanism of medium access control and multi-hop communications
- Understand the characteristics of ad hoc and sensor networks
- Present a solution or a new application for the above

Course 1:

- Understand the distributed constant elements and concept of scattering matrix.
- Derive frequency responses on linear RF circuits exploiting Mizuhashi Smith chart.
- Characterize various kinds of high frequency functional circuits and compose them based upon given specifications.

Course 2:

- Understand the mechanism of medium access control and multi-hop communications
- Understand the characteristics of ad hoc and sensor networks
- Present a solution or a new application for the above

#### Evaluation of achievement

Course 1: Marks are based on the final test.

Course 2: Marks are based on reports and presentations.

Course 1: Marks are based on the final test.

Course 2: Marks are based on reports and presentations.

#### Examination

定期試験を実施(対面)

Examination(Face to Face)

#### Details of examination

#### Other information

For e-mail address information, visit <http://www.comm.ee.tut.ac.jp/>

For e-mail address information, visit <http://www.comm.ee.tut.ac.jp/>

#### Reference URL

<http://www.comm.ee.tut.ac.jp/>

<http://www.comm.ee.tut.ac.jp/>

#### Office hours

Appoint a time slot via email

Appoint a time slot via email

#### Relations to attainment objectives of learning and education



**Key words**

microwave, circuit, electromagnetic field, Smith chart, scattering matrix, distributed constant element, wireless networks, medium access control, multi-hop  
microwave, circuit, electromagnetic field, Smith chart, scattering matrix, distributed constant element, wireless networks, medium access control, multi-hop

**(D53010010)Seminar on Computer Science and Engineering 1[Seminar on Computer Science and Engineering 1]**

<b>Subject name[English]</b>	Seminar on Computer Science and Engineering 1[Seminar on Computer Science and Engineering 1]				
<b>Schedule number</b>	D53010010	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	4
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員 3kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>	<p>The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering.</p> <p>It is also aimed for students to acquire various skills, required in general research work, such as those for oral presentation, and technical discussion and writing.</p>				
<b>Contents of class</b>	While specific contents depend on the research areas students are involved in, it is usually the case for students to read relevant textbooks/research papers and report on them, as well as to present and discuss on the research work of their own.				
<b>Self Preparation and Review</b>	Consult with your advisor.				
<b>Related subjects</b>	Consult with your advisor.				
<b>Notes for textbook</b>	Consult with your advisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire abilities for technical readings in English, logical thinking/explanation, and clear presentation.				
<b>Evaluation of achievement</b>	Will be evaluated by taking into account various factors overall, such as technical explanation, question answering, discussion involvements and so on.				
<b>Examination</b>	その他 None during exam period				
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					



**(D53010020)Seminar on Computer Science and Engineering 2[Seminar on Computer Science and Engineering 2]**

<b>Subject name[English]</b>	Seminar on Computer Science and Engineering 2[Seminar on Computer Science and Engineering 2]				
<b>Schedule number</b>	D53010020	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	2~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員 3kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>	<p>The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering.</p> <p>It is also aimed for students to acquire various skills, required in general research work, such as those for oral presentation, and technical discussion and writing.</p>				
<b>Contents of class</b>	While specific contents depend on the research areas students are involved in, it is usually the case for students to read relevant textbooks/research papers and report on them, as well as to present and discuss on the research work of their own.				
<b>Self Preparation and Review</b>	Consult with your advisor.				
<b>Related subjects</b>	Consult with your advisor.				
<b>Notes for textbook</b>	Consult with your advisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire abilities for technical readings in English, logical thinking/explanation, and clear presentation.				
<b>Evaluation of achievement</b>	Will be evaluated by taking into account various factors overall, such as technical explanation, question answering, discussion involvements and so on.				
<b>Examination</b>	その他 None during exam period				
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					



**(D53030020)Speech and Language Processing[Speech and Language Processing]**

<b>Subject name[English]</b>	Speech and Language Processing[Speech and Language Processing]				
<b>Schedule number</b>	D53030020	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Tue.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	秋葉 友良, 山本 一公 AKIBA Tomoyoshi, YAMAMOTO Kazumasa				
<b>Numbering</b>					
<b>Objectives of class</b>					
Important topics on spoken / natural language processing will be discussed. Important topics on spoken / natural language processing will be discussed.					
<b>Contents of class</b>					
Either (I) or (II) should be selected.					
(I) Basic of natural language processing / Modeling characters / Modeling words / Modeling sentences / Modeling documents/Modeling cross-language dependencies					
(II) Basic of spoken language processing / Basic of speech recognition / Algorithm for continuous speech recognition / Hidden Markov Model / Language model and decoder / Speech recognition using neural networks / Language processing / Spoken dialog systems, Multimodal dialog systems / Language identification, Speaker identification, Spoken document retrieval, Spoken document summarization, Computer aided language learning system					
Either (I) or (II) should be selected.					
(I) Basic of natural language processing / Modeling characters / Modeling words / Modeling sentences / Modeling documents/Modeling cross-language dependencies					
(II) Basic of spoken language processing / Basic of speech recognition / Algorithm for continuous speech recognition / Hidden Markov Model / Language model and decoder / Speech recognition using neural networks / Language processing / Spoken dialog systems, Multimodal dialog systems / Language identification, Speaker identification, Spoken document retrieval, Spoken document summarization, Computer aided language learning system					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Information theory, Formal language theory Information theory, Formal language theory					
<b>Notes for textbook</b>					
Materials will be prepared by lecturers. Materials will be prepared by lecturers.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
(I) Understand the basic concepts of information retrieval and natural language processing / Obtain actual ability to deal with a large text corpus / Understand current methods for the NLP applications.					
(II)					

Basics: Understand the role of spoken language as an human interface / Understand hierarchical structure of spoken language / Understand the basic speech analysing methods.

Speech Recognition: Understand the relation between speech recognition and information theory / Understand the algorithm for speech recognition using DP matching / Understand the Hidden Markov Model.

Natural Language Processing: Understand the role of language model / Understand the parser for context free language.

Applications: Understand the dictation system and the spoken dialog system / Understand the applications of speech technology including computer aided language learning system.

(I) Understand the basic concepts of information retrieval and natural language processing / Obtain actual ability to deal with a large text corpus / Understand current methods for the NLP applications.

(II)

Basics: Understand the role of spoken language as an human interface / Understand hierarchical structure of spoken language / Understand the basic speech analysing methods.

Speech Recognition: Understand the relation between speech recognition and information theory / Understand the algorithm for speech recognition using DP matching / Understand the Hidden Markov Model.

Natural Language Processing: Understand the role of language model / Understand the parser for context free language.

Applications: Understand the dictation system and the spoken dialog system / Understand the applications of speech technology including computer aided language learning system.

#### **Evaluation of achievement**

Marks are based on reports (100%).

Marks are based on reports (100%).

#### **Examination**

レポートで実施

By Report

#### **Details of examination**

#### **Other information**

(I) Tomoyosi Akiba: C-505, 44-6758, akiba@ics.tut.ac.jp

(II) Kazumasa Yamamoto: C-506, 44-6767, yamamoto@cs.tut.ac.jp

(I) Tomoyosi Akiba: C-505, 44-6758, akiba@ics.tut.ac.jp

(II) Kazumasa Yamamoto: C-506, 44-6767, yamamoto@cs.tut.ac.jp

#### **Reference URL**

#### **Office hours**

16:25-17:40, Tuesday and Wednesday

16:25-17:40, Tuesday and Wednesday

#### **Relations to attainment objectives of learning and education**

#### **Key words**

spoken language processing, natural language processing, human language technology

spoken language processing, natural language processing, human language technology

**(D53030090)Molecular Simulation[Molecular Simulation]**

<b>Subject name[English]</b>	Molecular Simulation[Molecular Simulation]				
<b>Schedule number</b>	D53030090	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Tue.5~5	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	後藤 仁志, 栗田 典之 GOTO Hitoshi, KURITA Noriyuki				
<b>Numbering</b>					
<b>Objectives of class</b>					
Understanding of theories for molecular science and simulation technology based upon it The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry, that is, molecular orbital (MO) theory. In addition, the knowledge on classical molecular dynamics (MD)simulations is understood in this class. In achieving this objective, we will attempt to acquire the elementary concepts in MO and MD theory, and learn about the dynamical and electronic properties of biological molecules such as proteins, RNA and DNA.					
<b>Contents of class</b>					
1)Basic Quantum Mechanics and Molecular Simulation (1st-3rd week) 2)Molecular Quantum Mechanics and Applications (Advanced) (4th-8th week) 3)Mathematical Foundation for basic Quantum Mechanical and Computational problems (9th-10th week) 4)Advanced Molecular Simulation (11th-15th week) Considering the preliminary knowledge of the participates in this class, some topics from the following things will be chosen to be learned. (1) Basis and elementary concepts for MO and MD theory (The 1-2 weeks) (2) Applications of MO method to small molecules (The 3-4 weeks) (3) MO calculations for amino acids and their peptides (The 5-6 weeks) (4) MO and MD calculations for DNA, RNA bases and base pairs (The 7-9 weeks) (5) MO and MD calculations for complexes with proteins and ligand molecules (The 10-12 weeks) (6) MO and MD calculations for DNA, RNA and their complexes with proteins (The 13-15 weeks)					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Molecular Design Engineering  Basis knowledge about quantum chemistry and biomolecules such as proteins, RNA and DNA is required. Also, that on MD simulations is needed.					
<b>Notes for textbook</b>					
1)Quantum Chemistry Eyring/Walter/Kimball  2)Modern Quantum Chemistry Introduction to Advanced Electron Structure Theory A.Szabo and N.S.Ostlund  3) Introduction to Computational Chemistry(2nd Edition), Frank Jensen 教科書: 資料配付 参考書: "Molecular orbital calculations for amino acids and peptides", by Anne-Marie Sapse					
<b>Notes for reference</b>					



<p><b>Goals to be achieved</b></p> <p>To understand quantum mechanics and molecular simulation, their numerical representation on computer.  The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry.</p>
<p><b>Evaluation of achievement</b></p> <p>Presentation in the class and reports, small tests as well as creation of simulation programs.  [Evaluation basis] Students who attend all classes will be evaluated as follows:  A: Achieved all goals and obtained total points of reports, 80 or higher (out of 100 points).  B: Achieved 80 % of goals and obtained total points of reports, 65 or higher (out of 100 points).  C: Achieved 80 % of goals and obtained total points of reports, 55 or higher (out of 100 points).</p>
<p><b>Examination</b></p> <p>その他  By Report</p>
<p><b>Details of examination</b></p> <p>In each class, students must show the proof that they did understand the subject they learned. Sometimes, homework is given.</p>
<p><b>Other information</b></p> <p>N. K. (F-306, 0532-44-6875), H. G.. (F-307, 0532-44-6882)  連絡先  教員の居室:F 棟 306 号室  電話番号:0532-44-6875  E-mail: kurita@cs.tut.ac.jp</p>
<p><b>Reference URL</b></p>
<p><b>Office hours</b></p> <p>Wed. 13:00 to 14:30  上記の E-mail による連絡により、適宜対応する。</p>
<p><b>Relations to attainment objectives of learning and education</b></p>
<p><b>Key words</b></p> <p>Molecular Orbital Theory Electronic structure of matter Quantum Walk Molecular Dynamics Molecular Mechanics  DNA, RNA, protein, ligand, molecular orbital calculation, MM and MD simulation</p>

**(D53030150)Web Data Engineering, Advanced 1[Web Data Engineering, Advanced 1]**

<b>Subject name[English]</b>	Web Data Engineering, Advanced 1[Web Data Engineering, Advanced 1]				
<b>Schedule number</b>	D53030150	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring1 term	<b>Day of the week,period</b>	Thu.1~1	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	青野 雅樹 AONO Masaki				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>Data engineering technologies for the data (primarily on the Web) will be discussed.  Main emphasis is on the information retrieval and data mining technologies.  Data Mining technologies include principal component analysis, supervised learning such as classification, unsupervised learning such as clustering, and Web mining technologies.  Multimedia data processing will also be discussed.  The objectives of this class is to let students know the state-of-the art technologies in data mining and information retrieval.</p>					
<b>Contents of class</b>					
<p>Classes will be held (theoretically) 7.5 times. The last time will be kept for the exam.</p> <p>1. Information Retrieval  Fundamental techniques to construct a search system, including how to build indices, how to tokenize texts, and how to extract features from texts and images, will be considered.</p> <p>2. Data and Web Mining  Fundamental methods for data mining as well as Web mining are discussed.</p> <p>We plan to do one or two assignments for data mining techniques inside.</p> <p>Please note that if this lecture is held at the same time with Japanese course, the lecture might be in Japanese.  The intelligent data engineering technologies for aggregated data will be focused, where the data include both semi-structured data, such as XML and JSON, and unstructured data (e.g. time series data and the Web) are included, but structured data (such as SQL) are excluded.</p> <p>Main emphasis is on the state-of-the-art technologies on data mining and information retrieval.</p> <p>For data mining technologies, both unsupervised and supervised learning methods will be discussed.  The former includes principal component analysis, clustering, Web graph mining, and information filtering, while the latter includes classification and regression.</p> <p>For information retrieval technologies, we start with traditional vector space (Bag-of-Words) models, ending with deep learning based models such as skip-gram (e.g. word2vec). Both linear and non-linear dimensional reduction techniques will be covered.  In addition, multimedia retrieval (3D shapes, images, and videos) will be referred.</p>					
<b>Self Preparation and Review</b>					
<p>It is desirable to self-study as well as review fundamental data mining techniques such as clustering, classification, principal component analysis, and regression. It is recommended installing R/Python language (sometimes with Java/C++) into your computer, because some of the lecture materials are written in R/Python language. (R is favorable for simple visualization.)  It is desirable to self-study as well as review fundamental data mining techniques such as clustering, classification, and regression. It should be noted that the knowledge on multivariate analysis techniques such as principal component analysis is a prerequisite to this class. It is recommended installing R/Python (also sometimes Java/C++) language into your computer, because some of the lecture materials are written in R/Python language.</p>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					

Materials will be prepared by lecturers

**References:**

- (1) C. D. Manning et al, Introduction to Information Retrieval, Cambridge Univ. Press
- (2) J. Han and M. Kamber, Data Mining: Concepts and Techniques, 2nd ed, Morgan Kaufmann

<b>Reference1</b>	<b>Book title</b>	Information Retrieval, Implementing and Evaluating Search Engines			<b>ISBN</b>	978-0-262-02651-2
	<b>Author</b>	Charles L.A. Clarke, Gordon V. Cormack	<b>Publisher</b>	MIT Press	<b>Publish year</b>	2010
<b>Reference2</b>	<b>Book title</b>	Data Mining: Concepts and Techniques, Third Edition			<b>ISBN</b>	978-0-123-81479-1
	<b>Author</b>	Jiawei Han, Micheline Kamber, and Jian Pei	<b>Publisher</b>	Morgan Kaufmann	<b>Publish year</b>	2011
<b>Reference3</b>	<b>Book title</b>	Data Mining Practical Machine Learning Tools and Techniques, Third Edition			<b>ISBN</b>	978-0-12-374856-0
	<b>Author</b>	Ian H. Witten, Eibe Frank, and Mark A. Hall	<b>Publisher</b>	Morgan Kaufmann	<b>Publish year</b>	2011

**Notes for reference**

Reference #4

Title: [Modern Information Retrieval, the concepts and technology behind search, Second Edition]  
 Authors: Ricardo Baeza-Yates, Bertier Ribeiro-Neto  
 Publisher: Addison Wesley  
 ISBN: 978-0-321-41691-9  
 Year: 2011

Reference #5

Title: [Google's PageRank and Beyond]  
 Authors: Amy N. Langville, Carl D. Meyer  
 Publisher: Princeton University Press  
 ISBN: 978-0-691-12202-1  
 Year: 2006

Reference #4

Title: [Modern Information Retrieval, the concepts and technology behind search, Second Edition]  
 Authors: Ricardo Baeza-Yates, Bertier Ribeiro-Neto  
 Publisher: Addison Wesley  
 ISBN: 978-0-321-41691-9  
 Year: 2011

Reference #5

Title: [Google's PageRank and Beyond]  
 Authors: Amy N. Langville, Carl D. Meyer  
 Publisher: Princeton University Press  
 ISBN: 978-0-691-12202-1  
 Year: 2006

**Goals to be achieved**

To acquire the following knowledge that can make you

1. Implement fundamental data mining technologies.
2. Understand advanced technologies for information retrieval, including dimensional reduction.
3. Design, analyze, and evaluate the information retrieval and data mining technologies.

The following items have to be achieved:

1. Able to implement and apply fundamental data mining technologies.
2. Understand fundamental technologies for information retrieval, making full use of good indexing (such as dimensional reduction) after properly representing data objects to be retrieved.
3. Able to design, analyze, and evaluate both data mining and information retrieval technologies.

**Evaluation of achievement**

Exercise (20%) and Final exam (80%)

A: (>=80), B: (>=65), C:(>=55)

Exercise (20%) and Final exam (80%)

A: (>=80), B: (>=65), C: (>= 55)

**Examination**

定期試験を実施(対面)

Examination(Face to Face)

**Details of examination**

**Other information**

Masaki Aono (C-511) aono@tut.jp

Masaki Aono (C-511) aono@tut.jp

**Reference URL**

<http://www.kde.cs.tut.ac.jp/~aono/myLecture.html>

<http://www.kde.cs.tut.ac.jp/~aono/myLecture.html>

**Office hours**

Anytime, but a priori email appointment is definitely preferable.

Anytime, but a priori email appointment is definitely preferable.

**Relations to attainment objectives of learning and education**

Programming skills with Java, C++, R, and Python might be preferable.

Programming skills with Java, C++, R, and Python might be preferable.

**Key words**

**(D53030170)Biological Information System Engineering 1[Biological Information System Engineering 1]**

<b>Subject name[English]</b>	Biological Information System Engineering 1[Biological Information System Engineering 1]				
<b>Schedule number</b>	D53030170	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring1 term	<b>Day of the week,period</b>	Mon.4~4	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	福村 直博 FUKUMURA Naohiro				
<b>Numbering</b>					
<b>Objectives of class</b>					
This course lectures on advanced studies on information processing in the nervous systems and computational models for motor controls of the human movements.					
This course lectures on advanced studies on information processing in the nervous systems and computational models for motor controls of the human movements.					
<b>Contents of class</b>					
1. Introduction to the computational neuroscience in the motor control system					
2. Information processing in the motor system of the brain					
3-4. Motor control models of the human arm movements					
5-6. Models for motor planning in the human arm movements					
7. Models for motor planning in the human hand movements					
8. Examination					
1. Introduction to the computational neuroscience in the motor control system					
2. Information processing in the motor system of the brain					
3-4. Motor control models of the human arm movements					
5-6. Models for motor planning in the human arm movements					
7. Models for motor planning in the human hand movements					
8. Examination					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
<b>Reference1</b>	<b>Book title</b>	Human Motor Control		<b>ISBN</b>	
	<b>Author</b>	David A. Rosenbaum	<b>Publisher</b>	Academic Press	<b>Publish year</b> 2010
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
1. Understand the computational processing in the motor control					
2. Understand the motor control models of the human voluntary movements					
3. Understand the models for motor planning of the human voluntary movements					
1. Understand the computational processing in the motor control					
2. Understand the motor control models of the human voluntary movements					
3. Understand the models for motor planning of the human voluntary movements					
<b>Evaluation of achievement</b>					
Final examination (100%), A: 100-80, B: 79-65, C: 64-55, D (fail): 54-0					
Final examination (100%), A: 100-80, B: 79-65, C: 64-55, D (fail): 54-0					

<b>Examination</b> 試験期間中には何も行わない None during exam period
<b>Details of examination</b>
<b>Other information</b> N. Fukumura (C611, Tel: 0532-44-6772, fukumura@cs.tut.ac.jp)  N. Fukumura (C611, Tel: 0532-44-6772, fukumura@cs.tut.ac.jp)
<b>Reference URL</b> <a href="http://www.bmcs.cs.tut.ac.jp">http://www.bmcs.cs.tut.ac.jp</a> <a href="http://www.bmcs.cs.tut.ac.jp">http://www.bmcs.cs.tut.ac.jp</a>
<b>Office hours</b> Monday 16:20-17:50 Monday 16:20-17:50
<b>Relations to attainment objectives of learning and education</b> D1  D1
<b>Key words</b>

**(D53030180)Biological Information System Engineering 2[Biological Information System Engineering 2]**

<b>Subject name[English]</b>	Biological Information System Engineering 2[Biological Information System Engineering 2]				
<b>Schedule number</b>	D53030180	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring2 term	<b>Day of the week,period</b>	Mon.4~4	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Begging grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	堀川 順生 HORIKAWA Junsei				
<b>Numbering</b>					
<b>Objectives of class</b>					
This course lectures on advanced studies on information processing in the brain and nervous systems. Neural mechanisms for production and transmission of electrical signals, and brain mechanisms for processing of sensory information are studied.					
This course lectures on advanced studies on information processing in the brain and nervous systems. Neural mechanisms for production and transmission of electrical signals, and brain mechanisms for processing of sensory information are studied.					
<b>Contents of class</b>					
1. Introduction to the information processing in the brain					
2. Structures of the nervous systems and brain and neural mechanisms of the production and transmission of electrical signals					
3-7.5. Brain mechanisms for processing of sensory information					
8. Final examination					
1. Introduction to the information processing in the brain					
2. Structures of the nervous systems and brain and neural mechanisms of the production and transmission of electrical signals					
3-7.5. Brain mechanisms for processing of sensory information					
8. Final examination					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Bio-physical Information Systems 1, Bio-physical Information Systems 2					
Bio-physical Information Systems 1, Bio-physical Information Systems 2					
<b>Notes for textbook</b>					
Handouts referring the reference books are used.					
Handouts referring the reference books are used.					
<b>Reference1</b>	<b>Book title</b>	Neuroscience – Exploring the brain		<b>ISBN</b>	
	<b>Author</b>	Bear, Connors, Paradiso	<b>Publisher</b>	Lippincott Williams & Wilkins	<b>Publish year</b> 2007
<b>Reference2</b>	<b>Book title</b>	Neuroscience – The biology of the brain		<b>ISBN</b>	
	<b>Author</b>	Gazzaniga, Ivry, Mangun	<b>Publisher</b>	WW Norton & Co Incm	<b>Publish year</b> 2008
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
1. Understand the information processing in the nervous systems and brain					
2. Understand neural mechanisms of the production and transmission of electrical signals					
3. Understand the brain mechanisms for processing of sensory information					
1. Understand the information processing in the nervous systems and brain					

2. Understand neural mechanisms of the production and transmission of electrical signals
3. Understand the brain mechanisms for processing of sensory information

**Evaluation of achievement**

[Evaluation basis] Students who attend all classes will be evaluated as follows:

- A: Achieved all goals and obtained total points of exam, 80 or higher (out of 100 points).
- B: Achieved 70 % of goals and obtained total points of exam, 65 or higher (out of 100 points).
- C: Achieved 60 % of goals and obtained total points of exam, 55 or higher (out of 100 points).

[Evaluation basis] Students who attend all classes will be evaluated as follows:

- A: Achieved all goals and obtained total points of exam, 80 or higher (out of 100 points).
- B: Achieved 70 % of goals and obtained total points of exam, 65 or higher (out of 100 points).
- C: Achieved 60 % of goals and obtained total points of exam, 55 or higher (out of 100 points).

**Examination**

定期試験を実施(対面)

Examination(Face to Face)

**Details of examination****Other information**

Junsei Horikawa (F407, Tel: 0532-44-6891, horikawa@cs.tut.ac.jp)

Junsei Horikawa (F407, Tel: 0532-44-6891, horikawa@cs.tut.ac.jp)

**Reference URL****Office hours**

Monday 16:20-17:50

Monday 16:20-17:50

**Relations to attainment objectives of learning and education**

(B)理論的・応用的知識の獲得と発展的活用能力

重要な学術・技術分野の理論・応用知識を自発的に獲得し、発展的に活用できる能力

**Key words**



**(D54010010)Seminar on Environmental & Life Sciences 1[Seminar on Environmental & Life Sciences 1]**

<b>Subject name[English]</b>	Seminar on Environmental & Life Sciences 1[Seminar on Environmental & Life Sciences 1]				
<b>Schedule number</b>	D54010010	<b>Subject area</b>	Advanced Applied Chemistry and Life Science	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	4
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S4系教務委員 4kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>					
This course will provide the students with opportunities to study on his/her research subjects on advanced environmental and life sciences by reading scientific papers under the guidance of his/her supervisor. The aim of the lesson for the students is to learn the latest knowledge and presentation skills required for his/her research in the seminar as well as to deepen his/her understanding of advanced environmental and life sciences.					
<b>Contents of class</b>					
The students will be required to read scientific papers written by other language than Japanese, especially English, which are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Seminar on Environmental & Life Sciences 2 All other relevant subjects in Advanced Environmental and Life Sciences					
<b>Notes for textbook</b>					
Supervisor will recommend textbooks, papers, and research materials to students.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To acquire advanced knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To be able to make oral and poster presentations relevant to papers he/she has read.					
<b>Evaluation of achievement</b>					
The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores.					
<b>Examination</b>					
その他 None during exam period					
<b>Details of examination</b>					
<b>Other information</b>					
Supervisor(s)					
<b>Reference URL</b>					
<a href="http://ens.tut.ac.jp/en/">http://ens.tut.ac.jp/en/</a>					
<b>Office hours</b>					
Students are encouraged visiting by appointment.					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					
Environmental science and technology, life science, materials science and engineering, applied chemistry					



**(D54010020)Seminar on Environmental & Life Sciences 2[Seminar on Environmental & Life Sciences 2]**

<b>Subject name[English]</b>	Seminar on Environmental & Life Sciences 2[Seminar on Environmental & Life Sciences 2]				
<b>Schedule number</b>	D54010020	<b>Subject area</b>	Advanced Applied Chemistry and Life Science	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	2~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S4系教務委員 4kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>					
This course will provide the students with opportunities to study on his/her research subjects on advanced environmental and life sciences by reading scientific papers under the guidance of his/her supervisor. The aim of the lesson for the students is to expand the knowledge and presentation skills acquired in Seminar on Environmental and Life Science 1.					
<b>Contents of class</b>					
The students will be required to read scientific papers written by other language than Japanese, especially English, which are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Seminar on Environmental & Life Sciences 1 All other relevant subjects in Advanced Environmental and Life Sciences					
<b>Notes for textbook</b>					
Supervisor will recommend textbooks, papers, and research materials to students.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To acquire advanced knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To be able to make oral and poster presentations relevant to papers he/she has read.					
<b>Evaluation of achievement</b>					
The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores.					
<b>Examination</b>					
その他 None during exam period					
<b>Details of examination</b>					
<b>Other information</b>					
Supervisor(s)					
<b>Reference URL</b>					
<a href="http://ens.tut.ac.jp/en/">http://ens.tut.ac.jp/en/</a>					
<b>Office hours</b>					
Students are encouraged visiting by appointment.					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					
Environmental science and technology, life science, materials science and engineering, applied chemistry					

**(D54030010)Advanced Environmental Technology 1[Advanced Environmental Technology 1]**

<b>Subject name[English]</b>	Advanced Environmental Technology 1[Advanced Environmental Technology 1]				
<b>Schedule number</b>	D54030010	<b>Subject area</b>	Advanced Applied Chemistry and Life Science	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Mon.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	田中 三郎, 高島 和則, 有吉 誠一郎 TANAKA Saburo, TAKASHIMA Kazunori, ARIYOSHI Seiichiro				
<b>Numbering</b>					
<b>Objectives of class</b>					
This lecture provides a comprehensive overview of the important technologies for photon detection from the millimeter-wave through the ultraviolet spectral regions.					
This lecture provides a comprehensive overview of the important technologies for photon detection from the millimeter-wave through the ultraviolet spectral regions.					
<b>Contents of class</b>					
Attendance students read the recommendation reference book 1 in advance and give presentation in a seminar form about any of the following topics.					
<ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Intrinsic photoconductors</li> <li>3. Extrinsic photoconductors</li> <li>4. Photodiodes and other junction-based detectors</li> <li>5. Amplifiers and readouts</li> <li>6. Arrays</li> <li>7. Photoemissive detectors</li> <li>8. Photography</li> <li>9. Bolometers and other thermal detectors</li> <li>10. Visible and infrared coherent receivers</li> <li>11. Submillimeter- and millimeter-wave heterodyne receivers</li> </ol>					
Attendance students read the recommendation reference book 1 in advance and give presentation in a seminar form about any of the following topics.					
<ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Intrinsic photoconductors</li> <li>3. Extrinsic photoconductors</li> <li>4. Photodiodes and other junction-based detectors</li> <li>5. Amplifiers and readouts</li> <li>6. Arrays</li> <li>7. Photoemissive detectors</li> <li>8. Photography</li> <li>9. Bolometers and other thermal detectors</li> <li>10. Visible and infrared coherent receivers</li> <li>11. Submillimeter- and millimeter-wave heterodyne receivers</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
References are distributed as needed.					
References are distributed as needed.					
<b>Reference1</b>	<b>Book title</b>	Detection of Light		<b>ISBN</b>	0 521 81636 X

	<b>Author</b>	George Rieke	<b>Publisher</b>	Cambridge University Press	<b>Publish year</b>	2003
<b>Notes for reference</b>						
<b>Goals to be achieved</b>						
<b>Evaluation of achievement</b>						
[Evaluation basis]						
Students who attend all classes basically will be evaluated as follows:						
A: Achieved 80 % of goals and obtained total points of presentation and reports, 80 or higher (out of 100 points).						
B: Achieved 65 % of goals and obtained total points of presentation and reports, 65 or higher (out of 100 points).						
C: Achieved 55 % of goals and obtained total points of presentation and reports, 55 or higher (out of 100 points).						
[Evaluation basis]						
Students who attend all classes basically will be evaluated as follows:						
A: Achieved 80 % of goals and obtained total points of presentation and reports, 80 or higher (out of 100 points).						
B: Achieved 65 % of goals and obtained total points of presentation and reports, 65 or higher (out of 100 points).						
C: Achieved 55 % of goals and obtained total points of presentation and reports, 55 or higher (out of 100 points).						
<b>Examination</b>						
レポートで実施						
By Report						
<b>Details of examination</b>						
<b>Other information</b>						
有吉誠一郎 Email: ariyoshi@ens.tut.ac.jp, G 棟 404 号室, 内線 6908						
田中三郎 Email: tanakas@ens.tut.ac.jp, G 棟 605 号室, 内線 6916						
高島和則 Email: takashima@ens.tut.ac.jp, G 棟 310 号室, 内線 6921						
Seiichiro Ariyoshi, Office: G-404 (phone 6908), E-mail: ariyoshi@ens.tut.ac.jp						
Sabro Tanaka, Office: G-605 (phone 6916), E-mail: tanakas@ens.tut.ac.jp						
Kazunori Takashima, Office: G-310 (phone 6921), E-mail: takashima@ens.tut.ac.jp						
<b>Reference URL</b>						
<a href="http://ens.tut.ac.jp/squid/">http://ens.tut.ac.jp/squid/</a>						
<a href="http://ens.tut.ac.jp/squid/">http://ens.tut.ac.jp/squid/</a>						
<b>Office hours</b>						
<b>Relations to attainment objectives of learning and education</b>						
<b>Key words</b>						

**(D54030030)Advanced Ecological Engineering[Advanced Ecological Engineering]**

<b>Subject name[English]</b>	Advanced Ecological Engineering[Advanced Ecological Engineering]				
<b>Schedule number</b>	D54030030	<b>Subject area</b>	Advanced Applied Chemistry and Life Science	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Thu.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	中野 裕美, 後藤 尚弘, 大門 裕之, 東海林 孝幸 NAKANO Hiromi, GOTOH Naohiro, DAIMON Hiroyuki, TOKAIRIN Takayuki				
<b>Numbering</b>					
<b>Objectives of class</b>					
The course provides students with the opportunity to improve their level in the skills(reading, writing, presentation) through reading current research articles.					
The course provides students with the opportunity to improve their level in the skills(reading, writing, presentation) through reading current research articles.					
<b>Contents of class</b>					
1. Students have to select at least three articles in the field of one of professors. Three weeks/professor & one week					
2. Students prepare both reports and present slides.					
3. The key words will be given at the first class.					
1. Students have to select at least three articles in the field of one of professors. Three weeks/professor & one week					
2. Students prepare both reports and present slides.					
3. The key words will be given at the first class.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Knowledge of environmental chemistry, chemical engineering and materials science is desirable.					
Knowledge of environmental chemistry, chemical engineering and materials science is desirable.					
<b>Notes for textbook</b>					
No textbook will be used.					
No textbook will be used.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To improve presentation skills(writing of reports and preparing of slides).					
To improve presentation skills(writing of reports and preparing of slides).					
<b>Evaluation of achievement</b>					
30% Report, 70% Presentation(30-45 min)					
30% Report, 70% Presentation(30-45 min)					
<b>Examination</b>					
試験期間中には何も行わない					
None during exam period					
<b>Details of examination</b>					
<b>Other information</b>					
Room # B-302, E-mail: kakuta@ens.tut.ac.jp					
Room # G-603, E-mail: goto@ens.tut.ac.jp					
Room # CRFC-Center 208, E-mail: hiromi@crfc.tut.ac.jp					
Room # G-602, E-mail: daimon@ens.tut.ac.jp					
Room # G-405, E-mail: tokairin@ens.tut.ac.jp					
Room # B-302, E-mail: kakuta@ens.tut.ac.jp					
Room # G-603, E-mail: goto@ens.tut.ac.jp					

Room # CRFC-Center 208, E-mail: hiromi@cxfc.tut.ac.jp

Room # G-602, E-mail: daimon@ens.tut.ac.jp

Room # G-405, E-mail: tokairin@ens.tut.ac.jp

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**Reference URL**

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**Office hours**

Anytime, but reservation is desirable.

Anytime, but reservation is desirable.

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**Relations to attainment objectives of learning and education**

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**Key words**

environmental chemistry, chemical engineering, materials science, sustainable engineering

environmental chemistry, chemical engineering, materials science, sustainable engineering

**(D54030040)Advanced Biotechnology 1[Advanced Biotechnology 1]**

<b>Subject name[English]</b>	Advanced Biotechnology 1[Advanced Biotechnology 1]				
<b>Schedule number</b>	D54030040	<b>Subject area</b>	Advanced Applied Chemistry and Life Science	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Fri.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	浴 俊彦, 平石 明, 田中 照通, 中鉢 淳 EKI Toshihiko, HIRAISHI Akira, TANAKA Terumichi, NAKABACHI Atsushi				
<b>Numbering</b>					
<b>Objectives of class</b>					
This course will provide the students with the opportunity to study on advanced life sciences (e.g., genomics, molecular genetics, microbiology, and biotechnology).					
This course will provide the students with the opportunity to study on advanced life sciences (e.g., genomics, molecular genetics, microbiology, and biotechnology).					
<b>Contents of class</b>					
In this course, the students will be expected to read several papers on the current progress in advanced life science (e.g., genomics, molecular genetics, microbiology, and biotechnology) to understand the frontier of these scientific fields. This course will be given by four instructors as described below (Eki, Hiraishi, Tanaka, and Nakabachi).					
1st~4th week: Genome and gene sciences (Dr. T. Eki)					
5th~8th week: (Dr. A. Hiraishi)					
9th~12th week: (Dr. T. Tanaka)					
13th~15th week: Animal-microbe symbioses (Dr. A. Nakabachi)					
In this course, the students will be expected to read several papers on the current progress in advanced life science (e.g., genomics, molecular genetics, microbiology, and biotechnology) to understand the frontier of these scientific fields. This course will be given by four instructors as described below (Eki, Hiraishi, Tanaka, and Nakabachi).					
1st~4th week: Genome and gene sciences (Dr. T. Eki)					
5th~8th week: (Dr. A. Hiraishi)					
9th~12th week: (Dr. T. Tanaka)					
13th~15th week: Animal-microbe symbioses (Dr. A. Nakabachi)					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
The knowledge of basic molecular biology and biochemistry is absolutely essential.					
The knowledge of basic molecular biology and biochemistry is absolutely essential.					
<b>Notes for textbook</b>					
Papers and references will be given by each instructor in the course.					
Papers and references will be given by each instructor in the course.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
Understanding, summarizing, and making presentations and/or reports on the current status in advanced life sciences including genomics, molecular genetics, microbiology and biotechnology.					
To understand the current status in advanced life sciences including genomics, molecular genetics, microbiology and biotechnology by summarizing, and making presentations and/or reports.					
<b>Evaluation of achievement</b>					
Grades for the course will be based on the average of the subject scores (by Eki, Hiraishi, Tanaka, and Nakabachi).					
[Evaluation basis] Students who attend all classes will be evaluated as follows:					
A: Achieved all goals and obtained total points of exam and reports, 80 or higher (out of 100 points).					
B: Achieved 70% of goals and obtained total points of exam and reports, 65 or higher (out of 100 points).					



C: Achieved 60% of goals and obtained total points of exam and reports, 55 or higher (out of 100 points).  
Grades for the course will be based on the average of the subject scores (by Eki, Hiraishi, Tanaka, and Nakabachi).

[Evaluation basis] Students who attend all classes will be evaluated as follows:

A: Achieved all goals and obtained total points of exam and reports, 80 or higher (out of 100 points).

B: Achieved 70% of goals and obtained total points of exam and reports, 65 or higher (out of 100 points).

C: Achieved 60% of goals and obtained total points of exam and reports, 55 or higher (out of 100 points).

**Examination**

試験期間中には何も行わない

None during exam period

**Details of examination**

**Other information**

Dr. Toshihiko Eki: Room: G-505, Phone: 6907, E-mail: eki@ens.tut.ac.jp

Dr. Akira Hiraishi: Room: G-503, Phone: 6913, E-mail: hiraishi@ens.tut.ac.jp

Dr. Terumichi Tanaka: Room: G-506. Phone: 6920, E-mail: terumichi-tanaka@tut.jp

Dr. Atsushi Nakabachi: Room: G-502, Phone: 6901, E-mail: nakabachi@eiiris.tut.ac.jp

Dr. Toshihiko Eki: Room: G-505, Phone: 6907, E-mail: eki@ens.tut.ac.jp

Dr. Akira Hiraishi: Room: G-503, Phone: 6913, E-mail: hiraishi@ens.tut.ac.jp

Dr. Terumichi Tanaka: Room: G-506. Phone: 6920, E-mail: terumichi-tanaka@tut.jp

Dr. Atsushi Nakabachi: Room: G-502, Phone: 6901, E-mail: nakabachi@eiiris.tut.ac.jp

**Reference URL**

**Office hours**

Please make an appointment.

Please make an appointment.

**Relations to attainment objectives of learning and education**

(B) 理論的・応用的知識の獲得と発展的活用能力

重要な学術・技術分野の理論・応用知識を自発的に獲得し、発展的に活用できる能力

(D) 国内外において活躍できる表現力・コミュニケーション力

論文、口頭及び情報メディアを通じて、自分の論点や考えなどを国の内外において効果的に表現し、コミュニケーションする能力

**Key words**

**(D54030060)Advanced Molecular Function Chemistry 1[Advanced Molecular Function Chemistry 1]**

<b>Subject name[English]</b>	Advanced Molecular Function Chemistry 1[Advanced Molecular Function Chemistry 1]				
<b>Schedule number</b>	D54030060	<b>Subject area</b>	Advanced Applied Chemistry and Life Science	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Tue.1~1	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	伊津野 真一, 岩佐 精二, 柴富 一孝, 原口 直樹 ITSUNO Shinichi, IWASA Seiji, SHIBATOMI Kazutaka, HARAGUCHI Naoki				
<b>Numbering</b>					
<b>Objectives of class</b>					
This course focuses on state-of-the-art technology of functional polymers and synthesis as for bioactive organic compounds. Synthesis and various applications of the functional polymers and bioactive organic compounds will be discussed.					
This course focuses on state-of-the-art technology of functional polymers and synthesis as for bioactive organic compounds. Synthesis and various applications of the functional polymers and bioactive organic compounds will be discussed.					
<b>Contents of class</b>					
(1) General aspects of functional polymers (Itsuno, Haraguchi)					
(2) Precise molecular design of functional polymers(Itsun, Haraguchi)					
(3) Preparation of highly functionalized polymers(Itsun, Haraguchi)					
(4) Reactive polymer synthesis(Itsun, Haraguchi)					
(5) Optically active polymers(Itsun, Haraguchi)					
(6) Asymmetric synthesis and polymerization(Itsun, Haraguchi)					
(7) Synthesis and structure-function relationship of biobased and biodegradable polymers(Itsun, Haraguchi)					
(8) Bioactive natural products (Iwasa)					
(9) Total synthesis of natural products (Iwasa)					
(10) Transition metal complexes and 18 electron rule (Iwasa)					
(11) Chiral catalysts and their applications (S. Iwasa)					
(12) Advanced Lewis acid catalysis. (Shibatomi)					
(13) Advanced organocatalysis. (Shibatomi)					
(14) Asymmetric synthesis of halogenated compounds and their synthetic applications. (Shibatomi)					
(15) Advanced organofluorine chemistry (Shibatomi)					
(1) General aspects of functional polymers (Itsuno, Haraguchi)					
(2) Precise molecular design of functional polymers(Itsun, Haraguchi)					
(3) Preparation of highly functionalized polymers(Itsun, Haraguchi)					
(4) Reactive polymer synthesis(Itsun, Haraguchi)					
(5) Optically active polymers(Itsun, Haraguchi)					
(6) Asymmetric synthesis and polymerization(Itsun, Haraguchi)					
(7) Synthesis and structure-function relationship of biobased and biodegradable polymers(Itsun, Haraguchi)					
(8) Bioactive natural products (Iwasa)					
(9) Total synthesis of natural products (Iwasa)					
(10) Transition metal complexes and 18 electron rule (Iwasa)					
(11) Chiral catalysts and their applications (S. Iwasa)					
(12) Advanced Lewis acid catalysis. (Shibatomi)					
(13) Advanced organocatalysis. (Shibatomi)					
(14) Asymmetric synthesis of halogenated compounds and their synthetic applications. (Shibatomi)					
(15) Advanced organofluorine chemistry (Shibatomi)					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
D34030060 Advanced Molecular Function Chemistry 1					
M44630100 Special Topics in Applied Organic Chemistry					
M24630460 応用有機化学特論					
<b>Notes for textbook</b>					
No textbooks are required.					
No textbooks are required.					
<b>Notes for reference</b>					

<p><b>Goals to be achieved</b></p> <p>To understand the latest trend of the research on functional polymers.</p> <p>To understand the latest trend of the research on total synthesis of natural products and their synthetic methods.</p> <p>To understand the latest trend of the research on functional polymers.</p> <p>To understand the latest trend of the research on total synthesis of natural products and their synthetic methods.</p>
<p><b>Evaluation of achievement</b></p> <p>Presentation (50%) and discussion (50%)</p> <p>Presentation (50%) and discussion (50%)</p>
<p><b>Examination</b></p> <p>レポートで実施</p> <p>By Report</p>
<p><b>Details of examination</b></p>
<p><b>Other information</b></p> <p>S. Itsuno: itsuno@ens.tut.ac.jp 6813</p> <p>S. Iwasa: office:B-506, tel: 6817, email: iwasa@ens.tut.ac.jp</p> <p>K. Shibatomi: shiba@ens.tut.ac.jp (room: B-507)</p> <p>S. Itsuno: itsuno@ens.tut.ac.jp 6813</p> <p>S. Iwasa: office:B-506, tel: 6817, email: iwasa@ens.tut.ac.jp</p> <p>K. Shibatomi: shiba@ens.tut.ac.jp (room: B-507)</p>
<p><b>Reference URL</b></p> <p><a href="http://www.siorgchem.ens.tut.ac.jp/index.html">http://www.siorgchem.ens.tut.ac.jp/index.html</a></p> <p><a href="http://www.siorgchem.ens.tut.ac.jp/index.html">http://www.siorgchem.ens.tut.ac.jp/index.html</a></p>
<p><b>Office hours</b></p> <p>anytime</p> <p>anytime</p>
<p><b>Relations to attainment objectives of learning and education</b></p>
<p><b>Key words</b></p> <p>functional polymer, asymmetric catalyst, transition metal, organocatalyst, Lewis acid, fluorine</p> <p>functional polymer, asymmetric catalyst, transition metal, organocatalyst, Lewis acid, fluorine</p>

**(D55010010)Seminar on Architecture and Civil Engineering 1[Seminar on Architecture and Civil Engineering 1]**

<b>Subject name[English]</b>	Seminar on Architecture and Civil Engineering 1[Seminar on Architecture and Civil Engineering 1]				
<b>Schedule number</b>	D55010010	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	4
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S5系教務委員 5kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>	All the students are required to attend all the seminars, which is arranged by the laboratory supervisor for the special study subjects related to the current research activity of the laboratory. The scheduled program of the seminars is announced by the supervisor at the guidance of the seminar.				
<b>Contents of class</b>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>	Report				
<b>Examination</b>	その他 By Report				
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(D55010020)Seminar on Architecture and Civil Engineering 2[Seminar on Architecture and Civil Engineering 2]**

<b>Subject name[English]</b>	Seminar on Architecture and Civil Engineering 2[Seminar on Architecture and Civil Engineering 2]				
<b>Schedule number</b>	D55010020	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Year	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	2~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	S5系教務委員 5kei kyomu Iin-S				
<b>Numbering</b>					
<b>Objectives of class</b>	All the students are required to attend all the seminars, which is arranged by the laboratory supervisor for the special study subjects related to the current research activity of the laboratory. The scheduled program of the seminars is announced by the supervisor at the guidance of the seminar.				
<b>Contents of class</b>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>	Report				
<b>Examination</b>	その他 By Report				
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(D55030030)Advanced Building Environmental Engineering and Building Services[Advanced Building Environmental Engineering and Building Services]**

<b>Subject name[English]</b>	Advanced Building Environmental Engineering and Building Services[Advanced Building Environmental Engineering and Building Services]				
<b>Schedule number</b>	D55030030	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Mon.5~5	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	松本 博, 都築 和代 MATSUMOTO Hiroshi, TSUZUKI Kazuyo				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>The goal of this course is to help professionals update related to the recent research and development on life cycle assessment (LCA) for buildings, environmental symbiotic technologies, climatic building design and urban energy management.</p> <p>The goal of this course is to help professionals update related to the recent research and development on life cycle assessment (LCA) for buildings, environmental symbiotic technologies, climatic building design and urban energy management.</p>					
<b>Contents of class</b>					
<p>The course consists of the following topics.</p> <ol style="list-style-type: none"> <li>1. Buildings and its Impact on the Global Environment</li> <li>2. Impact Assessment indices for Buildings</li> <li>3. Life Cycle Inventory for Buildings</li> <li>4. Overview of CASBEE</li> <li>5. Environmental Symbiotic Technologies (1)</li> <li>6. Environmental Symbiotic Technologies (2)</li> <li>7. Ecological Building Design (1)</li> <li>8. Ecological Building Design (2)</li> <li>9. Climatic Building Design (1)</li> <li>10. Climatic Building Design (2)</li> <li>11. Sustainable Building Design (1)</li> <li>12. Sustainable Building Design (2)</li> <li>13. Energy and Buildings (1)</li> <li>14. Energy and Buildings (2)</li> <li>15. Compact city –urban energy management–</li> </ol> <p>The course consists of the following topics.</p> <ol style="list-style-type: none"> <li>1. Buildings and its Impact on the Global Environment</li> <li>2. Impact Assessment indices for Buildings</li> <li>3. Life Cycle Inventory for Buildings</li> <li>4. Overview of CASBEE</li> <li>5. Environmental Symbiotic Technologies (1)</li> <li>6. Environmental Symbiotic Technologies (2)</li> <li>7. Ecological Building Design (1)</li> <li>8. Ecological Building Design (2)</li> <li>9. Climatic Building Design (1)</li> <li>10. Climatic Building Design (2)</li> <li>11. Sustainable Building Design (1)</li> <li>12. Sustainable Building Design (2)</li> <li>13. Energy and Buildings (1)</li> <li>14. Energy and Buildings (2)</li> <li>15. Compact city –urban energy management–</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					

Building science: Indoor Air Quality and Ventilation, Building and Urban Thermal Environment  
Building science: Indoor Air Quality and Ventilation, Building and Urban Thermal Environment

**Notes for textbook**

The related handouts will be distributed.  
The related handouts will be distributed.

<b>Reference1</b>	<b>Book title</b>	Architecture for a Sustainable Future –All about the Holistic Approach in Japan–		<b>ISBN</b>	
	<b>Author</b>	Architectural Institute of Japan	<b>Publisher</b>	Institute for Building Environment and Energy Conservation	<b>Publish year</b> 2002

**Notes for reference**

**Goals to be achieved**

Achievement level of this course is to understand the background of building's impact on the global environment, the practical strategies for sustainable building design, urban energy management and so on.

Achievement level of this course is to understand the background of building's impact on the global environment, the practical strategies for sustainable building design, urban energy management and so on.

**Evaluation of achievement**

Reports related to this subject are reviewed to evaluate the achievement level.

Reports related to this subject are reviewed to evaluate the achievement level.

**Examination**

レポートで実施

By Report

**Details of examination**

**Other information**

Hiroshi Matsumoto: D-710, Phone: 0532-44-6838, Fax: 0532-44-6831, E-mail: matsu@ace.tut.ac.jp

Hiroshi Matsumoto: D-710, Phone: 0532-44-6838, Fax: 0532-44-6831, E-mail: matsu@ace.tut.ac.jp

**Reference URL**

Hiroshi Matsumoto: <http://einstein.ace.tut.ac.jp/>

Hiroshi Matsumoto: <http://einstein.ace.tut.ac.jp/>

**Office hours**

Hiroshi Matsumoto: Thursday 13:00-14:30

Hiroshi Matsumoto: Thursday 13:00-14:30

**Relations to attainment objectives of learning and education**

**Key words**

climatic building design, sustainable building design, building energy management, energy saving  
climatic building design, sustainable building design, building energy management, energy saving

**(D55030090)Advanced Transportation Systems and Economics[Advanced Transportation Systems and Economics]**

<b>Subject name[English]</b>	Advanced Transportation Systems and Economics[Advanced Transportation Systems and Economics]				
<b>Schedule number</b>	D55030090	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Tue.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	宮田 讓, 洪澤 博幸 MIYATA Yuzuru, SHIBUSAWA Hiroyuki				
<b>Numbering</b>					
<b>Objectives of class</b>					
To obtain the advanced knowledge of theories and methods for policies and planning for the environment, cities, regions and transportation.					
To obtain the advanced knowledge of theories and methods for policies and planning for the environment, cities, regions and transportation.					
<b>Contents of class</b>					
By using books, reports and papers on the environment, cities, regions and infrastructure, students learn the advanced transportation systems and transportation economics. Discussion between the lecturer and students will be performed in the lecture time.					
By using books, reports and papers on the environment, cities, regions and infrastructure, students learn the advanced transportation systems and transportation economics. Discussion between the lecturer and students shall be performed in the lecture time.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Transportation systems Analysis on environmental economics Policy for industry Econometrics Transportation systems Analysis on environmental economics Policy for industry Econometrics					
<b>Notes for textbook</b>					
Textbooks and scientific papers will be announced at the start of the class.					
Textbooks and scientific papers will be announced at the start of the class.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
1.To understand the necessity and significance of policy and planning for the environment, cities, regions and infrastruncure.					
2.To understand the concept of policy and planning for the above mentioned fields.					
3.To undestand methodologies in the above mentioned fields.					
1.To understand the necessity and significance of policy and planning for the environment, cities, regions and infrastruncure.					



- 2.To understand the concept of policy and planning for the above mentioned fields.  
3.To understand methodologies in the above mentioned fields.

**Evaluation of achievement**

Home work assignments will be required. Final reports or examination will be conducted.

Home work assignments shall be required. Final reports or examination shall be conducted.

**Examination**

レポートで実施

By Report

**Details of examination****Other information**

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phone: 0532-44-6955

room(D-806), miyata@ace.tut.ac.jp

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**Reference URL**

Hirobata: <http://www.tr.ace.tut.ac.jp>

Miyata: <http://pm.hse.tut.ac.jp/kakenA/>

Shibusawa: <http://www.pm.ace.tut.ac.jp>

Hirobata: <http://www.tr.ace.tut.ac.jp>

Miyata: <http://pm.hse.tut.ac.jp/kakenA/>

Shibusawa: <http://www.pm.ace.tut.ac.jp>

**Office hours**

Yuzuru Miyata: 16:00-17:00 in every Tuesday

Yuzuru Miyata: 16:00-17:00 on every Tuesday

**Relations to attainment objectives of learning and education**

(A) 研究者・技術者としての正しい倫理観と社会性

研究者・技術者としての専門的・倫理的責任を自覚し、人類の幸福・健康・福祉の観点から社会における技術的課題を設定・解決・評価する能力

(B) 理論的・応用的知識の獲得と発展的活用能力

重要な学術・技術分野の理論・応用知識を自発的に獲得し、発展的に活用できる能力

(C) 広範囲の知識を有機的に連携させた研究開発能力

広範囲の知識の連携による研究開発に対する方法論を体得し、研究開発の計画立案と、それを実践できる能力

**Key words**

planning process, social & economic evaluation method, forecasting models

planning process, social & economic evaluation method, forecasting models

**(D55030110)Advanced Management of Technology[Advanced Management of Technology]**

<b>Subject name[English]</b>	Advanced Management of Technology[Advanced Management of Technology]				
<b>Schedule number</b>	D55030110	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Wed.4~4	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Begging grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	藤原 孝男, 渋澤 博幸 FUJIWARA Takao, SHIBUSAWA Hiroyuki				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>The main objective is to understand the function of technological entrepreneurship for commercialization of basic research results from a perspective of financial engineering. Especially the decision-making model is examined for irreversible investment under uncertainty(Fujiwara).</p> <p>In this course, students learn the regional and urban economic modeling techniques and the urban and regional policy evaluation methodology(Shibusawa).</p>					
<b>Contents of class</b>					
<p>Fujiwara From a view point regarding the technological development as risky but competitive investment, this class has following topics: 1-2:Technological entrepreneurship 3-5:Investment decision 6-8:Basic real options 9-11:Optio valuation methods 12-15:Application and cases</p> <p>For each week class discussion, self-preview &amp; review are expected.</p> <p>Shibusawa 1-2:Urban and Regional Policy and Evaluation 3-5:Modeling of the Urban and Regional Economic Systems 6-8:Policies and the Evaluation Methodology 9-11:Evaluation Techniques and Tools 12-13:Case Studies of the urban and regional policy 14-15:Evaluating Case Studies</p>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<p>Fujiwara Management Science (English), Operations Management (Japanese), Real Options (Japanese), Game Theory (Japanese), Finance (Japanese), &amp; Entrepreneurship (Japanese),</p> <p>Shibusawa Economics, Policy, Simulation</p>					
<b>Notes for textbook</b>					
<p>Fujiwara Studying materials will be introduced at first class time.</p> <p>Shibusawa Papers will be distributed.</p>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
Fujiwara					

- 1) Able to understand the concept and knowledge of management of technology.
- 2) Able to understand and use the real options analysis.
- 3) Able to apply and propose original technological management methods.

Shibusawa

Advanced Urban and Regional Economics

Advanced Economic Simulation Model

Policy Evaluation Methodology

**Evaluation of achievement**

Fujiwara

Evaluation method: Scoring is based on reports .

Evaluation criteria: A: 80 or higher, B: 65 or higher, C: 55 or higher (Maximum scoring 100).

Shibusawa

Policy evaluation reports must be submitted.

A: 80 Points or higher, B: 65 points or higher, C: 55 points or higher, D: Less than 55 points

**Examination**

その他

By Report

**Details of examination**

**Other information**

Fujiwara

Office#: B-313, Phone#: 6946, e-mail: fujiwara@las.tut.ac.jp

Shibusawa

Office#: B-409, Phone#: 6963, e-mail: hiro-shibu@tut.jp

**Reference URL**

**Office hours**

Fujiwara

Anytime if available.

Shibusawa

Tuesday 10:00-12:00

**Relations to attainment objectives of learning and education**

**Key words**

Real Options, Game Theory, & Technological Entrepreneurship

**(D55030130)Advanced Western Culture[Advanced Western Culture]**

<b>Subject name[English]</b>	Advanced Western Culture[Advanced Western Culture]				
<b>Schedule number</b>	D55030130	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Fri.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Doctoral Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	D1, D2, D3
<b>Charge teacher name[Roman alphabet mark]</b>	相京 邦宏 AIKYO Kunihiro				
<b>Numbering</b>					
<b>Objectives of class</b>					
Research on a history of scientific ideas in the ancient world. Research on a history of scientific ideas in the ancient world.					
<b>Contents of class</b>					
Lecture on a view of nature and science in the ancient world. Modern science and ancient 'science'. What are similarities or differences between the two?					
Program of lecture					
1. Orientation (outline of the lecture)					
2. Purpose of the Series					
3. Science in Antiquity?					
4. Modern Science 1					
5. Modern Science 2					
6. History and Philosophy					
7. Building Histories 1					
8. Building Histories 2					
9. Building Histories 3					
10. Intellectual Paternities 1					
11. Intellectual Paternities 2					
12. Selective Survival of Texts					
13. Resources for History 1					
14. Resources for History 2					
15. Summary of the lecture					
Lecture on a view of nature and science in the ancient world. Modern science and ancient 'science'. What are similarities or differences between the two?					
Program of lecture					
1. Orientation (outline of the lecture)					
2. Purpose of the Series					
3. Science in Antiquity?					
4. Modern Science 1					
5. Modern Science 2					
6. History and Philosophy					
7. Building Histories 1					
8. Building Histories 2					
9. Building Histories 3					
10. Intellectual Paternities 1					
11. Intellectual Paternities 2					
12. Selective Survival of Texts					
13. Resources for History 1					
14. Resources for History 2					
15. Summary of the lecture					
<b>Self Preparation and Review</b>					

Preparation & review of text  
Preparation & review of text

**Related subjects**

**Notes for textbook**

Roger French, Ancient Natural History. Routledge, 1994.  
Roger French, Ancient Natural History. Routledge, 1994.

**Notes for reference**

**Goals to be achieved**

- (1)A correct perception of a history of science.
- (2)A comprehensive grasp of the origin of scientific ideas in Western Europe.
- (3)Understanding of basic terms on a history of science.
- (4)A correct understanding of a relation between modern science and pre-modern science.
- (5)A total appreciation of a transition of scientific ideas.
- (6)A correct understanding of literature on a history of science.

- (1)A correct perception of a history of science.
- (2)A comprehensive grasp of the origin of scientific ideas in Western Europe.
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- (4)A correct understanding of a relation between modern science and pre-modern science.
- (5)A total appreciation of a transition of scientific ideas.
- (6)A correct understanding of literature on a history of science.

**Evaluation of achievement**

Holding the end-of-term exams.  
Holding the end-of-term exams.

**Examination**

レポートで実施  
By Report

**Details of examination**

**Other information**

**Reference URL**

**Office hours**

pm. 1-4(Wednesday)

pm. 1-4(Wednesday)

**Relations to attainment objectives of learning and education**

**Key words**

ancient, science, history  
ancient, science, history