

# **Syllabus**

**International Master' s Degree  
Program  
(2017-Spring Term)**

**(M40030010)Management Science[Management Science]**

<b>Subject name[English]</b>	Management Science[Management Science]				
<b>Schedule number</b>	M40030010	<b>Subject area</b>	General courses	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Thu.1~1	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Mechanical Engineering, Architecture and Civil Engineering, Electrical and Electronic Information Engineering, Computer Science and Engineering, Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	藤原 孝男 FUJIWARA Takao				
<b>Numbering</b>	GEN_LIB52325				
<b>Objectives of class</b>					
Study objective is to learn an analytical capability on social and managerial perspectives. This class introduces basic finance knowledge to understand the managerial idea and the tool for the company value and capital cost. Teaching language is mainly dependent on English.					
<b>Contents of class</b>					
The class will discuss about basic ideas on the valuation of financial option as a derivative based on the elementary probability, interest rate, and arbitrage theory. Class content will include following topics: #1: baic probability, #2: normal random variable, #3: geometric Brownian motion, #4: interest rates, #5: arbitrage trade, #6-7: Black Scholes formula, #8-10: additional items; dividend, jump, and volatility estimation, #11: valuation by expected utility, #12: stochastic order, #13: optimization model, #14: group exercises about business plan, #15: group exercises about business presentation, #16: semester examination.					
<b>Self Preparation and Review</b>					
Teaching materials will be uploaded at moodle. Attending students are expected to complete pre- and re-views, investigate by themselves, and ask the lecturer.					
<b>Related subjects</b>					
Management (undergraduate), Operations Management, Real Options, Game Theory, MOT, Entrepreneurship, Innovation Management.					
<b>Notes for textbook</b>					
As noted above, materials will be uploaded at moodle.					
<b>Reference1</b>	<b>Book title</b>	An Elementary Introduction to Mathematical Finance (3rd.ed.)	<b>ISBN</b>	978-0-521-19253-8	
	<b>Author</b>	Sheldon M. Ross	<b>Publisher</b>	Cambridge University Press	<b>Publish year</b>
					2011 年
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
1) To understand the meaning of normal random variable. 2) To comprehend the basic model structure of Black Scholes formula. 3) To value an European call option as a financial derivative.					

**Evaluation of achievement**

Evaluation Style:

Evaluation weight allocation is planned as Semester Examination 60% and Reports 40%.

Evaluation Criteria:

A: If students achieved every above goals and their summed scores are equal or more than 80 (the maxim scores 100).

B: If students achieved at least 65% of above goals and their summed scores are equal or more than 65 (the maxim scores 100).

C: If students achieved at least 55% of above goals and their summed scores are equal or more than 55 (the maxim scores 100).

**Examination**

Examination(Face to Face)

**Details of examination****Other information****Reference URL****Office hours**

At any time if available.

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

Real Options, Game Theory, Operations Management, Management

**(M40030050)Japanese Life Today[Japanese Life Today]**

<b>Subject name[English]</b>	Japanese Life Today[Japanese Life Today]				
<b>Schedule number</b>	M40030050	<b>Subject area</b>	General courses	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Fri.1~1	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Mechanical Engineering, Architecture and Civil Engineering, Electrical and Electronic Information Engineering, Computer Science and Engineering, Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S総合一教務委員, Lim Pang Boey, 大門 裕之, 穂積 直裕, 井佐原 均, 福本 昌宏, 岩佐 精二, 齊藤 大樹, 高嶋 孝明, 伊藤 公毅, 寺嶋 一彦, 武藤 浩行, 藤原 孝男, 毛利 雅子, 加藤 三保子, 池松 峰男 Sougou kyoiku kyomu Iin, Lim Pang Boey, DAIMON Hiroyuki, HOZUMI Naohiro, ISAHARA Hitoshi, FUKUMOTO Masahiro, IWASA Seiji, SAITOH Taiki, TAKASHIMA Takaaki, ITO Koki, TERASHIMA Kazuhiko, MUTO Hiroyuki, FUJIWARA Takao, MOURI Masako, KATOH Mihoko, IKEMATSU Mineo				
<b>Numbering</b>	GEN_LIB51325				
<b>Objectives of class</b>					
In this series of lectures, the excellent experts of our university from different areas will impart to the engineering students highly interesting insider knowledge. The participants will get to know Japan of today from technical, economic and social viewpoints.					
<b>Contents of class</b>					
1. Lim Pang Boey "Japanese Education System" Learn about the Japanese education system and what the life of a student is like in Japan?					
2. Daimon "Working in Japanese Company" Learn and discuss about working in Japanese company and what you should do for it.					
3. Hozumi "Japan's Modernization Supported by Electric Power" Japan's modernization started in the middle of 19 th centry when a long period of isolation policy has been terminated. Her rapid growth until now has been strongly supported by electric power. Now Japan's power supply is recognized as the best quality in the world. In the lecture, history and state of the art of Japan's electric power will be presented.					
4. Isahara "Computer and Japanese" Japanese language is very much different from other languages. Problems caused by such differences during computer processing of Japanese are discussed in this lecture.					
5.Fukumoto "Introduction of advanced surface modofication and welding technology in Japan" Two advanced materials processing will be introduced. One is on the surface modification technology based on the particles deposition. Thermal spray, Cold spray and Aero-sol deposition will be explained. Another is on the welding technology based on the friction stirring. Fundamental aspects on FSW will be given in the lecture.					
6. Iwasa "The Range of Organic Chemistry" I will give a talk on the following subjects as one of scene of science and technology in Japan: ◆Organic Chemistry in Environment —Amazing Natural Products— ◆Development of Life Environment —Molecular Sensor as an Basic Technology in all of Science— ◆New Horizon of Catalytic Asymmetric Synthesis —C1 Asymmetric Catalyst—					
7. Saito "Earthquake safety of buildings in Japan" The purpose of this lecture is to understand the history of earthquake disasters in Japan and lessons learned from those disasters for the safety of buildings.					
8.Takashima & Nakamori "A global company doing business in Japan" IBM, a global enterprise, is running business in Japan more than 75 years. A history and transformation of IBM's business in Japan are introduced. A comparative analysis of IBM with TOYOTA is provided to see and think about the differences. An insight that the lecturer got from the experience of working in IBM for 32 years is also shared.					
9. Ito "Progress in pure mathematics in Japan"					

In this lecture, we focus on the progress in pure mathematics in Japan after World War II; especially we give a brief introduction to

1. the work done by Kunihiko Kodaira, who is the first Japanese mathematician awarded to Fields Medal, and
2. algebraic analysis, promoted strongly by Japanese mathematicians (e.g. Mike Sato, Kazuhiko Aomoto, etc.)

#### 10. Terashima "Robot in Japan"

Robot is very popular in Japan. Especially, industry robot is number one all over the world. The year of 1980 is said to be the first year of robotics in Japan. Since then, Japanese robot has been extremely developed. In this lecture, history of robotics development and state of art in robot is lectured.

#### 11. Muto "Fine Ceramics"

Fine Ceramics (also known as "advanced ceramics") are used to make components that require high levels of performance and reliability, such as advanced electronic devices and so on. In fact, Fine Ceramics support the latest technologies in diverse applications throughout modern society.

In this class, students will learn about "manufacture (Mono-zukuri)" in Japan.

#### 12. Fujiwara "Japaneses-style Business Management"

Since 1980s, Japanese management style has become popular in automobile, electrical, and electronics industries in terms of employment, promotion, and industrial relations for quality control and skill transfer. We will discuss its advantages and disadvantages.

#### 13. Mouri "Legal interpreting in Japan"

Japan has faced the numbers of foreign national criminals along with the globalization. This class explains the criminal justice, in particular focusing on foreign national criminals and legal interpreting in Japan.

#### 14. Kato "Japanese culture and their mind"

This lecture will provide students with an opportunity to become familiar with Japanese culture and its artifacts as well as an understanding of the differences between Japan and other countries. Students will be expected to demonstrate knowledge of the way Japanese people think or act and their cultural heritage.

#### 15. Ikematsu "Water Pollution History"

Japan has overcome lots of pollution incidents first in the world on her way to industrialization. Ashio Mining Pollution in 1878 was the first among various cases including Itai-Itai disease and Minamata disease. In the class, students are expected to learn about Japan's water pollution history and view the world's current environmental issues through the window of it.

### Self Preparation and Review

#### Related subjects

N/A

#### Notes for textbook

#### Notes for reference

#### Goals to be achieved

- 1) To understand a variety of Japanese cultural, social, and engineering perspectives.
- 2) To evaluate and criticize Japanese characteristics from interdisciplinary viewpoints.
- 3) To discuss and write global understanding.

#### Evaluation of achievement

Evaluation method: scoring will be proceeded by sum of each report evaluation.

Evaluation criteria:

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 at least 65 % of goals and obtained total points of exam and reports, 65 or higher (out of 100 points).
- C: Achieved at least 55 % of goals and obtained total points of exam and reports, 55 or higher (out of 100 points).

#### Examination

その他  
Other

**Details of examination**

**Other information**

**Reference URL**

**Office hours**

After each class.

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

**Key words**

Japan, Japanese, Culture, Religion, Politics & Economy, Technology

(M40030080)Principles of Japanese Conversation[Principles of Japanese Conversation]

<b>Subject name[English]</b>	Principles of Japanese Conversation[Principles of Japanese Conversation]				
<b>Schedule number</b>	M40030080	<b>Subject area</b>	General courses	<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 Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Mechanical Engineering, Architecture and Civil Engineering, Electrical and Electronic Information Engineering, Computer Science and Engineering, Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	村松 由起子 MURAMATSU Yukiko				
<b>Numbering</b>	GEN_FOR56025				
<b>Objectives of class</b>					
This is a Basic Japanese conversation class. You will learn elementary Japanese grammar to speak Japanese on campus.					
<b>Contents of class</b>					
Students will learn the following lessons in Japanese textbook “ Basic Japanese for Students Hakase1”.					
<ol style="list-style-type: none"> <li>1. Pronunciation of Japanese</li> <li>2. Lesson 1 Hajimemashite. Watashi wa Heren desu.</li> <li>3. Lesson 2 O-kuni wa dochira desuka.</li> <li>4. Lesson 3 Sore wa nan desuka.</li> <li>5. Lesson 4 Watashi wa asa koohii o nomimasu.</li> <li>6. Lesson 5 Ima nan-ji desuka.</li> <li>7. Lesson 6 Ashita doko e ikimasu ka.</li> <li>8. Lesson 7 Juu-gatsu juu-go-nichi ni Nihon e kimashita.</li> <li>9. Lesson 8 Kyooshitsu ni dare ga imasu ka.</li> <li>10.Lesson 9 Yuubinkyoku wa doko ni arimasu ka.</li> <li>11.Lesson 10 Nihon e robotto no kenkyuu ni kimashita.</li> <li>12.Lesson 11 Fuji-san wa kireina yama desu.</li> <li>13.Lesson 12 Ryokoo wa doo deshita ka.</li> <li>14.Lesson 13 Shuumatsu ni nani oshitai desu ka.</li> <li>15.Lesson 14 Ongaku ga suki desu ka.</li> </ol>					
The term examination					
<b>Self Preparation and Review</b>					
Preparation: Please read Vocabulary and Notes in each lesson. Review:Please memorize “Structures” after each lesson.					
<b>Related subjects</b>					
Basic Japanese Classes (Nihongo Hokoo):If you want to know more details, please contact the International Affairs Division (Kokusaikooryuuka).					
<b>Textbook1</b>	<b>Book title</b>	Basic Japanese for Students Hakase 1 (はかせ1)		<b>ISBN</b>	
	<b>Author</b>	Yamazaki yoshiko, Doi mitsuru	<b>Publisher</b>	3A Corporation (スリーエーネットワーク)	<b>Publish year</b>
<b>Notes for textbook</b>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
You will be able to communicate with Japanese people in easy Japanese.					
<b>Evaluation of achievement</b>					
Evaluation Weight Homework 40%					

The term examination 60%  
Grade  
A:Total score is 80 or higher  
B:Total score is 65 or higher  
C:Total score is 55 or higher

**Examination**

その他  
Other

**Details of examination**

**Other information**

**Reference URL**

**Office hours**

Tuesday 13:00-13:30

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

**Key words**



**(M41610010)Seminar on Mechanical Engineering I[Seminar on Mechanical Engineering I]**

<b>Subject name[English]</b>	Seminar on Mechanical Engineering I[Seminar on Mechanical Engineering I]				
<b>Schedule number</b>	M41610010	<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 Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS51015				
<b>Objectives of class</b>	The seminar aims to provide a broad understanding of the mechanical engineering available for the master thesis research of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems, and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					

**(M41610020)Seminar on Mechanical Engineering II[Seminar on Mechanical Engineering II]**

<b>Subject name[English]</b>	Seminar on Mechanical Engineering II[Seminar on Mechanical Engineering II]				
<b>Schedule number</b>	M41610020	<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>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Mechanical Engineering			<b>Begging grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS61015				
<b>Objectives of class</b>	The seminar aims to provide a broad understanding of the mechanical engineering available for the master thesis research of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems, and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					

**(M41610030)Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]**

<b>Subject name[English]</b>	Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]				
<b>Schedule number</b>	M41610030	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員, 1系各教員 1kei kyomu Iin-S, 1kei kakukyouin				
<b>Numbering</b>					
<b>Objectives of class</b>	The thesis research aims to provide a practical experience of research work, and to acquire research skills with a deep understanding of relevant knowledge.				
<b>Contents of class</b>	The research subject depends on the supervisor and the research group you join. Individual students will have different research subjects. Discuss with your supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>	Reference and material will be available from the supervisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To get something new on individual research fields. To develop your research skills including planning and presentation skills.				
<b>Evaluation of achievement</b>					
<b>Examination</b>	その他 Other				
<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>					

(M41610030)Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]

<b>Subject name[English]</b>	Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]				
<b>Schedule number</b>	M41610030	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS61015				
<b>Objectives of class</b>	The thesis research aims to provide a practical experience of research work, and to acquire research skills with a deep understanding of relevant knowledge.				
<b>Contents of class</b>	The research subject depends on the supervisor and the research group you join. Individual students will have different research subjects. Discuss with your supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>	Reference and material will be available from the supervisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To get something new on individual research fields. To develop your research skills including planning and presentation skills.				
<b>Evaluation of achievement</b>					
<b>Examination</b>	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>					

**(M4161003T)Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]**

<b>Subject name[English]</b>	Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]				
<b>Schedule number</b>	M4161003T	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS61015				
<b>Objectives of class</b>	The thesis research aims to provide a practical experience of research work, and to acquire research skills with a deep understanding of relevant knowledge.				
<b>Contents of class</b>	The research subject depends on the supervisor and the research group you join. Individual students will have different research subjects. Discuss with your supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>	Reference and material will be available from the supervisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To get something new on individual research fields. To develop your research skills including planning and presentation skills.				
<b>Evaluation of achievement</b>					
<b>Examination</b>	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>					

**(M41610040)Seminar on Mechanical Engineering[Seminar on Mechanical Engineering]**

<b>Subject name[English]</b>	Seminar on Mechanical Engineering[Seminar on Mechanical Engineering]				
<b>Schedule number</b>	M41610040	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Mechanical Engineering			<b>Begging grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS61015				
<b>Objectives of class</b>	The seminar aims to provide a broad understanding of the mechanical engineering available for the master thesis research of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems, and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					

**(M41610051)Internship[Internship]**

<b>Subject name[English]</b>	Internship[Internship]				
<b>Schedule number</b>	M41610051	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>		<b>Credit(s)</b>	0
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS51015				
<b>Objectives of class</b>					
Students are expected to address problems in a specialized field in a company or research institute. The objectives of this subject are to experience practical research and development and to cultivate the practical problem-solving ability, planning ability, and creativity.					
<b>Contents of class</b>					
In order to cultivate the practical problem-solving ability, academic and company/institutional supervisors will provide practical problems in a specialized field through close communication.					
<b>Self Preparation and Review</b>					
Students are expected to discuss a preferable intership topic with supervisors before starting it.					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Follow instructions provided by company/institutional supervisors.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
While engaging practical activities in a company or research institution for several months, students are expected to improve the practical problem-solving ability, planning ability, and creativity as well as an international way of thinking.					
<b>Evaluation of achievement</b>					
Comprehensive evaluation based on students' reports and evaluation sheets by academic and company/institutional supervisors. A: 80 or higher (out of 100 points), B: 65 or higher (out of 100 points) C: 55 or higher (out of 100 points)					
<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>					
<b>Reference URL</b>					
<b>Office hours</b>					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

(M41630030)Applied Mechanics of Materials[Applied Mechanics of Materials]

<b>Subject name[English]</b>	Applied Mechanics of Materials[Applied Mechanics of Materials]					
<b>Schedule number</b>	M41630030	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective	
<b>Time of starting a course</b>	Spring1 term	<b>Day of the week,period</b>	Tue.2~2	<b>Credit(s)</b>	1	
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~	
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1	
<b>Charge teacher name[Roman alphabet mark]</b>	足立 忠晴 ADACHI Tadaharu					
<b>Numbering</b>	MEC_MAS53025					
<b>Objectives of class</b>						
To understand mechanical performances of structures, and mechanical behaviors of solid and structures, fundamental mechanics of solid and structure is lectured. Especially, mechanics of thin-walled structures which is useful for practical design of mechanical structures is explained in detail.						
<b>Contents of class</b>						
Chapter 1. Introduction Chapter 2. Automobile Structures from View of Solid Mechanics Purpose of automobile structure, Loading to automobile structure Deformation of automobile structure, Performance of automobile structure Chapter 3. Fundamentals of Structural Mechanics Fundamental equations in solid mechanics Chapter 4. Forces and Moments Applying to Structures Normal force, shear force, bending moment, torsional moment Chapter 5. Elementary Mechanics of Structures Torsion and bending of thin-walled beams Chapter 6. Mechanics of Thin-Walled Structures Torsion and bending of thin-walled beams Chapter 7. Fundamentals of Dynamic Measurement Frequency response, Strain gage, Load cell, Accelerator Chapter 8. Summary						
<b>Self Preparation and Review</b>						
<b>Related subjects</b>						
Mechanics of Materials, Elasticity, Solid Mechanics						
<b>Notes for textbook</b>						
Text will be distributed on the web site. The details of the text will given in the first class.						
<b>Reference1</b>	<b>Book title</b>	A First Course in Continuum Mechanics			<b>ISBN</b>	
	<b>Author</b>	Fung YC	<b>Publisher</b>	Prentice-Hall	<b>Publish year</b>	
<b>Reference2</b>	<b>Book title</b>	Mechanics of Engineering Materials			<b>ISBN</b>	
	<b>Author</b>	Benham PP, Crawford RJ and Armstrong CG	<b>Publisher</b>	Longman	<b>Publish year</b>	
<b>Reference3</b>	<b>Book title</b>	Classical and Computational Solid Mechanics			<b>ISBN</b>	
	<b>Author</b>	Fung YC and Pin T	<b>Publisher</b>	World Scientific	<b>Publish year</b>	2001
<b>Reference4</b>	<b>Book title</b>	Theory of Elasticity, Course of Theoretical Physics Vol.7			<b>ISBN</b>	
	<b>Author</b>	Landau L.D. and Lifshitz E.M.	<b>Publisher</b>		<b>Publish year</b>	1970
<b>Reference5</b>	<b>Book title</b>	Aircraft Structures for Engineering Students			<b>ISBN</b>	
	<b>Author</b>	Megson THG	<b>Publisher</b>	Butterworth-Heinemann	<b>Publish year</b>	2007



<b>Notes for reference</b>
<p><b>Goals to be achieved</b></p> <p>To understand physical meaning fundamental equations in solid mechanics.</p> <p>To deeply understand elementary mechanics of materials (strength of materials); tension of bar, torsion of axis and bending of beam.</p> <p>To understand mechanics of thin-walled structures.</p> <p>To know concept of dynamic measurement of deformation.</p>
<p><b>Evaluation of achievement</b></p> <p>Examinations, 80 % and attendances, 20 %</p>
<p><b>Examination</b></p> <p>その他</p> <p>By Report</p>
<b>Details of examination</b>
<p><b>Other information</b></p> <p>Prof Tadaharu Adachi, Room D-305, Extension phone 6664, Email adachi@me.tut.ac.jp</p>
<p><b>Reference URL</b></p> <p><a href="http://solid.me.tut.ac.jp/solid/">http://solid.me.tut.ac.jp/solid/</a></p>
<p><b>Office hours</b></p> <p>Anytime. Contact me by email before coming if possible.</p>
<b>Relations to attainment objectives of learning and education</b>
<p><b>Key words</b></p> <p>Strength of materials, Mechanics of materials, solid mechanics, Structural mechanics, Thin-walled Structure</p>

**(M41630080)Science and Technology of Thin Films[Science and Technology of Thin Films]**

<b>Subject name[English]</b>	Science and Technology of Thin Films[Science and Technology of Thin Films]				
<b>Schedule number</b>	M41630080	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring2 term	<b>Day of the week,period</b>	Fri.2~2	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Begging grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	伊崎 昌伸 IZAKI Masanobu				
<b>Numbering</b>	MEC_MAS54025				
<b>Objectives of class</b> To understand fundamental thermodynamics and solid state physics of thin film and the applications					
<b>Contents of class</b> 1. Introduction to Thin film and preparation 2. Thermodynamics in solution chemical process(I) 3. Thermodynamics in solution chemical process(II) 4. Electronic state in inorganic thin films 5. Crystal structure and symmetry on thin films 6. Structural analysis of thin films 7. Physical properties of thin films 8. Oxide semiconductor thin films and application					
<b>Self Preparation and Review</b> This class deals with the deposition mechanism based on the thermodynamics and the characteristics of structure, optical and electrical properties based on solid state physics.					
<b>Related subjects</b> Basic knowledge of chemistry and solid-state physics					
<b>Notes for textbook</b>					
<b>Reference1</b>	<b>Book title</b>	Modern Electroplating, 5 th edition		<b>ISBN</b>	978-0-16778-6
	<b>Author</b>	M. schlesinger, M. Paunovic	<b>Publisher</b>	Weily & Sons	<b>Publish year</b> 2010
<b>Notes for reference</b>					
<b>Goals to be achieved</b> 1. Understanding of thermodynamic in soft-solution processing 2. Understanding of the basic solid state physics of thin films					
<b>Evaluation of achievement</b> Reports(50%) and presentation(50%)					
<b>Examination</b> その他 By Report					
<b>Details of examination</b>					
<b>Other information</b> Masanobu Izaki, D-505, m-izaki@me.tut.ac.jp					
<b>Reference URL</b>					
<b>Office hours</b> as-needed					
<b>Relations to attainment objectives of learning and education</b>					

**Key words**

thin films, thermodynamics, physics, semiconductor

(M41630130)Modeling and Analysis of Dynamical Control Systems[Modeling and Analysis of Dynamical Control Systems]

<b>Subject name[English]</b>	Modeling and Analysis of Dynamical Control Systems[Modeling and Analysis of Dynamical Control Systems]				
<b>Schedule number</b>	M41630130	<b>Subject area</b>	Advanced Mechanical Engineering	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring1 term	<b>Day of the week,period</b>	Thu.2~2	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	寺嶋 一彦 TERASHIMA Kazuhiko				
<b>Numbering</b>	MEC_MAS55025				
<b>Objectives of class</b>					
<p>Basic modelling and analysis of dynamical systems is lectured to conduct systematic control design . First, physical modeling are studied. Next, transfer function and realization are lectured. Finally, identification theory are lectured for parameter estimation by least square method and determination of model order by AIC .</p> <p>Basic modelling and analysis of dynamical systems is lectured to conduct systematic control design . First, physical modeling are studied. Next, transfer function and realization are lectured. Finally, identification theory are lectured for parameter estimation by least square method and determination of model order by AIC .</p>					
<b>Contents of class</b>					
<p>We provide the following schedule. Because this course is for master students, we can consider the requests from the master students.</p> <p>1st week: Modelling of Physical systems                  2nd week: Transfer function and Realization                  3rd week: Identification I- Non-parametric method                  4th week: Identification II- Parametric method, Least square method                  5th week: Persistent Excitation and AIC                  6th week: Simulation by using Matlab software                  7th week: Relationship between Modeling and control                  8th week: Test</p> <p>We provide the following schedule. Because this course is for master students, we can consider the requests from the master students.</p> <p>1st week: Modelling of Physical systems                  2nd week: Transfer function and Realization                  3rd week: Identification I- Non-parametric method                  4th week: Identification II- Parametric method, Least square method                  5th week: Persistent Excitation and AIC                  6th week: Simulation by using Matlab software                  7th week: Relationship between Modeling and control                  8th week: Test</p>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<p>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.</p>					
<b>Notes for textbook</b>					
<b>Reference1</b>	<b>Book title</b>	Linear Feedback Control – Analysis and Design with Matlab		<b>ISBN</b>	978-0-898716-38-2
	<b>Author</b>	D.Xue, Y. Q.Chen,D.P.Ttherton	<b>Publisher</b>	Siam	<b>Publish year</b> 2007

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

- (1) Understand Analysis methods of Dynamical Systems
- (2) Understand Modeling
- (3) Understand Identification
- (4) Understand Least square method
- (5) Understand PE condition and AIC
- (6) Understand Realization

- (1) Understand Analysis methods of Dynamical Systems
- (2) Understand Modeling
- (3) Understand Identification
- (4) Understand Least square method
- (5) Understand PE condition and AIC
- (6) Understand Realization

**Evaluation of achievement**

Test(70%) Report (30%)

S: Score of the report is 90 or higher.

A: Score of the report is 80 or higher.

B: Score of the report is 70 or higher.

C: Score of the report is 60 or higher.

Test(70%) Report (30%)

S: Score of the report is 90 or higher.

A: Score of the report is 80 or higher.

B: Score of the report is 70 or higher.

C: Score of the report is 60 or higher.

**Examination**

定期試験を実施(対面)

Examination(Face to Face)

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

Tel. 0532-44-6699

E-mail: terasima@me.tut.ac.jp

Tel. 0532-44-6699

E-mail: terasima@me.tut.ac.jp

**Reference URL**

Students who are interesting with dynamical systems, modeling, identification and control design such as Nonlinear optimal control, Linear optimal control, Observer, Kalman filter and H-infinity robust control are very welcome.

Basic control theory and mathematical knowledge are required.

Students who are interesting with dynamical systems, modeling, identification and control design such as Nonlinear optimal control, Linear optimal control, Observer, Kalman filter and H-infinity robust control are very welcome.

Basic control theory and mathematical knowledge are required.

**Office hours**

Thursday 4-6pm (Terashima D-510)

Thursday 4-6pm (Terashima D-510)

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

(D1) Ability for solving problems with expertise

(D1) Ability for solving problems with expertise

**Key words**

Modeling, Identification, Realization, Control

Modeling, Identification, Realization, Control

**(M41630220)Advanced Mechanical Systems Design II[Advanced Mechanical Systems Design II]**

<b>Subject name[English]</b>	Advanced Mechanical Systems Design II[Advanced Mechanical Systems Design II]				
<b>Schedule number</b>	M41630220	<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.4~4	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 Ikei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS63025				
<b>Objectives of class</b>	This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					

**(M41630240)Advanced Materials and Manufacturing Process II[Advanced Materials and Manufacturing Process II]**

<b>Subject name[English]</b>	Advanced Materials and Manufacturing Process II[Advanced Materials and Manufacturing Process II]				
<b>Schedule number</b>	M41630240	<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.4~4	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS54025				
<b>Objectives of class</b>	This lecture aims to provide a broad understanding of the materials and manufacturing process available for the master thesis research work of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					

**(M41630260)Advanced System, Control and Robotics II[Advanced System, Control and Robotics II]**

<b>Subject name[English]</b>	Advanced System, Control and Robotics II[Advanced System, Control and Robotics II]				
<b>Schedule number</b>	M41630260	<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.4~4	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS55025				
<b>Objectives of class</b>	This lecture aims to provide a broad understanding of the control and robotics available for the master thesis research work of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					



**(M41630280)Advanced Energy and Environmental Engineering II[Advanced Energy and Environmental Engineering II]**

<b>Subject name[English]</b>	Advanced Energy and Environmental Engineering II[Advanced Energy and Environmental Engineering II]				
<b>Schedule number</b>	M41630280	<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 Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Mechanical Engineering			<b>Begging grade</b>	M1
<b>Charge teacher name[Roman alphabet mark]</b>	S1系教務委員 1kei kyomu Iin-S				
<b>Numbering</b>	MEC_MAS56025				
<b>Objectives of class</b>	This lecture aims to provide a broad understanding of the energy and environmental engineering available for the master thesis research work of a student.				
<b>Contents of class</b>	The class provides both of fundamental knowledge of his/her master thesis research work and the most advanced results in the related field by reading research papers and monographs. The 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 supervisors.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire fundamental knowledge of individual research fields. To acquire the ability to find problems, the ability to solve the problems and the presentation skill.				
<b>Evaluation of achievement</b>	Coursework, presentation and/or report.				
<b>Examination</b>	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>					

(M41630420)Modeling and Design of Dynamical Control Systems[Modeling and Design of Dynamical Control Systems]

<b>Subject name[English]</b>	Modeling and Design of Dynamical Control Systems[Modeling and Design of Dynamical Control Systems]				
<b>Schedule number</b>	M41630420	<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.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Mechanical Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	寺嶋 一彦 TERASHIMA Kazuhiko				
<b>Numbering</b>	MEC_MAS55025				
<b>Objectives of class</b>					
<p>Basic modelling and analysis of dynamical systems is lectured to conduct systematic control design . First, physical modeling, realization and identification theory are lectured to realize time-domain computer simulation. Next, control design theory is lectured. Nonlinear optimal control is studied by using calculus of variation. Then, based on this result, Linear Optimal (LQ) control is studied, and Observer and Kalman filter are lectured. Finally, H-infinity robust control is lectured. Several examples and application are introduced.</p> <p>Some applications such at vibration control, transfer control and stabilization problem are introduced.</p> <p>Basic modelling and analysis of dynamical systems is lectured to conduct systematic control design . First, physical modeling, realization and identification theory are lectured to realize time-domain computer simulation. Next, control design theory is lectured. Nonlinear optimal control is studied by using calculus of variation. Then, based on this result, Linear Optimal (LQ) control is studied, and Observer and Kalman filter are lectured. Finally, H-infinity robust control is lectured. Several examples and application are introduced.</p> <p>Some applications such at vibration control, transfer control and stabilization problem are introduced.</p>					
<b>Contents of class</b>					
<p>We provide the following schedule. Because this course is for master students, we can consider the requests from the master students.</p> <p>1st week: Modelling                  2nd week: Transfer function and Realization                  3rd week: Identification I- Non-parametric method                  4th week: Identification II- Parametric method, Least square method                  5th week: Persistent Excitation and AIC                  6th week: Discrete system                  7th week: Transformation from discrete system to continuous system and vice versa                  8th week: Nonlinear optimal control by using calculus variation                  9th week: Application to Linear system, and Linear optimal control(LQ)                  10th week: Observer                  11th week: Kalman filter                  12th week: Introduction of H-infinity control                  13th week: Mixed sensitivity problem                  14th week: Generalized plant and Solution                  15th week: Examples and application                  16th weeks: Test</p> <p>We provide the following schedule. Because this course is for master students, we can consider the requests from the master students.</p> <p>1st week: Modelling                  2nd week: Transfer function and Realization                  3rd week: Identification I- Non-parametric method                  4th week: Identification II- Parametric method, Least square method                  5th week: Persistent Excitation and AIC                  6th week: Discrete system</p>					

7th week: Transformation from discrete system to continuous system and vice versa  
 8th week: Nonlinear optimal control by using calculus variation  
 9th week: Application to Linear system, and Linear optimal control(LQ)  
 10th week: Observer  
 11th week: Kalman filter  
 12th week: Introduction of H-infinity control  
 13th week: Mixed sensitivity problem  
 14th week: Generalized plant and Solution  
 15th week: Examples and application  
 16th weeks: Test

**Self Preparation and Review**

**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**

<b>Reference1</b>	<b>Book title</b>	Linear Feedback Control – Analysis and Design with Matlab			<b>ISBN</b>	978-0-898716-38-2
	<b>Author</b>	D.Xue, Y. Q.Chen,D.P.Ttherton	<b>Publisher</b>	Siam	<b>Publish year</b>	2007

**Notes for reference**

**Goals to be achieved**

- (1) Understand Analysis methods of Dynamical Systems
- (2) Understand Modeling
- (3) Understand Identification
- (4) Understand Least square method
- (5) Understand PE condition and AIC
- (6) Understand Realization
- (7) Understand Discrete system and continuous system
- (8) Understand Nonlinear optimal control
- (9) Understand Liner optimal control
- (10) Understand Observer and Kalman filter
- (11) Understand H-infinity robust control
- (1) Understand Analysis methods of Dynamical Systems
- (2) Understand Modeling
- (3) Understand Identification
- (4) Understand Least square method
- (5) Understand PE condition and AIC
- (6) Understand Realization
- (7) Understand Discrete system and continuous system
- (8) Understand Nonlinear optimal control
- (9) Understand Liner optimal control
- (10) Understand Observer and Kalman filter
- (11) Understand H-infinity robust control

**Evaluation of achievement**

Test(70%) Report (30%)  
 S: Score of the report is 90 or higher.  
 A: Score of the report is 80 or higher.  
 B: Score of the report is 70 or higher.  
 C: Score of the report is 60 or higher.  
 Test(70%) Report (30%)  
 S: Score of the report is 90 or higher.  
 A: Score of the report is 80 or higher.  
 B: Score of the report is 70 or higher.  
 C: Score of the report is 60 or higher.

**Examination**

定期試験を実施(対面)  
 Examination(Face to Face)

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

Tel. 0532-44-6699

E-mail: terasima@me.tut.ac.jp

Tel. 0532-44-6699

E-mail: terasima@me.tut.ac.jp

**Reference URL**

Students who are interesting with dynamical systems, modeling, identification and control design such as Nonlinear optimal control, Linear optimal control, Observer, Kalman filter and H-infinity robust control are very welcome.

Basic control theory and mathematical knowledge are required.

Students who are interesting with dynamical systems, modeling, identification and control design such as Nonlinear optimal control, Linear optimal control, Observer, Kalman filter and H-infinity robust control are very welcome.

Basic control theory and mathematical knowledge are required.

**Office hours**

Thursday 4-6pm (Terashima D-510)

Thursday 4-6pm (Terashima D-510)

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

(D1) Ability for solving problems with expertise

(D1) Ability for solving problems with expertise

**Key words**

Modeling, Identification, Realization, Optimal control, Observer and Kalman filter, H-infinity control, Robust control

Modeling, Identification, Realization, Optimal control, Observer and Kalman filter, H-infinity control, Robust control

**(M42610020)Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]**

<b>Subject name[English]</b>	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]				
<b>Schedule number</b>	M42610020	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S2系教務委員, 2系各教員 2kei kyomu Iin-S, 2kei kakukyoin				
<b>Numbering</b>					
<b>Objectives of class</b>					
The thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.					
<b>Contents of class</b>					
The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Reference and material will be available from the supervisor.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To get something new on individual research fields. To develop his/her research skill including the planning and the presentation.					
<b>Evaluation of achievement</b>					
Presentation, Thesis, Coursework, and Outcomes are evaluated generally.					
<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>					

**(M42610020)Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]**

<b>Subject name[English]</b>	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]				
<b>Schedule number</b>	M42610020	<b>Subject area</b>	Advanced Electrical and Electronic Information Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M2
<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 thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.					
<b>Contents of class</b>					
The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Reference and material will be available from the supervisor.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To get something new on individual research fields. To develop his/her research skill including the planning and the presentation.					
<b>Evaluation of achievement</b>					
Presentation, Thesis, Coursework, and Outcomes are evaluated generally.					
<b>Examination</b>					
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>					

(M4261002T)Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]

<b>Subject name[English]</b>	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]				
<b>Schedule number</b>	M4261002T	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M2
<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 thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.					
<b>Contents of class</b>					
The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Reference and material will be available from the supervisor.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To get something new on individual research fields. To develop his/her research skill including the planning and the presentation.					
<b>Evaluation of achievement</b>					
Presentation, Thesis, Coursework, and Outcomes are evaluated generally.					
<b>Examination</b>					
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>					

(M42610040)Seminar on Electrical and Electronic Information Engineering[Seminar on Electrical and Electronic Information Engineering]

<b>Subject name[English]</b>	Seminar on Electrical and Electronic Information Engineering[Seminar on Electrical and Electronic Information Engineering]				
<b>Schedule number</b>	M42610040	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M2
<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>					
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>					



(M42610050)Seminar on Electrical and Electronic Information Engineering 1A[Seminar on Electrical and Electronic Information Engineering 1A]

<b>Subject name[English]</b>	Seminar on Electrical and Electronic Information Engineering 1A[Seminar on Electrical and Electronic Information Engineering 1A]				
<b>Schedule number</b>	M42610050	<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 Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<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>					
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>					

(M42610060)Seminar on Electrical and Electronic Information Engineering 1B[Seminar on Electrical and Electronic Information Engineering 1B]

<b>Subject name[English]</b>	Seminar on Electrical and Electronic Information Engineering 1B[Seminar on Electrical and Electronic Information Engineering 1B]				
<b>Schedule number</b>	M42610060	<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>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M2
<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>					
<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>					
<b>Examination</b>					
<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>					

**(M42630110)Methodology of R & D 2[Methodology of R & D 2]**

<b>Subject name[English]</b>	Methodology of R & D 2[Methodology of R & D 2]				
<b>Schedule number</b>	M42630110	<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>	Tue.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S2系教務委員 2kei kyomu Iin-S				
<b>Numbering</b>	ELC_MAS58025				
<b>Objectives of class</b>	The class aims to provide a basic understanding of R&D methodology 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 some fundamental tips to conduct R&D work effectively. 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>	Reference and material will be available from the supervisor.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire the ability of identifying and formulating research problem, planning and implementing specific research tasks, troubleshooting and communicating outcomes.				
<b>Evaluation of achievement</b>	Coursework and presentation are evaluated generally.				
<b>Examination</b>	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>					

**(M42630140)Physics for Electronics 1[Physics for Electronics 1]**

<b>Subject name[English]</b>	Physics for Electronics 1[Physics for Electronics 1]				
<b>Schedule number</b>	M42630140	<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 Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	松田 厚範, 服部 敏明, 石山 武, 高木 宏幸 MATSUDA Atsunori, HATTORI Toshiaki, ISHIYAMA Takeshi, TAKAGI Hiroyuki				
<b>Numbering</b>	ELC_MAS52025				
<b>Objectives of class</b>					
Objectives of this subject are to understand the fundamental aspects on functional materials, photonics, electrodnics, spin electronics, and also to have overall knowledge on the latest technologies on these physical phenomena.					
<b>Contents of class</b>					
"Physics for Electronics 1" is composed of four topics of functional materials, photonics, electrodnics, and spin electronics, which will be delivered for three times for each by four professors whose expertise lie on the individual categories.					
The category of "Functional materials" is made to learn preparation, characterization and applications of functional materials for electronics and ionics based on physics and chemistry. The contents are 1) Fundamentals of amorphous and crystal, 2) Structure and property of glasses, 3) New preparation techniques of advanced materials, 4) Functional materials for ionis including Li-ion battery and fuel cell, and 5) Functional materials for optics including coatings, micro-optical components, and photonic devices.					
The course of "photonics" is devoted to the understanding of interactions between photon (light wave) and materials based on the quantum theory and also to industrial applications of photonic devices. 1) Optoelectronic devices, 2) optical processes in semiconductors and exciton, 3) nanomaterial.					
The category of "electrodnics" is electrochemical reaction on electrode. The contents are 1) fundamentals of thermodynamics in aqueous solution, 2) fundamental of electrical double layer 3) fundamental of adsorption, 4) fundamentals of electrochemical reaction, and 5) applications of chemical sensor.					
The category of "spin electronics" covers a wide area from fundamentals to applications of magnetic materials and magnetics. 1) Origin of magnetics, 2) Soft and hard magnetic materials, 3) Major applications of magnetics and magnetic materials, 4) Interaction phenomena among spins and various physical quantities, 5) Micro-magnetic devices and systems, 6) Spintronics and spin photonics					
<b>Self Preparation and Review</b>					
Students must perform their preparation and review of this subject based on the course materials with following the instruction of the teachers.					
<b>Related subjects</b>					
Physics for Electronics, Analysis of Inorganic Materials, Advanced Materials for Electronics, Functional Materials for Optical Applications,					
<b>Textbook1</b>	<b>Book title</b>	Physical Chemistry		<b>ISBN</b>	0198700725
	<b>Author</b>	Atkins	<b>Publisher</b>	Oxford University Press	<b>Publish year</b> 2006
<b>Textbook2</b>	<b>Book title</b>	Inorganic Chemistry		<b>ISBN</b>	0199264635
	<b>Author</b>	Shriver	<b>Publisher</b>	Oxford University Press	<b>Publish year</b> 2006
<b>Notes for textbook</b>					

None
<b>Notes for reference</b>
<b>Goals to be achieved</b> (1) To understand fundamental aspects on functional materials, photonics, electrodis and spin electronics. (2) To get the knowledge on the latest technologies on these physical phenomena.
<b>Evaluation of achievement</b> The final evaluation will be the sum of four categories (25%); functional materials, photonics, electrodis, spin electronics.
<b>Examination</b> None during exam period
<b>Details of examination</b> Taking examination and submission of report will be explained and required by the teachers during their classes.
<b>Other information</b> Photonics; Takeshi Ishiyama: ishiyama@ee.tut.ac.jp Functional materials; Atsunori Matuda : matsuda@ee.tut.ac.jp Electrodis; Toshiaki Hattori : thattori@ee.tut.ac.jp Spin electronics: Hiroyuki Takagi : takagi@ee.tut.ac.jp
<b>Reference URL</b> <a href="http://www.ee.tut.ac.jp/material">http://www.ee.tut.ac.jp/material</a>
<b>Office hours</b> one hour after every classes
<b>Relations to attainment objectives of learning and education</b>
<b>Key words</b> functional materials, photonics, spin electronics, ionics, micro-optics, electrodis

(M42630180)Electrical Technology and Materials 1[Electrical Technology and Materials 1]

<b>Subject name[English]</b>	Electrical Technology and Materials 1[Electrical Technology and Materials 1]				
<b>Schedule number</b>	M42630180	<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.1~1	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<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>	ELC_MAS53025				
<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. Fundamentals of Electrochemical Energy Conversion Devices</li> <li>3. Lithium-Ion Secondary Batteries (1)</li> <li>4. Lithium-Ion Secondary Batteries (2)</li> <li>5. 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 (1 week)</li> <li>2. High Voltage Engineering and Electrical Insulation (2 weeks)</li> <li>3. Fundamental Properties of Dielectrics and Electrical Insulating Materials(2 weeks)</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. Fundamentals of Electrochemical Energy Conversion Devices</li> <li>3. Lithium-Ion Secondary Batteries (1)</li> <li>4. Lithium-Ion Secondary Batteries (2)</li> <li>5. 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>					
Materials will be prepared by the lecturer.					

Materials will be prepared by the lecturer.

<b>Reference1</b>	<b>Book title</b>	Fuel Cell Systems Explained			<b>ISBN</b>	
	<b>Author</b>	J. Larminie and A. Dicks	<b>Publisher</b>	Wiley	<b>Publish year</b>	
<b>Reference2</b>	<b>Book title</b>	Lithium Ion Batteries: Science and Technologies			<b>ISBN</b>	
	<b>Author</b>	M. Yoshio, R.J. Brodd and A. Kozawa	<b>Publisher</b>	Springer-Verlag	<b>Publish year</b>	
<b>Reference3</b>	<b>Book title</b>	High Voltage Engineering			<b>ISBN</b>	
	<b>Author</b>	E. Kuffel, W. Zaengel and J. Kuffel	<b>Publisher</b>	Newnes	<b>Publish year</b>	
<b>Notes for reference</b>						
<b>Goals to be achieved</b>						
<b>Evaluation of achievement</b> Marks are based on examinations(100%). Marks are based on examinations(100%).						
<b>Examination</b> 定期試験を実施(対面) Examination(Face to Face)						
<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>						

**(M42630220)LSI Process 1[LSI Process 1]**

<b>Subject name[English]</b>	LSI Process 1[LSI Process 1]				
<b>Schedule number</b>	M42630220	<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>	Thu.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	澤田 和明, 石川 靖彦, 関口 寛人, 高橋 一浩 SAWADA Kazuaki, ISHIKAWA Yasuhiko, SEKIGUCHI Hiroto, TAKAHASHI Kazuhiro				
<b>Numbering</b>	ELC_MAS55025				
<b>Objectives of class</b>					
From the viewpoint of deep understanding of LSI processes, semiconductors devices including material desgin and an example of latest device will be lectured.					
<b>Contents of class</b>					
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					
<b>Notes for textbook</b>					
Physics of Semiconducotr Devices S.M.Sze, Willy					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
(1) To understand fundamental aspects on LSI process, and semiconductor devices including material design. (2) To get the knowledge on the latest technologies on LSI process.					
<b>Evaluation of achievement</b>					
Reports (100%)					
<b>Examination</b>					
その他 Examination(Face to Face)					
<b>Details of examination</b>					
<b>Other information</b>					
K.Sawada (C-605) sawada@ee.tut.ac.jp H. Sekiguchi (C-610) sekiguchi@ee.tut.ac.jp ext. 6744 K. Takahashi (C-406) takahashi@ee.tut.ac.jp ext. 6740					
<b>Reference URL</b>					
<a href="http://www.tut.ac.jp/english/introduction/02EE.pdf">http://www.tut.ac.jp/english/introduction/02EE.pdf</a> (department)  <a href="http://www.int.ee.tut.ac.jp/">http://www.int.ee.tut.ac.jp/</a>					



(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.

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

**Key words**

**(M42630240)Information and Communication Technology 1[Information and Communication Technology 1]**

<b>Subject name[English]</b>	Information and Communication Technology 1[Information and Communication Technology 1]				
<b>Schedule number</b>	M42630240	<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 Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Electrical and Electronic Information Engineering			<b>Beggining grade</b>	M1, M2
<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>	ELC_MAS55025				
<b>Objectives of class</b>					
Students select one course from the following three courses: A 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. A 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. The last course is intended for learning point-to-point communication systems, multiuser communication systems, and multiple-input multiple-output (MIMO) systems in the physical layer of wireless communications. Students challenge a unified understanding of existing advanced schemes in wireless communications.					
<b>Contents of class</b>					
Course 1 provided by Prof. Ohira: 1. Transmission lines 2. Scattering matrix 3. Mizuhashi Smith chart  Course 2 provided by Prof. Uehara: 1. Medium access control protocols 2. Multi-hop communications 3. Ad hoc and sensor networks  Course 3 provided by Prof. Takeuchi: 1. Point-to-point communication systems 2. Multiuser communication systems 3. MIMO systems					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
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.  Course 3: Basic understanding on modulation/demodulation, signal processing, probability theory, and information theory are prerequisite.					
<b>Notes for textbook</b>					
Course 1: Lecture on the blackboard without resorting to textbooks.					

Course 2: Instruct in 1st class.

Course 3: Same as Course 2.

**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 3:

- Understand the concept of detection, diversity, and channel uncertainty in point-to-point communication systems.
- Understand resource allocation and interference management in multiuser communication systems.
- Understand statistical channel models and basic multiuser detection schemes in MIMO systems.

**Evaluation of achievement**

Course 1: Marks are based on the final test.

Course 2: Marks are based on reports and presentations.

Course 3: Marks are based on reports and tests.

**Examination**

Examination(Face to Face)

**Details of examination**

**Other information**

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

**Reference URL**

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

**Office hours**

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, wireless communications, modulation/demodulation, MIMO

**(M43610010)Seminar on Computer Science and Engineering I[Seminar on Computer Science and Engineering I]**

<b>Subject name[English]</b>	Seminar on Computer Science and Engineering I[Seminar on Computer Science and Engineering I]				
<b>Schedule number</b>	M43610010	<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 Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員－23kei kyomu lin-S2				
<b>Numbering</b>					
<b>Objectives of class</b>					
The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering. 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.					
<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>					
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>					



**(M43610020)Seminar on Computer Science and Engineering II[Seminar on Computer Science and Engineering II]**

<b>Subject name[English]</b>	Seminar on Computer Science and Engineering II[Seminar on Computer Science and Engineering II]				
<b>Schedule number</b>	M43610020	<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>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員－23kei kyomu lin-S2				
<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>	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>					



**(M43610030)Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]**

<b>Subject name[English]</b>	Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]				
<b>Schedule number</b>	M43610030	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員, 3系各教員 3kei kyomu iin-S, 3kei kakukyoin				
<b>Numbering</b>					
<b>Objectives of class</b>	<p>The course is intended for students to foster their interests in research problems on computer science and engineering and to acquire ability for independent studies.</p> <p>It is also aimed for students to acquire, through thesis research, cooperativeness, a sense of responsibility, abilities for problem solving, research planning, decision making, outcome presentation and subject investigation, and to enhance their creativity and persistency, among others.</p>				
<b>Contents of class</b>	<p>It is usually the case that thesis research is carried out on individual bases with specific contents differing from one student to another.</p> <p>Consult with your advisor for any further details.</p>				
<b>Self Preparation and Review</b>	<p>Consult with your advisor for them.</p>				
<b>Related subjects</b>	<p>Consult with your advisor for them.</p>				
<b>Notes for textbook</b>	<p>Consult with your advisor for them.</p>				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	<p>To acquire abilities for doing research and development at technically high level, sophisticated decision making, and leading large scale research projects.</p>				
<b>Evaluation of achievement</b>	<p>Three faculty members will be assigned to prepare the evaluation for your thesis research, based on publication records, master thesis, and oral presentation. It will be then finalized by the faculty meeting.</p>				
<b>Examination</b>	<p>その他 None during exam period</p>				
<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>					



**Key words**

**(M43610030)Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]**

<b>Subject name[English]</b>	Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]				
<b>Schedule number</b>	M43610030	<b>Subject area</b>	Advanced Computer Science and Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員, S3系教務委員—23kei kyomu lin-S, 3kei kyomu lin-S2				
<b>Numbering</b>					
<b>Objectives of class</b>	<p>The course is intended for students to foster their interests in research problems on computer science and engineering and to acquire ability for independent studies.</p> <p>It is also aimed for students to acquire, through thesis research, cooperativeness, a sense of responsibility, abilities for problem solving, research planning, decision making, outcome presentation and subject investigation, and to enhance their creativity and persistency, among others.</p>				
<b>Contents of class</b>	<p>It is usually the case that thesis research is carried out on individual bases with specific contents differing from one student to another.</p> <p>Consult with your advisor for any further details.</p>				
<b>Self Preparation and Review</b>	<p>Consult with your advisor for them.</p>				
<b>Related subjects</b>	<p>Consult with your advisor for them.</p>				
<b>Notes for textbook</b>	<p>Consult with your advisor for them.</p>				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	<p>To acquire abilities for doing research and development at technically high level, sophisticated decision making, and leading large scale research projects.</p>				
<b>Evaluation of achievement</b>	<p>Three faculty members will be assigned to prepare the evaluation for your thesis research, based on publication records, master thesis, and oral presentation. It will be then finalized by the faculty meeting.</p>				
<b>Examination</b>	<p>None during exam period</p>				
<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>					

**Key words**

**(M4361003T)Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]**

<b>Subject name[English]</b>	Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]				
<b>Schedule number</b>	M4361003T	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S3系教務委員－23kei kyomu lin-S2				
<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>					
<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>	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>					



**(M43610040)Seminar on Computer Science and Engineering[Seminar on Computer Science and Engineering]**

<b>Subject name[English]</b>	Seminar on Computer Science and Engineering[Seminar on Computer Science and Engineering]				
<b>Schedule number</b>	M43610040	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M2
<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>	<p>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.</p>				
<b>Self Preparation and Review</b>	<p>Consult with your advisor.</p>				
<b>Related subjects</b>	<p>Consult with your advisor.</p>				
<b>Notes for textbook</b>	<p>Consult with your advisor.</p>				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	<p>To acquire abilities for technical readings in English, logical thinking/explanation, and clear presentation.</p>				
<b>Evaluation of achievement</b>	<p>Will be evaluated by taking into account various factors overall, such as technical explanation, question answering, discussion involvements and so on.</p>				
<b>Examination</b>	<p>None during exam period</p>				
<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>					



**(M43630160)Quantum Biology and Materials Science[Quantum Biology and Materials Science]**

<b>Subject name[English]</b>	Quantum Biology and Materials Science[Quantum Biology and Materials Science]				
<b>Schedule number</b>	M43630160	<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>	Wed.1~1	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	栗田 典之, 後藤 仁志 KURITA Noriyuki, GOTO Hitoshi				
<b>Numbering</b>	CMP_MAS53025				
<b>Objectives of class</b>					
<p>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.</p> <p>In achieving this objective, students will be required to attempt to acquire the elementary concepts in MO theory, and they will learn about the electronic properties of biological molecules such as proteins, RNA and DNA.</p> <p>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.</p> <p>In achieving this objective, students will be required to attempt to acquire the elementary concepts in MO theory, and they will learn about the electronic properties of biological molecules such as proteins, RNA and DNA.</p>					
<b>Contents of class</b>					
<p>Considering the preliminary knowledge of the participates in this class, some topics from the following things will be chosen to be learned.</p> <p>(1) Basis and elementary concepts for molecular orbital (MO) theory (1 and 2 weeks)</p> <p>(2) Applications of MO method to small molecules (3 and 4 weeks)</p> <p>(3) MO calculations for amino acids and their peptides (5 and 6 weeks)</p> <p>(4) MO calculations for DNA, RNA bases and base pairs (7, 8 and 9 weeks)</p> <p>(5) MO calculations for complexes with proteins and ligand molecules (10, 11 and 12 weeks)</p> <p>(6) MO calculations for DNA, RNA and their complexes with proteins (13, 14 and 15 weeks)</p> <p>Considering the preliminary knowledge of the participates in this class, some topics from the following things will be chosen to be learned.</p> <p>(1) Basis and elementary concepts for molecular orbital (MO) theory (1 and 2 weeks)</p> <p>(2) Applications of MO method to small molecules (3 and 4 weeks)</p> <p>(3) MO calculations for amino acids and their peptides (5 and 6 weeks)</p> <p>(4) MO calculations for DNA, RNA bases and base pairs (7, 8 and 9 weeks)</p> <p>(5) MO calculations for complexes with proteins and ligand molecules (10, 11 and 12 weeks)</p> <p>(6) MO calculations for DNA, RNA and their complexes with proteins (13, 14 and 15 weeks)</p>					
<b>Self Preparation and Review</b>					
<p>Elementary concepts in MO theory as well as biomolecules such as proteins, RNA and DNA are required.</p> <p>Elementary concepts in MO theory as well as biomolecules such as proteins, RNA and DNA are required.</p>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
<p>教科書:資料配付</p> <p>参考書:</p> <p>"Molecular orbital calculations for amino acids and peptides", by Anne-Marie Sapse</p> <p>"Molecular orbital calculations for amino acids and peptides", by Anne-Marie Sapse</p>					
<b>Notes for reference</b>					



<p><b>Goals to be achieved</b></p> <p>The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry.</p> <p>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>授業で与えられた課題に対するレポート内容及びその発表内容(70%)、テスト(30%)の割合で、総合的に評価する。 Report (70%), Test (30%)</p>
<p><b>Examination</b></p> <p>レポートで実施 Regular Class</p>
<p><b>Details of examination</b></p>
<p><b>Other information</b></p> <p>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 E-mail: kurita@cs.tut.ac.jp</p>
<p><b>Reference URL</b></p>
<p><b>Office hours</b></p> <p>上記の E-mail による連絡により、適宜対応する。 Please contact by the above E-mail.</p>
<p><b>Relations to attainment objectives of learning and education</b></p>
<p><b>Key words</b></p> <p>DNA, RNA, Protein, molecular orbital calculation DNA, RNA, Protein, molecular orbital calculation</p>

**(M43630280)Web Data Engineering 1[Web Data Engineering 1]**

<b>Subject name[English]</b>	Web Data Engineering 1[Web Data Engineering 1]				
<b>Schedule number</b>	M43630280	<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.2~2	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	青野 雅樹 AONO Masaki				
<b>Numbering</b>	CMP_MAS52425				
<b>Objectives of class</b>					
<p>インターネット、すなわち Web 上には、大量のデータが日々作成・蓄積・更新されている。この中から有用なデータを検索し、抽出する Web アプリケーション技術や、複数の Web アプリケーション間でデータをやりとりする技術も重要になってきている。特に、このようなビッグデータをどう表現するかも、アプリケーションをカスケードする場合、必須である。</p> <p>本講義では、Web 上やデータファイルにあるテキストだけでなく、画像、動画、3D モデルなど様々なメディアに対するデータ表現技術、特徴量抽出技術、次元削減を含むインデクシング、テキストマイニング、データマイニング、自然言語処理、情報検索技術、回帰・分類・クラスタリングに代表される統計的機械学習、リンク解析に代表される Web マイニング技術、ならびに深層学習技術に焦点を当て、最新のデータサイエンス技術を講述する。</p> <p>Day by day, massive data has been generated, accumulated, and updated on the Internet, where data include texts, images, movies, 3D shapes, and their composites. Extracting important pieces of information is crucial in may Web applications. The objectives of this class is to let students know the state-of-the-art technologies in data science ranging from (big) data representation, data mining, text mining, natural language processing, information retrieval, information extraction, machine learning (including both supervised and unsupervised learning plus deep learning), based on fundamental data science technologies.</p>					
<b>Contents of class</b>					
<p>(1)はじめに(Web で扱うデータ、データサイエンス、統計的機械学習の基礎)</p> <p>(2)情報検索序論(検索、類似度、言語モデル、次元削減、評価尺度)、自然言語処理の基礎</p> <p>(3)マルチメディア特徴量抽出、検索、分類、深層学習基礎</p> <p>(4)リンク解析、教師なし学習(クラスタリング技術)</p> <p>(5)時系列データマイニング、教師あり学習(特徴抽出と分類)</p> <p>(6)教師あり学習(特徴抽出と回帰)、評価手法、深層学習事例</p> <p>(7+0.5)定期テスト</p> <p>(1) Introduction (Basics of Data Science including Data Representation and Statistical Machine Learning)</p> <p>(2) Information Retrieval (Search, Similarity, Language Model, Dimensional Reduction, Evaluations), and Natural Language Processing</p> <p>(3) Multimedia Feature Extraction, Search, Classification, Deep Learning Basics</p> <p>(4) Web Link Analysis, Unsupervised Learning (Clustering)</p> <p>(5) Time Series Data Mining, Supervised Learning (Classification)</p> <p>(6) Supervised Learning (Regression), Evaluations, and Deep Learning Examples</p> <p>(7+0.5) Final Exam</p>					
<b>Self Preparation and Review</b>					
<p>基本的なデータマイニング技術(主成分分析・判別分析・回帰分析、クラスタリング)に関しては、各自、予習・復習をしておくこと。特に、授業の補助用 Web ページで、Python (Jupyter notebook) を使った自習教材を準備するので、慣れておくことが好ましい。</p> <p>It is desirable to self-study as well as to review fundamental data mining techniques such as clustering, classification, and regression. It should be noted that the knowledge on machine learning and multivariate analysis techniques such as principal component analysis is a prerequisite to this class. It is recommended installing Python into your computer, because some of the lecture materials are assumed the knowledge of Python.</p>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					

授業の資料は、<http://www.kde.cs.tut.ac.jp/~aono/myLecture.html> で公開する。

Materials for this class will be available at <http://www.kde.cs.tut.ac.jp/~aono/myLecture.html>.

<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>	Stefan Buttcher, 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 and Analysis			<b>ISBN</b>	978-0-521-76633-3
	<b>Author</b>	Mohammed J. Zaki, Wagner Meira Jr.	<b>Publisher</b>	Cambridge University Press	<b>Publish year</b>	2014
<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
<b>Reference4</b>	<b>Book title</b>	Python Machine Learning			<b>ISBN</b>	978-1-78355-513-0
	<b>Author</b>	Sebastian Raschka	<b>Publisher</b>	PACKT Publishing	<b>Publish year</b>	2016

#### Notes for reference

##### 参考書 5

書名「Modern Information Retrieval, the concepts and technology behind search, Second Edition」

著者名 : Ricardo Baeza-Yates, Bertier Ribeiro-Neto

出版社 : Addison Wesley

ISBN : 978-0-321-41691-9

出版年 : 2011

##### 参考書 6

書名「Google's PageRank and Beyond」

著者名 : Amy N. Langville, Carl D. Meyer

出版社 : Princeton University Press

ISBN : 978-0-691-12202-1

出版年 : 2006

##### Reference #5

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 #6

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

- (1) データサイエンス・データマイニング(データ表現、主成分分析に代表される多変量解析)の基礎技術が理解できること
- (2) 情報検索(自然言語処理、文書検索・メディア検索、類似度、ランキング)の基礎技術が理解できること
- (3) 機械学習(分類、回帰分析、クラスタリング)ならびに深層学習の基礎技術が理解できること
- (4) リンク解析、Web マイニング解析、時系列データ解析等の基礎技術が理解できること

The following items have to be achieved:

1. Able to implement and apply fundamental data science (mining) technologies.
2. Able to understand fundamental technologies of information retrieval such as natural language processing, search performance measures, feature extraction, and ranking methods such as language model
3. Able to understand basics of machine learning (classification, regression, clustering) and deep learning

4. Able to understand basics of Web link analysis, Wen content mining, Time series data mining

**Evaluation of achievement**

原則として、すべての授業に出席したものにつき、下記のように成績を評価する。

定期試験 80 点、課題 20 点の合計で評価する。

A: 80 点以上, B: 65 点以上, C: 55 点以上

In principle, for those who have attended all the classes, the credit will be given as follows:

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

A: ( $\geq 80$ ), B: ( $\geq 65$ ), C: ( $\geq 55$ )

**Examination**

定期試験を実施(対面)

Examination(Face to Face)

**Details of examination**

**Other information**

C-511, TEL: 6764, Email: 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**

随時だが、事前に aono@tut.jp まで電子メールで予約をとること。

Anytime, but it is recommended that a priori email appointment is preferable.

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

**Key words**

データ・テキストマイニング、情報検索、特徴量抽出、機械学習、深層学習

data and text mining, information retrieval, feature extraction, machine learning, deep learning

**(M43630340)Statistical Natural Language Processing[Statistical Natural Language Processing]**

<b>Subject name[English]</b>	Statistical Natural Language Processing[Statistical Natural Language Processing]					
<b>Schedule number</b>	M43630340	<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>	Wed.2~2	<b>Credit(s)</b>	1	
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2	
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2	
<b>Charge teacher name[Roman alphabet mark]</b>	秋葉 友良 AKIBA Tomoyoshi					
<b>Numbering</b>	CMP_MAS52525					
<b>Objectives of class</b>						
Important topics on statistical natural language processing will be discussed by focusing on statistical machine translation.						
<b>Contents of class</b>						
Week 1: Introduction						
Week 2: Basic of Probability and Statistics						
Week 3: Language Models						
Week 4: Translation Models						
Week 5: Parameter Estimation						
Week 6: EM Algorithm						
Week 7: Advanced methods in SMT						
<b>Self Preparation and Review</b>						
<b>Related subjects</b>						
Information theory, Formal language theory						
<b>Notes for textbook</b>						
Resumes will be provided, which are based on:						
•Kevin Knight						
A Statistical MT Tutorial Workbook						
•Seiichi Nakagawa et al.						
Spoken Language Processing and Natural Language Processing						
<b>Reference1</b>	<b>Book title</b>	Statistical Machine Translation		<b>ISBN</b>	978-0521874151	
	<b>Author</b>	Philipp Koehn	<b>Publisher</b>	Cambridge University Press	<b>Publish year</b>	2010
<b>Reference2</b>	<b>Book title</b>	A Statistical MT Tutorial Workbook		<b>ISBN</b>		
	<b>Author</b>	Kevin Knight	<b>Publisher</b>		<b>Publish year</b>	
<b>Notes for reference</b>						
<b>Goals to be achieved</b>						
Basics: Understand the basic concepts of natural language processing						
Natural Language Processing: Understand the role of language resources, language and translation models, word alignments, and parameter estimation methods,						
Applications: Understand statistical machine translation system.						
<b>Evaluation of achievement</b>						
Marks are based on reports (100%).						
<b>Examination</b>						
By Report						
<b>Details of examination</b>						

**Other information**

Tomoyosi Akiba: C-505, 44-6758, akiba@cs.tut.ac.jp

**Reference URL**

<http://www.cl.ics.tut.ac.jp/~akiba/>

**Office hours**

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

**(M43630350)Advanced Chemoinformatics 1[Advanced Chemoinformatics 1]**

<b>Subject name[English]</b>	Advanced Chemoinformatics 1[Advanced Chemoinformatics 1]				
<b>Schedule number</b>	M43630350	<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.3~3	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	高橋 由雅 TAKAHASHI Yoshimasa				
<b>Numbering</b>	CMP_MAS53225				
<b>Objectives of class</b>					
The purpose of this course is to introduce and explain practical and applied approaches to data analysis (or mining) and knowledge discovery with illustrative examples in chemistry and molecular biology. The course is helpful for the students who are interested in not only pursuing careers in chemo-informatics but also taking general data science.					
<b>Contents of class</b>					
Topics to be covered:					
<ol style="list-style-type: none"> <li>1.Chemical data space and multivariate data analysis</li> <li>2.Quantitative structure-activity relationships and knowledge aquisition</li> <li>3.Visualization of higher dimensional data of molecules</li> <li>4.Evaluation of structural similarity and its application</li> <li>5.Fundamentals of machine learning</li> <li>6.Artificial neural network and chemical application</li> <li>7.Support vector machine and chemical application</li> <li>8.Exam.</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Molecular Informatics, Linear Algebra, Elementary Analytics					
<b>Notes for textbook</b>					
Material will be made available in the form of hard copies or on the class website (to be announced).					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
/They understand regression analysis technique based on linear least squares method and the application to chemical data fitting.					
/They learn fundamentals of quantitative structure-activity relationships (QSAR)					
/They learn mathematical basis of principal component analysis and visualization of multivariate chemical data space.					
/They understand usefulness and importance of structural similarity in intelligent molecular information processing.					
/They learn mathematical basis of machine learning.					
/Artificial neural network (ANN) and applicaton in chemistry.					
/Support vector machine (SVM) and application in drug design and development.					
They acquire the abilities how they can apply the methods to chemical data analysis, data classification and prediction.					
<b>Evaluation of achievement</b>					
Reports and classroom performance 20%					
Written examination 80%					
[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**

Examination(Face to Face)

**Details of examination**

**Other information**

Office: F-303 (Ext. 6878) Email: taka@cs.tut.ac.jp (Takahashi)

**Reference URL**

<http://www.mis.cs.tut.ac.jp/>

**Office hours**

Friday 13:00-14:30

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

**Key words**

chemoinformatics, bioinformatics, multivariate data analysis, QSAR, chemometrics, pattern recognition, machine learning, data mining



**(M43630360)Advanced Chemoinformatics 2[Advanced Chemoinformatics 2]**

<b>Subject name[English]</b>	Advanced Chemoinformatics 2[Advanced Chemoinformatics 2]				
<b>Schedule number</b>	M43630360	<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.3~3	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Computer Science and Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	未定 To be assigned				
<b>Numbering</b>	CMP_MAS53225				
<b>Objectives of class</b>					
<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>					
<b>Examination</b> 授業と定期試験(対面) Regular Class and Examination(Face to Face)					
<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>					

**(M44610010)Seminar on Environmental and Life Science I[Seminar on Environmental and Life Science I]**

<b>Subject name[English]</b>	Seminar on Environmental and Life Science I[Seminar on Environmental and Life Science I]				
<b>Schedule number</b>	M44610010	<b>Subject area</b>	Advanced Environmental and Life Sciences	<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>	3
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<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 environmental and life sciences by reading textbooks and scientific papers under the guidance of his/her supervisor. The aim of the lessen for the students is to learn knowledge and presentation skills required for his/her research in the seminar as well as to deepen his/her understanding of environmental and life sciences.					
<b>Contents of class</b>					
The students will be required to read textbooks and 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 and Life Science II Thesis Research on Environmental and Life Science 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 basic 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>					
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					

**(M44610020)Seminar on Environmental and Life Science II[Seminar on Environmental and Life Science II]**

<b>Subject name[English]</b>	Seminar on Environmental and Life Science II[Seminar on Environmental and Life Science II]				
<b>Schedule number</b>	M44610020	<b>Subject area</b>	Advanced Environmental and Life Sciences	<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>	3
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M2
<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>					
Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportunity to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance of his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in the seminar.					
<b>Contents of class</b>					
The students will be required to read textbooks and 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 and Life Science I Thesis Research on Environmental and Life Science 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 basic 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>					
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					

**(M44610030)Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]**

<b>Subject name[English]</b>	Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]				
<b>Schedule number</b>	M44610030	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S4系教務委員, 4系各教員 4kei kyomu iin-S, 4kei kakuyouin				
<b>Numbering</b>					
<b>Objectives of class</b>					
In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lesson are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.					
<b>Contents of class</b>					
The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense.					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II					
<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 basic knowledge on environmental and life sciences To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research To be able to make safety control in experimental work					
<b>Evaluation of achievement</b>					
The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).					
<b>Examination</b>					
その他 None during exam period					
<b>Details of examination</b>					
<b>Other information</b>					
Supervisor					
<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>					

**Key words**

Environmental science and technology, life science, materials science and engineering, applied chemistry

**(M44610030)Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]**

<b>Subject name[English]</b>	Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]				
<b>Schedule number</b>	M44610030	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	M2
<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>	In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lesson are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.				
<b>Contents of class</b>	The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II				
<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 basic knowledge on environmental and life sciences To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research To be able to make safety control in experimental work				
<b>Evaluation of achievement</b>	The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).				
<b>Examination</b>	None during exam period				
<b>Details of examination</b>					
<b>Other information</b>	Supervisor				
<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>					

**Key words**

Environmental science and technology, life science, materials science and engineering, applied chemistry

**(M4461003T)Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]**

<b>Subject name[English]</b>	Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]				
<b>Schedule number</b>	M4461003T	<b>Subject area</b>	Advanced Environmental and Life Sciences	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	M2
<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>	In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lesson are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.				
<b>Contents of class</b>	The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II				
<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 basic knowledge on environmental and life sciences To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research To be able to make safety control in experimental work				
<b>Evaluation of achievement</b>	The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).				
<b>Examination</b>	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>					



**Key words**

Environmental science and technology, life science, materials science and engineering, applied chemistry

**(M44610040)Seminar on Environmental and Life Science[Seminar on Environmental and Life Science]**

<b>Subject name[English]</b>	Seminar on Environmental and Life Science[Seminar on Environmental and Life Science]				
<b>Schedule number</b>	M44610040	<b>Subject area</b>	Advanced Environmental and Life Sciences	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M2
<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 the opportunity to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance of his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in the seminar.				
<b>Contents of class</b>	The students will be expected to read textbooks and papers written by foreign language that are indicated by his/her supervisor, and report and discuss deeply on his/her research subject in the seminar.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Thesis Research on Environmental and Life Science All other relevant subjects in Advanced Environmental and Life Sciences				
<b>Notes for textbook</b>	Supervisor will recommend textbooks and papers to students.				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>	To acquire basic 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 papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores.				
<b>Examination</b>	None during exam period				
<b>Details of examination</b>					
<b>Other information</b>	Supervisor				
<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>					

**(M44630100)Special Topics in Applied Organic Chemistry[Special Topics in Applied Organic Chemistry]**

<b>Subject name[English]</b>	Special Topics in Applied Organic Chemistry[Special Topics in Applied Organic Chemistry]				
<b>Schedule number</b>	M44630100	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring1 term	<b>Day of the week,period</b>	Tue.5~5	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	岩佐 精二, 柴富 一孝 IWASA Seiji, SHIBATOMI Kazutaka				
<b>Numbering</b>	ENV_MAS52225				
<b>Objectives of class</b>					
To provide you with a working knowledge of advanced synthesis of molecular materials.					
<b>Contents of class</b>					
This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallics, and the total synthesis of natural products on the basis of retrosynthetic analysis.					
<ol style="list-style-type: none"><li>1. Total synthesis of bioactive organic compounds. (Iwasa)</li><li>2. Advanced modern synthetic organic reactions using transition metals. (Iwasa)</li><li>3. Basic concept of oxidative addition and reductive elimination in catalytic cycles. (Iwasa)</li><li>4. Synthetic applications of asymmetric synthesis and asymmetric catalysts. (Iwasa)</li><li>5. Basic concept of Lewis acid catalyst and organocatalyst. (Shibatomi)</li><li>6. Advanced Lewis acid catalysis in organic synthesis. (Shibatomi)</li><li>7. Advanced organocatalysis in organic synthesis. (Shibatomi)</li><li>8. Organofluorine chemistry. (Shibatomi)</li></ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Subjects related to Organic Chemistry					
<b>Notes for textbook</b>					
No textbook is required. Some of information in WebCT will be help for your understanding on this course.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
A firm understanding on catalyst, stereochemistry, reaction mechanism, and their application for the synthesis of molecular materials is achieved.					
<b>Evaluation of achievement</b>					
The report on papers from scientific journals such as J.A.C.S and Angew. Chem. will be imposed. A design of novel organic molecular material.					
<b>Examination</b>					
その他 By Report					
<b>Details of examination</b>					
<b>Other information</b>					
For more information: Seiji Iwasa: room (B-506), e-mail (iwasa@ens.tut.ac.jp) Kazutaka Shibatomi: room (B-507), e-mail (shiba@ens.tut.ac.jp)					
<b>Reference URL</b>					
<a href="http://material.tutms.tut.ac.jp/STAFF/IWASA/index.html">http://material.tutms.tut.ac.jp/STAFF/IWASA/index.html</a> , <a href="http://ens.tut.ac.jp/orgchem/">http://ens.tut.ac.jp/orgchem/</a> <a href="http://www.siorgchem.ens.tut.ac.jp/index.html">http://www.siorgchem.ens.tut.ac.jp/index.html</a>					

**Office hours**

anytime.

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

molecular catalyst, total synthesis, natural product, asymmetric synthesis, transition metal

**(M44630110)Developmental Neuroscience[Developmental Neuroscience]**

<b>Subject name[English]</b>	Developmental Neuroscience[Developmental Neuroscience]				
<b>Schedule number</b>	M44630110	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring2 term	<b>Day of the week,period</b>	Tue.2~2	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	吉田 祥子, 沼野 利佳 YOSHIDA Sachiko, NUMANO Rika				
<b>Numbering</b>	ENV_MAS53225				
<b>Objectives of class</b>					
Objective of class is to develop a new technology for detection of neuronal function in your brain. We deal with neuronal property and development of neuronal circuit, and discuss applicability and problem of your ideas.					
<b>Contents of class</b>					
S Yoshida, (1)Properties of neuronal cells (2)Electrical function and ion transport (3)Chemical information transport (4)Development of neuronal circuit (5)Detection of chemical information (6)Detection of electrical information (7)Detection of cortical development					
R Numano, (8)Neural inducer in vertebrates (9)Notch and Delta genes (10)Notch and Delta genes (11)Polarity and Segmentation (12)Polarity and Segmentation (13)Hox gene function in the nervous system (14)Hox gene function in the nervous system (15)Topic & Discussion					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
A firm understanding on fundamental biochemistry and thermodynamics will be necessary.					
<b>Notes for textbook</b>					
Web-based text will be distributed.					
(Reference) From Neuron To Brain 4th Ed, Nicholls et. al. (Sinauer, 2001)					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>					
Yoshida S. Short reports on Web; 40%, Term report; 60%					
Numano Term report; 100%					
<b>Examination</b>					
その他 Other					
<b>Details of examination</b>					

**Other information**

S Yoshida

Room: B-406, E-mail: syoshida@ens.tut.ac.jp

R Numano

Room: G-407, E-mail: numano@tut.jp

**Reference URL**

<https://lms.imc.tut.ac.jp>

**Office hours**

Make an appointment by e-mail.

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

**(M44630140)Advanced Electrical and Electronic Technology for Ecological Engineering[Advanced Electrical and Electronic Technology for Ecological Engineering]**

<b>Subject name[English]</b>	Advanced Electrical and Electronic Technology for Ecological Engineering[Advanced Electrical and Electronic Technology for Ecological Engineering]				
<b>Schedule number</b>	M44630140	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring1 term	<b>Day of the week,period</b>	Fri.4~4	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<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>	ENV_MAS54225				
<b>Objectives of class</b>					
1.Fundamentals of operational Amplifiers 2.Application circuits of operational Amplifiers 3.Fundamentals of air purification by Electronics.					
<b>Contents of class</b>					
The textbook includes the following subjects:					
1. Integrated circuit 2. Ideal OP-Amp model and Linear circuit 3. Application technologies					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
The knowledge of basic Electronics and mathematics is absolutely necessary. If you have not completed these subjects, you are not qualified for this course.					
<b>Notes for textbook</b>					
Microelectronics Circuits and Devices by Mark N. Horenstein. Selected current technical papers.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>					
Grades for the course will be based on the test score, the report and presentation score.					
<b>Examination</b>					
その他 Other					
<b>Details of examination</b>					
<b>Other information</b>					
Tanaka: Room: G-605, Phone: 6916, E-mail: tanakas@ens.tut.ac.jp					
<b>Reference URL</b>					
<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>					
環境・生命工学専攻 (C)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					

(F) 最新の技術や社会環境の変化に対する探究心と持続的学習力  
社会、環境、技術等の変化に対応して、生涯にわたって自発的に学習する能力

**Key words**



**(M44630190)Advanced Sustainable Coordinator[Advanced Sustainable Coordinator]**

<b>Subject name[English]</b>	Advanced Sustainable Coordinator[Advanced Sustainable Coordinator]				
<b>Schedule number</b>	M44630190	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring2 term	<b>Day of the week,period</b>	Fri.4~4	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	東海林 孝幸 TOKAIRIN Takayuki				
<b>Numbering</b>	ENV_MAS54225				
<b>Objectives of class</b>					
Goto To establish a "Sustainable Society" is one of major fields for sustainable development. Countermeasures for it should be comprehensive and they comprise not only engineering but also several disciplines. The objectives of this class are 1 to comprehend notion of "Sustainable Society" 2 to learn human dimensional disciplines for "Sustainable Society" 3 to know planning method to establish "Sustainable Society" though examples					
Tokairin The objectives of this class are 1 to know air pollution situation 2 to understand the evaluation method of pollutant concentration 3 to understand the characteristics of planetary boundary layer					
<b>Contents of class</b>					
Goto 1 Concept of Sustainable development 2 Material (Substance) flow analysis and Life Cycle Assessment 3 Japanese environmental law and institution					
Tokairin 1 Atmospheric environment and air pollution 2 Atmospheric diffusion modeling 3 Meteorology of planetary boundary layer					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Goto I will distribute copies of document.					
Tokairin I will distribute copies of document.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
Goto to understand how to establish sustainable society					

Tokairin to understand basics on atmospheric environment and its evaluation method.
<b>Evaluation of achievement</b> Every week and Term end report (100%)
<b>Examination</b> By Report
<b>Details of examination</b>
<b>Other information</b> Naohiro Goto (G603) goto@ens.tut.ac.jp Takayuki Tokairin (G405) tokairin@ens.tut.ac.jp
<b>Reference URL</b>
<b>Office hours</b> Any time by E-mail
<b>Relations to attainment objectives of learning and education</b>
<b>Key words</b> Sustainability, MFA, LCA, Air pollution, planetary boundary layer, Atmospheric diffusion

**(M44630200)Advanced Supercritical Fluid Engineering[Advanced Supercritical Fluid Engineering]**

<b>Subject name[English]</b>	Advanced Supercritical Fluid Engineering[Advanced Supercritical Fluid Engineering]				
<b>Schedule number</b>	M44630200	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring2 term	<b>Day of the week,period</b>	Fri.2~2	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	大門 裕之 DAIMON Hiroyuki				
<b>Numbering</b>	ENV_MAS54125				
<b>Objectives of class</b>					
<p>Based on Supercritical Fluid Engineering and Environmental Chemical Engineering, practical philosophy, creativity and leadership of engineer are improved during this course. The topics are mainly waste management and utilization of biomass. Environmental issue is widely discussed to obtain the knowledge and organizing skill of comprehensive process or society.</p> <p>Based on Supercritical Fluid Engineering and Environmental Chemical Engineering, practical philosophy, creativity and leadership of engineer are improved during this course. The topics are mainly waste management and utilization of biomass. Environmental issue is widely discussed to obtain the knowledge and organizing skill of comprehensive process or society.</p>					
<b>Contents of class</b>					
1st Summary 2nd History 3rd Physical property 1 4th Physical property 2 5th Instrumentation and process engineering 6th Application of Supercritical Water Technologies 1 7th Application of Supercritical Water Technologies 2 8th Application of Supercritical Water Technologies 3 9th Application of Supercritical Water Technologies 4 10th Application of Supercritical Water Technologies 5 11th Application of Supercritical Carbon dioxide Technologies 1 12th Application of Supercritical Carbon dioxide Technologies 2 13th Application of Supercritical Carbon dioxide Technologies 3 14th Application of Supercritical Carbon dioxide Technologies 4 15th Examination 1st Summary 2nd History 3rd Physical property 1 4th Physical property 2 5th Instrumentation and process engineering 6th Application of Supercritical Water Technologies 1 7th Application of Supercritical Water Technologies 2 8th Application of Supercritical Water Technologies 3 9th Application of Supercritical Water Technologies 4 10th Application of Supercritical Water Technologies 5 11th Application of Supercritical Carbon dioxide Technologies 1 12th Application of Supercritical Carbon dioxide Technologies 2 13th Application of Supercritical Carbon dioxide Technologies 3 14th Application of Supercritical Carbon dioxide Technologies 4 15th Examination					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Advanced Analytical Separation Chemistry, Advanced Industrial Ecology Advanced Analytical Separation Chemistry, Advanced Industrial Ecology					
<b>Notes for textbook</b>					
1. Analytical Supercritical Fluid Chromatography and Extraction edited by M. L. Lee and K. E. Markides, 1990					

Chromatography Conference, Inc.  
2. Hyphenated Techniques in Supercritical Fluid Chromatography and Extraction  
edited by K. Jinno, 1992  
Elsevier  
1. Analytical Supercritical Fluid Chromatography and Extraction  
edited by M. L. Lee and K. E. Markides, 1990  
Chromatography Conference, Inc.  
2. Hyphenated Techniques in Supercritical Fluid Chromatography and Extraction  
edited by K. Jinno, 1992  
Elsevier

**Notes for reference**

**Goals to be achieved**

1. To understand Supercritical Fluid Technology
2. To improve engineering skill
3. To obtain the knowledge about Environmental problem especially for waste management
1. To understand Supercritical Fluid Technology
2. To improve engineering skill
3. To obtain the knowledge about Environmental problem especially for waste management

**Evaluation of achievement**

Based on Presentation and Interview during class

More than

80% ; A

65% ; B

55% ; C

Based on Presentation and Interview during class

More than

80% ; A

65% ; B

55% ; C

**Examination**

レポートで実施

By Report

**Details of examination**

**Other information**

Office : Building G, Floor 6th, Room 602

Tel:0532-44-6905

Email:daimon@ens.tut.ac.jp

Office : Building G, Floor 6th, Room 602

Tel:0532-44-6905

Email:daimon@ens.tut.ac.jp

**Reference URL**

<http://water.eco.tut.ac.jp/class.html> (English version under construction)

<http://water.eco.tut.ac.jp/class.html> (English version under construction)

**Office hours**

After the class or anytime when you make an appointment through Email

After the class or anytime when you make an appointment through Email

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

(D)

(D)

**Key words**

Supercritical Fluids, Resource Recovery, Material and Energy Balance, Process Engineering

Supercritical Fluids, Resource Recovery, Material and Energy Balance, Process Engineering

**(M44630220)Advanced Life Science and Biotechnology II[Advanced Life Science and Biotechnology II]**

<b>Subject name[English]</b>	Advanced Life Science and Biotechnology II[Advanced Life Science and Biotechnology II]				
<b>Schedule number</b>	M44630220	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S4系教務委員 4kei kyomu Iin-S				
<b>Numbering</b>	ENV_MAS53225				
<b>Objectives of class</b>	This course will provide the students with the opportunity to study on the selected subject in the realm of further advanced life science and biotechnology based on the knowledge of the course of Advanced Life Science and Biotechnology I.				
<b>Contents of class</b>	The classes will be given by his/her supervisor. The type and contents of this course depend on his/her supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Advanced Life Science and Biotechnology I				
<b>Notes for textbook</b>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>	The evaluation is based on the scores of reports, presentations, and examination.				
<b>Examination</b>	None during exam period				
<b>Details of examination</b>					
<b>Other information</b>	Supervisor				
<b>Reference URL</b>					
<b>Office hours</b>	Students are encouraged visiting by appointment.				
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>	Molecular biology and microbiology, genomics, biotechnology and bioengineering				

**(M44630240)Advanced Environmental Technology II[Advanced Environmental Technology II]**

<b>Subject name[English]</b>	Advanced Environmental Technology II[Advanced Environmental Technology II]				
<b>Schedule number</b>	M44630240	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begging grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S4系教務委員 4kei kyomu Iin-S				
<b>Numbering</b>	ENV_MAS54225				
<b>Objectives of class</b>	This course will provide the students with the opportunity to study on the selected subject in the realm of further advanced environmental technology based on the knowledge of the course of Advanced Environmental Technology I.				
<b>Contents of class</b>	The classes will be given by his/her supervisor. The type and contents of this course depend on his/her supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Advanced Environmental Technology I				
<b>Notes for textbook</b>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>	The evaluation is based on the scores of reports, presentations, and examination.				
<b>Examination</b>	None during exam period				
<b>Details of examination</b>					
<b>Other information</b>	Supervisor				
<b>Reference URL</b>					
<b>Office hours</b>	Students are encouraged visiting by appointment.				
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(M44630260)Advanced Environmental and Ecological Systems II[Advanced Environmental and Ecological Systems II]**

<b>Subject name[English]</b>	Advanced Environmental and Ecological Systems II[Advanced Environmental and Ecological Systems II]				
<b>Schedule number</b>	M44630260	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring term	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Begining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S4系教務委員 4kei kyomu Iin-S				
<b>Numbering</b>	ENV_MAS54125				
<b>Objectives of class</b>	This course will provide the students with the opportunity to study on the selected subject in the realm of further advanced environmental and ecological systems based on the knowledge of the course of Advanced Environmental and Ecological Systems I.				
<b>Contents of class</b>	The classes will be given by his/her supervisor. The type and contents of this course depend on his/her supervisor.				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	Advanced Environmental and Ecological Systems I				
<b>Notes for textbook</b>					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>	The evaluation is based on the scores of reports, presentations, and examination.				
<b>Examination</b>	None during exam period				
<b>Details of examination</b>					
<b>Other information</b>	Supervisor				
<b>Reference URL</b>					
<b>Office hours</b>	Students are encouraged visiting by appointment.				
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(M44630290)Advanced Biomaterials Engineering[Advanced Biomaterials Engineering]**

<b>Subject name[English]</b>	Advanced Biomaterials Engineering[Advanced Biomaterials Engineering]				
<b>Schedule number</b>	M44630290	<b>Subject area</b>	Advanced Environmental and Life Sciences	<b>Required or elective</b>	Elective
<b>Time of starting a course</b>	Spring2 term	<b>Day of the week,period</b>	Thu.3~3	<b>Credit(s)</b>	1
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Environmental and Life Sciences			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	辻 秀人, 手老 龍吾 TSUJI Hideto, TERO Ryugo				
<b>Numbering</b>	ENV_MAS52225				
<b>Objectives of class</b>					
Biomaterials have been developed and studied in terms of various applications including biomedical, pharmaceutical and environmental applications. This course covers the fundamentals and applications of biomaterials and related experimental techniques.					
<b>Contents of class</b>					
This course deals with all aspects of biobased and biodegradable polymers for biomedical, pharmaceutical, and environmental applications, and of devices and techniques for sensing biomolecules. The detailed course schedule is shown below. The detailed course schedule is shown below.					
Biobased and biodegradable polymers (Hideto Tsuji): (1) introduction, synthesis, and structures, (2) molding, crystallization, and physical properties, (3) hydrolytic degradation and biodegradation, and (4) applications.					
Biodevice and biosensing (Ryugo Tero): (5) introduction of biomaterials and biodevices, (6) detection of cell membrane functions, (7) surface patterning and microarray, and (8) imaging techniques for biomolecules.					
<b>Self Preparation and Review</b>					
If possible, read the reference book chapters which are shown below and you can find them in the university library (Hideto Tsuji). Read the appropriate chapter(s) of the reference book (#3) shown below. You can access it in the university network. (Ryugo Tero)					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
Printed materials will be distributed (Hideto Tsuji). Printed materials will be distributed as necessary (Ryugo Tero).					
<b>Reference1</b>	<b>Book title</b>	Degradation of Poly (Lactide)-Based Biodegradable Materials		<b>ISBN</b>	1604565020
	<b>Author</b>	Hideto Tsuji	<b>Publisher</b>	Nova Science Pub Inc	<b>Publish year</b>
<b>Reference2</b>	<b>Book title</b>	Chapter 21 in "Poly(lactic acid): Synthesis, Structures, Properties, Processing, and Applications"		<b>ISBN</b>	0470293667
	<b>Author</b>	Hideto Tsuji	<b>Publisher</b>	Wiley	<b>Publish year</b>
<b>Reference3</b>	<b>Book title</b>	Nanoscience: Nanobiotechnology and Nanobiology		<b>ISBN</b>	978-3-540-88633-4
	<b>Author</b>	Patrick Boisseau & Marcel Lahmani	<b>Publisher</b>	Springer	<b>Publish year</b>
<b>Notes for reference</b>					
Reference book 3 (Ryugo Tero): <a href="http://link.springer.com/book/10.1007%2F978-3-642-28030-6">http://link.springer.com/book/10.1007%2F978-3-642-28030-6</a>					
<b>Goals to be achieved</b>					



To understand the fundamentals and applications of biobased and biodegradable polymers (Hideto Tsuji).  
To understand the fundamentals and applications of biodevice, biosensing and related methods (Ryugo Tero).

**Evaluation of achievement**

Presentation (100%) regarding the biobased and biodegradable polymers (Hideto Tsuji)  
Reporting assignment (100%) which will be given in each class (Ryugo Tero)

**Examination**

その他

By Report

**Details of examination**

Presentation (Hideto Tsuji)  
Reporting assignment (Ryugo Tero)

**Other information**

Room (G-606), e-mail (tsuji@ens.tut.ac.jp), phone: 6922 (Hideto Tsuji)  
Room (B-405), e-mail (tero@tut.jp), phone: 6791 (Ryugo Tero)

**Reference URL**

**Office hours**

Immediately after the class (Hideto Tsuji)  
After the class, or as needed in my office (Ryugo Tero)

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

**Key words**

**(M45610010)Seminar on Architecture and Civil Engineering I[Seminar on Architecture and Civil Engineering I]**

<b>Subject name[English]</b>	Seminar on Architecture and Civil Engineering I[Seminar on Architecture and Civil Engineering I]				
<b>Schedule number</b>	M45610010	<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>	3
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<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>					

**(M45610020)Seminar on Architecture and Civil Engineering II[Seminar on Architecture and Civil Engineering II]**

<b>Subject name[English]</b>	Seminar on Architecture and Civil Engineering II[Seminar on Architecture and Civil Engineering II]				
<b>Schedule number</b>	M45610020	<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>	3
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M2
<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>					

(M45610030)Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]

<b>Subject name[English]</b>	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]				
<b>Schedule number</b>	M45610030	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	S5系教務委員, 5系各教員 5kei kyomu iin-S, 5kei kakukyoin				
<b>Numbering</b>					
<b>Objectives of class</b>	This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).				
<b>Contents of class</b>	The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).				
<b>Self Preparation and Review</b>					
<b>Related subjects</b>	TBD by the laboratory				
<b>Notes for textbook</b>	TBD by the laboratory				
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>	This credit is assigned for all the process for the preparation and presentation of the thesis.				
<b>Examination</b>	その他 By Report				
<b>Details of examination</b>					
<b>Other information</b>	Refer to administration office.				
<b>Reference URL</b>	Refer to the URL of each laboratory				
<b>Office hours</b>	Refer to administration office.				
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

(M45610030)Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]

<b>Subject name[English]</b>	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]				
<b>Schedule number</b>	M45610030	<b>Subject area</b>	Advanced Architecture and Civil Engineering	<b>Required or elective</b>	Required
<b>Time of starting a course</b>	2Years	<b>Day of the week,period</b>	Intensive	<b>Credit(s)</b>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M2
<b>Charge teacher name[Roman alphabet mark]</b>	S5系教務委員 5kei kyomu Iin-S				
<b>Numbering</b>	ARC_MAS51025				
<b>Objectives of class</b>					
This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).					
<b>Contents of class</b>					
The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
TBD by the laboratory					
<b>Notes for textbook</b>					
TBD by the laboratory					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>					
This credit is assigned for all the process for the preparation and presentation of the thesis.					
<b>Examination</b>					
その他 By Report					
<b>Details of examination</b>					
<b>Other information</b>					
Refer to administration office.					
<b>Reference URL</b>					
Refer to the URL of each laboratory					
<b>Office hours</b>					
Refer to administration office.					
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(M4561003T)Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]**

<b>Subject name[English]</b>	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]				
<b>Schedule number</b>	M4561003T	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M2
<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>	This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).				
<b>Contents of class</b>	The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).				
<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>	This credit is assigned for all the process for the preparation and presentation of the thesis.				
<b>Examination</b>	By Report				
<b>Details of examination</b>					
<b>Other information</b>	Refer to administration office.				
<b>Reference URL</b>	Refer to the URL of each laboratory				
<b>Office hours</b>	Refer to administration office.				
<b>Relations to attainment objectives of learning and education</b>					
<b>Key words</b>					

**(M45610040)Seminar on Architecture and Civil Engineering[Seminar on Architecture and Civil Engineering]**

<b>Subject name[English]</b>	Seminar on Architecture and Civil Engineering[Seminar on Architecture and Civil Engineering]				
<b>Schedule number</b>	M45610040	<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>	6
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	2~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M2
<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>	In each seminar, students pursue several research topics and/or undertake projects collectively and solely under the instruction of the faculty members of the department and/or those of other departments.				
<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>	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>					

(M45630130)Advanced Study on Housing System and Housing Policy[Advanced Study on Housing System and Housing Policy]

<b>Subject name[English]</b>	Advanced Study on Housing System and Housing Policy[Advanced Study on Housing System and Housing Policy]				
<b>Schedule number</b>	M45630130	<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 Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	松島 史朗 MATSUSHIMA Shiro				
<b>Numbering</b>					
<b>Objectives of class</b>					
<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>					
<b>Examination</b>					
<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>					



**(M45630200)Advanced Structural System Planning and Design II[Advanced Structural System Planning and Design II]**

<b>Subject name[English]</b>	Advanced Structural System Planning and Design II[Advanced Structural System Planning and Design II]				
<b>Schedule number</b>	M45630200	<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>	Intensive	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<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>	It depends on the laboratory. The resistered 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>					
<b>Examination</b>	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>					

**(M45630220)Advanced Environmental System Planning and Design II[Advanced Environmental System Planning and Design II]**

<b>Subject name[English]</b>	Advanced Environmental System Planning and Design II[Advanced Environmental System Planning and Design II]				
<b>Schedule number</b>	M45630220	<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>	Intensive	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<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>	It depends on the laboratory. The resistered 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>					
<b>Examination</b>	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>					

**(M45630240)Advanced Regional System Planning and Design II[Advanced Regional System Planning and Design II]**

<b>Subject name[English]</b>	Advanced Regional System Planning and Design II[Advanced Regional System Planning and Design II]				
<b>Schedule number</b>	M45630240	<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>	Intensive	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<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>	It depends on the laboratory. The resistered 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>					
<b>Examination</b>	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>					

**(M45630340)Building science:Thermal Environment and vernacular architecture[Building science:Thermal Environment and vernacular architecture]**

<b>Subject name[English]</b>	Building science:Thermal Environment and vernacular architecture[Building science:Thermal Environment and vernacular architecture]				
<b>Schedule number</b>	M45630340	<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.2~2	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Beggining grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	都築 和代 TSUZUKI Kazuyo				
<b>Numbering</b>					
<b>Objectives of class</b>					
<p>This course deals with the latest trend of research and development on prediction of indoor environment to ensure safe, reliable and comfortable quality of life, and to design a sustainable building. Also, the comprehensive assessment system for built environment efficiency will be lectured. Moreover, it also enhances the point of view, field of view and perspective to pursue built environments surround by us such as habitant, building, reginal/urban and global environments, and the objective is to cultivate an ability to tackle complex environmental issues. Simultaneously, this course aims to understand social requests and the ability required for environment and building services designs in buildings and cities.</p>					
<b>Contents of class</b>					
<p>The contents are as follows:</p> <ol style="list-style-type: none"> <li>1. Actual situations of environmental impact to global environment affected by buildings and cities</li> <li>2. Environmental impact evaluation affected by buildings and cities</li> <li>3. LCA evaluation of buildings and cities</li> <li>4. Comprehensive assessment system for built environment efficiency</li> <li>5. Sustainable buildings</li> <li>6. Eco city</li> <li>7. Adaptive thermal comfort 1</li> <li>8. Adaptive thermal comfort 2</li> <li>9. Building science: Thermal Environment and vernacular architecture 1</li> <li>10. Building science: Thermal Environment and vernacular architecture 2</li> <li>11. Guidelines, codes and standard</li> <li>12. Research and Development on thermal environment</li> <li>13. Research and Development on IAQ</li> <li>14. Discussion on IAQ related issues</li> <li>15. Supplementary lecture</li> </ol>					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
Building climate design, Building services design					
<b>Notes for textbook</b>					
Hand-outs related this course will be distributed.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
<b>Evaluation of achievement</b>					
<p>The grades will be evaluated by comprehensive consideration based on discussion (30%) and reports (70%) in the course.</p> <p>[Evaluation basis] Students who attend all classes will be evaluated as follows:</p> <p>A: Achieved all goals and obtained total points of reports, 80 or higher (out of 100 points).</p> <p>B: Achieved 70 % of goals and obtained total points of reports, 65 or higher (out of 100 points).</p> <p>C: Achieved 60 % of goals and obtained total points of reports, 55 or higher (out of 100 points).</p>					
<b>Examination</b>					

By Report
<b>Details of examination</b>
<b>Other information</b> Phone: ext. 6839, Email: ktsuzuki@ace.tut.ac.jp
<b>Reference URL</b>
<b>Office hours</b> K.tsuzuki: Monday, 15:00-17:00
<b>Relations to attainment objectives of learning and education</b>
<b>Key words</b>

**(M45630350)Water Environment Engineering[Water Environment Engineering]**

<b>Subject name[English]</b>	Water Environment Engineering[Water Environment Engineering]				
<b>Schedule number</b>	M45630350	<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.3~3	<b>Credit(s)</b>	2
<b>Faculty</b>	Graduate Program for Master's Degree			<b>Subject grade</b>	1~2
<b>Department Offered</b>	Architecture and Civil Engineering			<b>Begging grade</b>	M1, M2
<b>Charge teacher name[Roman alphabet mark]</b>	井上 隆信 INOUE Takano				
<b>Numbering</b>					
<b>Objectives of class</b>					
To know and understand the water quality change in environment and treatment system. To know and understand the water quality management.					
<b>Contents of class</b>					
Water pollutants and management 1-2 environmental standard 3-5 nutrients, organic matter 6-7 chemicals in water environment drinking water treatment and waste water treatment 8-9 rapid sand filtration process 10-11 activated sludge treatment process water quality change in environment and treatment system. 12 fundamental equation of the mass balance 13 piston flow model 14 complete mixing model 15 reaction rate					
<b>Self Preparation and Review</b>					
<b>Related subjects</b>					
<b>Notes for textbook</b>					
No textbook is required for this class.					
<b>Notes for reference</b>					
<b>Goals to be achieved</b>					
To understand the water pollution and environmental quality standard.					
<b>Evaluation of achievement</b>					
[Evaluation basis] Students who attend all classes will be evaluated as follows: A: Achieved all goals and obtained total points of reports and presentation, 80 or higher (out of 100 points). B: Achieved 65 % of goals and obtained total points of reports and presentation, 65 or higher (out of 100 points). C: Achieved 55 % of goals and obtained total points of reports and presentation, 55 or higher (out of 100 points).					
<b>Examination</b>					
By Report					
<b>Details of examination</b>					
<b>Other information</b>					
<b>Reference URL</b>					
<b>Office hours</b>					
Wednesday 12:00- 13:00					
<b>Relations to attainment objectives of learning and education</b>					

**Key words**