Syllabus

International Master′s Degree Program

（2019-Spring Term）

(M40030010)Management Science[Management Science]

Subject name[English]	Management Science[Management Science]				
Schedule number	M40030010	**Subject area**	General courses	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Thu.1～1	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering, Architecture and Civil Engineering, Electrical and Electronic Information Engineering, Computer Science and Engineering, Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	藤原 孝男 FUJIWARA Takao				
Numbering	GEN_LIB52325				

Objectives of class

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.

Contents of class

The class will disucss about basic ideas on the valuation of financial option as a derivative based on the elementary probabiity, 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.

Self Preparation and Review

Teaching materials will be uploaded at moodle. Attending students are expected to complete pre- and re-views, investigate by themselves, and ask the lecturer.

Related subjects

Management (undergraduate), Operations Management, Real Options, Game Theory, MOT, Entrepreneurship, Innovation Management.

Notes for textbook

As noted above, materials will be uploaded at moodle.

Reference1	**Book title**	An Elementary Introduction to Mathematical Finance (3rd.ed.)			**ISBN**	978-0-521-19253-8
	Author	Sheldon M. Ross	**Publisher**	Cambridge University Press	**Publish year**	2011

Notes for reference

N/A

Goals to be achieved

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%, Reports 20%, and Presentation 20%.

Evaluation Criteria:
Bachelor , Master student
S: If students achieved every above goals and their summed scores are equal or more than 90 (the maxim scores 100).
A: If students achieved 80% of above goals and their summed scores are equal or more than 80 (the maxim scores 100).
B: If students achieved at least 70% of above goals and their summed scores are equal or more than 70 (the maxim scores 100).
C: If students achieved at least 60% of above goals and their summed scores are equal or more than 60 (the maxim scores 100).

Examination

定期試験を実施（対面）
Examination(Face to Face)

Details of examination

N/A

Other information

N/A

Reference URL

N/A

Office hours

At any time if available.

Relations to attainment objectives of learning and education

機械工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
(B)技術者・研究者としての正しい倫理観と社会性
上級技術者・研究者として社会的・倫理的責任を有し，社会における技術的課題を設定・解決・評価する能力を身につけている。
電気・電子情報工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
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応用化学・生命工学専攻
(B)技術者・研究者としての正しい倫理観と社会性
上級技術者・研究者として社会的・倫理的責任を有し，社会における技術的課題を設定・解決・評価する能力を身につけている。
建築・都市システム学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。

Graduate Program of Mechanical Engineering for Master's Degree
(A) Personality and outlook with a broad perspective

Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare
(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; and have the ability to set, solve and evaluatetechnical issues in society
Graduate Program of Electrical and Electronic Information Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; the ability to consider the symbiosis between humans and nature as well as publicwelfare
(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; have the ability to set, solve and evaluate technicalissues in society
Graduate Program of Computer Science and Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare
Graduate Program of Applied Chemistry and Life Science for Master's Degree
(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; and have the ability to set, solve and evaluatetechnical issues in society
Graduate Program of Architecture and Civil Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare

Key words

Real Options, Game Theory, Operations Management, Management

(M40030050)Japanese Life Today[Japanese Life Today]

Subject name[English]	Japanese Life Today[Japanese Life Today]				
Schedule number	M40030050	**Subject area**	General courses	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Thu.5～5	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering, Architecture and Civil Engineering, Electrical and Electronic Information Engineering, Computer Science and Engineering, Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S総合ー教務委員, 穂積 直裕, 大門 裕之, Lim Pang Boey, 井佐原 均, 福本 昌宏, 岩佐 精二, 毛利 雅子, 髙嶋 孝明, 蔡 万里, 中村 大介, 武藤 浩行, 藤原 孝男, 和泉 司, 加藤 三保子, 齊藤 大樹 Sougou kyoiku kyomu Iin, HOZUMI Naohiro, DAIMON Hiroyuki, Lim Pang Boey, ISAHARA Hitoshi, FUKUMOTO Masahiro, IWASA Seiji, MOURI Masako, TAKASHIMA Takaaki, SAI Banri, NAKAMURA Daisuke, MUTO Hiroyuki, FUJIWARA Takao, IZUMI Tsukasa, KATOH Mihoko, SAITOH Taiki				
Numbering	GEN_LIB51325				

Objectives of class

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.

Contents of class

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 Suppoted 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 repid 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 "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. Sai The legal system of Intellectual Property in Japan（日本の知的財産法制度）

In modern information society, technological and cultural reforms progress very quickly. And this progress has been based on what is known as intellectual rights such as patent right, trademark right, copyright, and other rights related to intellectual property.
Intellectual property issues cause a number of problems which have attracted much interest in the present society. This class explains the Japanese legal system of Intellectual property, in particular focusing on the legal protection of patent right and copyright in Japan.

10. Nakamura "Cinema of Japan"
Japan is recognized as one of the most creative countries in the movie culture. Regarding films such as Naruse, Ozu,Godzilla and "Chanbara", students will learn some aspects of Japanese movie culture.

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 "Sign Language Writing System for the deaf"
Sign language for the deaf is a visual-manual language and has some characteristics different from those of aural-oral language. In this class, we will overview linguistic aspects of sign language. After studying some notation systems for sign languages, we will discuss the necessity to employ "writing system" of sign languages to describe a sign or a signed sentence for everyday purposes.

15.Izumi "Modern literature in Japanese society"
Although book sales is decreasing in Japan recently, there are a lot of people who want to become a novelist. Why don't Japanese people buy books? Nevertheless, why do some people want to become a Novelist?
Let's think about book market in Japan together and learn about Japanese modern literature.

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects
N/A

Notes for textbook
Papers(resume)will be distributed.

Notes for reference
N/A

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:
S: Achieved all goals and obtained total points of exam and reports, 90 or higher (out of 100 points).

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

Examination

試験期間中には何も行わない
None during exam period

Details of examination

N/A

Other information

N/A

Reference URL

N/A

Office hours

After each class.

Relations to attainment objectives of learning and education

機械工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
電気・電子情報工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
情報・知能工学専攻
(A)幅広い人間性と考え方
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応用化学・生命工学専攻
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Graduate Program of Mechanical Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare
Graduate Program of Electrical and Electronic Information Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
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Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare
Graduate Program of Applied Chemistry and Life Science for Master's Degree
(A) Personality and outlook with a broad perspective
Have a mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as public welfare
Graduate Program of Architecture and Civil Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare

Key words

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

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

Subject name[English]	Principles of Japanese Conversation[Principles of Japanese Conversation]				
Schedule number	M40030080	**Subject area**	General courses	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Wed.1～1	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering, Architecture and Civil Engineering, Electrical and Electronic Information Engineering, Computer Science and Engineering, Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	村松　由起子 MURAMATSU Yukiko				
Numbering	GEN_LIB51425				

Objectives of class

This is a Basic Japanese conversation class. You will learn elementary Japanese grammar and vocabulary to speak Japanese on campus.

Contents of class

Students will learn the following lessons in Japanese textbook " Basic Japanese for Students Hakase1".

1. Pronunciation of Japanese
2. Lesson 1 Hajimemashite. Watashi wa Heren desu.
3. Lesson 2 O-kuni wa dochira desuka.
4. Lesson 3 Sore wa nan desuka.
5. Lesson 4 Watashi wa asa koohii o nomimasu.
6. Lesson 5 Ima nan-ji desuka.
7. Lesson 6 Ashita doko e ikimasu ka.
8. Lesson 7 Juu-gatsu juu-go-nichi ni Nihon e kimashita.
9. Lesson 8 Kyooshitsu ni dare ga imasu ka.
10. Lesson 9 Yuubinkyoku wa doko ni arimasu ka.
11. Lesson 10 Nihon e robotto no kenkyuu ni kimashita.
12. Lesson 11 Fuji-san wa kireina yama desu.
13. Lesson 12 Ryokoo wa doo deshita ka.
14. Lesson 13 Shuumatsu ni nani oshitai desu ka.
15. Lesson 14 Ongaku ga suki desu ka.

Examination

Self Preparation and Review

Preparation: Please read Vocabulary and Notes in each lesson.
Review:Please memorize "Structures" after each lesson.

Related subjects

Basic Japanese Classes (Nihongo Hokoo)
For more information,please see the following URL: http://ignite.tut.ac.jp/cir/students/program/hokou.html

Textbook1	**Book title**	Basic Japanese for Students Hakase 1（はかせ1）		**ISBN**		
	Author	Yamazaki yoshiko, Doi mitsuru	**Publisher**	3A Corporation（スリーエーネットワーク）	**Publish year**	

Notes for textbook

Papers(resume)will be distributed.

Notes for reference

N/A

Goals to be achieved

1)You will be able to understand basic Japanese structures and grammatical items.
2)You will be able to communicate with Japanese people in easy Japanese.

Evaluation of achievement

Homework 40%, Examination 60%
Evaluation criteria:

Students who attend all classes will be evaluated as follows:
M1
S: Total points obtained from exams and homework, 90 or higher (out of 100 points).
A: Total points obtained from exams and homework, 80 or higher (out of 100 points).
B: Total points obtained from exams and homework, 70 or higher (out of 100 points).
C: Total points obtained from exams and homework, 60 or higher (out of 100 points).
M2
A: Total points obtained from exams and homework, 80 or higher (out of 100 points).
B: Total points obtained from exams and homework, 65 or higher (out of 100 points).
C: Total points obtained from exams and homework, 55 or higher (out of 100 points).

Examination

定期試験を実施(対面)
Examination(Face to Face)

Details of examination

N/A

Other information

N/A

Reference URL

N/A

Office hours

Tuesday 13:00-13:30

Relations to attainment objectives of learning and education

機械工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
電気・電子情報工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
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応用化学・生命工学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。
(D)グローバルに活躍できるコミュニケーション力
グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で，自らの考えや成果を効果的に表現するコミュニケーション力を身につけている。
(D1) 論文，口頭及び情報メディアを通じて，自分の論点や考えなどを国の内外において効果的に表現・発信し，コミュニケーションする能力を身につけている。
(D2) チーム内の個々の要員の価値観を互いに尊重するとともに，協調して，チームとしての目標達成に寄与できる高い能力を身につけている。
建築・都市システム学専攻
(A)幅広い人間性と考え方
人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち，人間と自然との共生，公共の福祉について考える能力を身につけている。

Graduate Program of Mechanical Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare
Graduate Program of Electrical and Electronic Information Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; the ability to consider the symbiosis between humans and nature as well as publicwelfare

Graduate Program of Computer Science and Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare
Graduate Program of Applied Chemistry and Life Science for Master's Degree
(A) Personality and outlook with a broad perspective
Have a mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as public welfare
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team member; and to contribute to the team's achievements through working cooperatively with other team members
Graduate Program of Architecture and Civil Engineering for Master's Degree
(A) Personality and outlook with a broad perspective
Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare

Key words

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

Subject name[English]	Seminar on Mechanical Engineering I[Seminar on Mechanical Engineering I]				
Schedule number	M41610010	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	4
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS51015				

Objectives of class

The seminar aims to provide a broad understanding of the mechanical engineering available for the master thesis research of a student.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Textbook or material will be made available from the supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

Coursework, presentation and/or report.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Seminar on Mechanical Engineering II[Seminar on Mechanical Engineering II]				
Schedule number	M41610020	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Mechanical Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS61015				

Objectives of class

The seminar aims to provide a broad understanding of the mechanical engineering available for the master thesis research of a student.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Textbook or material will be made available from the supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

Coursework, presentation and/or report.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]				
Schedule number	M41610030	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Mechanical Engineering			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S1系教務委員, 1系各教員 1kei kyomu Iin-S, 1kei kakukyouin				
Numbering	MEC_MAS61015				

Objectives of class

The thesis research aims to provide a practical experience of research work, and to acquire research skills with a deep understanding of relevant knowledge.

Contents of class

The research subject depends on the supervisor and the research group you join. Individual students will have different research subjects. Discuss with your supervisor.

Self Preparation and Review

Related subjects

Notes for textbook

Reference and material will be available from the supervisor.

Notes for reference

Goals to be achieved

To get something new on individual research fields.
To develop your research skills including planning and presentation skills.

Evaluation of achievement

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]				
Schedule number	M41610030	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Mechanical Engineering			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S1系教務委員, 1系各教員 1kei kyomu Iin-S, 1kei kakukyouin				
Numbering	MEC_MAS61015				

Objectives of class

The thesis research aims to provide a practical experience of research work, and to acquire research skills with a deep understanding of relevant knowledge.

Contents of class

The research subject depends on the supervisor and the research group you join. Individual students will have different research subjects. Discuss with your supervisor.

Self Preparation and Review

Related subjects

Notes for textbook

Reference and material will be available from the supervisor.

Notes for reference

Goals to be achieved

To get something new on individual research fields.
To develop your research skills including planning and presentation skills.

Evaluation of achievement

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Mechanical Engineering[Thesis Research on Mechanical Engineering]				
Schedule number	M4161003T	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～2
Department Offered	Mechanical Engineering			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S1系教務委員, 1系各教員 1kei kyomu Iin-S, 1kei kakukyouin				
Numbering	MEC_MAS61015				

Objectives of class

The thesis research aims to provide a practical experience of research work, and to acquire research skills with a deep understanding of relevant knowledge.

Contents of class

The research subject depends on the supervisor and the research group you join. Individual students will have different research subjects. Discuss with your supervisor.

Self Preparation and Review

Related subjects

Notes for textbook

Reference and material will be available from the supervisor.

Notes for reference

Goals to be achieved

To get something new on individual research fields.
To develop your research skills including planning and presentation skills.

Evaluation of achievement

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Seminar on Mechanical Engineering[Seminar on Mechanical Engineering]				
Schedule number	M41610040	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS51015				

Objectives of class

The seminar aims to provide a broad understanding of the mechanical engineering available for the master thesis research of a student.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Textbook or material will be made available from the supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

Coursework, presentation and/or report.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

(M41610051)Internship[Internship]

Subject name[English]	Internship[Internship]				
Schedule number	M41610051	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	0
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～2
Department Offered	Mechanical Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS51015				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Studens are expected to discuss a preferable intership topic with supervisors before starting it.

Related subjects

Notes for textbook

Follow instructions provided by company/institutional supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

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)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(D)グローバルに活躍できるコミュニケーション力
グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で，自らの考えや成果を効果的に表現するコミュニケーション力を身につけている。
(D1)論文，口頭及び情報メディアを通じて，自分の論点や考えなどを国の内外において効果的に表現・発信し，コミュニケーションする能力を身につけている。
(D2)チーム内の個々の要員の価値観を互いに尊重するとともに，協調して，チームとしての目標達成に寄与できる高い能力を身につけている。

(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high skills to mutually respect the values of individual team members; and to contribute to the team's achievements through working cooperatively with other team members

Key words
Internship
Internship

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

Subject name[English]	Applied Mechanics of Materials[Applied Mechanics of Materials]				
Schedule number	M41630030	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Tue.2～2	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	足立　忠晴 ADACHI Tadaharu				
Numbering	MEC_MAS53025				

Objectives of class

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.

Contents of class

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

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

Mechanics of Materials, Elasticity, Solid Mechanics

Notes for textbook

Text will be distributed on the web site. The details of the text will given in the first class.

Reference1	**Book title**	A First Course in Continuum Mechanics			**ISBN**	
	Author	Fung YC	**Publisher**	Prentice-Hall	**Publish year**	
Reference2	**Book title**	Mechanics of Engineering Materials			**ISBN**	
	Author	Benham PP, Crawford RJ and Armstrong CG	**Publisher**	Longman	**Publish year**	
Reference3	**Book title**	Classical and Computational Solid Mechanics			**ISBN**	
	Author	Fung YC and Pin T	**Publisher**	World Scientific	**Publish year**	2001
Reference4	**Book title**	Theory of Elasticity, Course of Theoretical Physics Vol.7			**ISBN**	
	Author	Landau L.D. and Lifshitz E.M.	**Publisher**		**Publish year**	1970
Reference5	**Book title**	Aircraft Structures for Engineering Students			**ISBN**	
	Author	Megson THG	**Publisher**	Butterworth-Heinemann	**Publish year**	2007

Notes for reference

N/A

Goals to be achieved

To understand physical meaning fundamental equations in solid mechanics.
To deeply understand elementary mechanics of materials (strength of materials); tension of bar, torsion of axis and bending of beam.
To understand mechanics of thin-walled structures.
To know concept of dynamic measurement of deformation.

Evaluation of achievement

S: Achieved all goals and obtained total points of reports, 90 or higher (out of 100 points).
A: Achieved 80% of goals and obtained total points of reports, 80 or higher (out of 100 points).
B: Achieved 70% of goals and obtained total points of reports, 70 or higher (out of 100 points).
C: Achieved 60% of goals and obtained total points of reports, 60 or higher (out of 100 points).

Examination

その他
Other

Details of examination

N/A

Other information

Prof Tadaharu Adachi, Room D-305, Extension phone 6664, Email adachi@me.tut.ac.jp

Reference URL

http://solid.me.tut.ac.jp/solid/

Office hours

Anytime. Contact me by email before coming if possible.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words

Strength of materials, Mechanics of materials, solid mechanics, Structural mechanics, Thin-walled Structure

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

Subject name[English]	Science and Technology of Thin Films[Science and Technology of Thin Films]				
Schedule number	M41630080	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Fri.2～2	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	伊﨑　昌伸 IZAKI Masanobu				
Numbering	MEC_MAS54025				

Objectives of class

Understanding fundamental physics of solid materials, such as structure of atoms, electronic state of electron, bonding, symmetry of lattice, and scattering by electron, and the effects of the light and heat on the energy state and related physical properties, electrical and optical properties.

Contents of class

[09th] Chap. 1 : Structure of atoms
[10th] Chap. 1: Electron and quantum number, orbital
[11th] Chap. 2: Symmetry on Lattice
[12th] Chap. 2: Diffraction and Structural factor
[13th] Chap. 2, Reciprocal space
[14th] Chap. 18: Electrical property and semiconductors
[15th] Chap. 19: Optical property and optics
[16th] Review (45min) & Periodic exam. (45min)

Self Preparation and Review

Review every time after the lecture and prepare for next lecture.

Related subjects

Textbook1	**Book title**	Materials Science and Engineering (9th Edition)			**ISBN**	978-1118319222
	Author	William D. Callister, Jr., David G. Rethwisch	**Publisher**	Wiley	**Publish year**	2014

Notes for textbook

It is desirable to purchase the textbook, but the textbook can also be lent, so please consult with the instructor.
The relating handouts will be given in the class.

Notes for reference

Goals to be achieved

(1) Understand the electronic state of electron
(2) Understand the symmetry of lattice and scattering
(3) Understand the electrical and optical property of materials.

Evaluation of achievement

Evaluation basis: Students who attend all classes will be evaluated as follows.
S: achieve all objectives and total marks of reports and exam. over 80.
A: achieve all objectives and total marks of reports and exam. over 80.
B: achieve 3 objectives and total marks of reports and exam. over 70.
C: achieve 3 objectives and total marks of reports and exam. over 60.

Examination

定期試験を実施（対面）
Examination(Face to Face)

Details of examination

Other information

Masanobu Izaki, D-505, m-izaki@me.tut.ac.jp

Reference URL

http://tf,metut,.ac.jp

Office hours

Please send e-mail in advance for appointment.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words

electron, quantum number, semiconductor, optics

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

Subject name[English]	Advanced Mechanical Systems Design II[Advanced Mechanical Systems Design II]				
Schedule number	M41630220	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Mon.4～4	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS53025				

Objectives of class

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

Contents of class

Follow instruction of supervisors.

Follow instruction of supervisors.

Self Preparation and Review

Follow instruction of supervisors.

Follow instruction of supervisors.

Related subjects

Follow instruction of supervisors.

Follow instruction of supervisors.

Notes for textbook

N/A

N/A

Notes for reference

N/A

N/A

Goals to be achieved

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.

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.

Evaluation of achievement

Coursework, presentation and/or report.

Grade levels are C(60% – less than 70%), B(70– less than 80%), A(80% – less than 90 %) and S(90% or over).

Coursework, presentation and/or report.

Grade levels are C(60% – less than 70%), B(70– less than 80%), A(80% – less than 90 %) and S(90% or over).

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

For any questions, contact your supervisor.

For any questions, contact your supervisor.

Reference URL

N/A

N/A

Office hours

Contact your supervisor.

Contact your supervisor.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words
Mechanical Systems Design
Mechanical Systems Design

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

Subject name[English]	Advanced Materials and Manufacturing Process II[Advanced Materials and Manufacturing Process II]				
Schedule number	M41630240	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.4～4	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS54025				

Objectives of class

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

Contents of class

Follow instruction of supervisors.

Follow instruction of supervisors.

Self Preparation and Review

Follow instruction of supervisors.

Follow instruction of supervisors.

Related subjects

Follow instruction of supervisors.

Follow instruction of supervisors.

Notes for textbook

N/A

N/A

Notes for reference

N/A

N/A

Goals to be achieved

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.

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.

Evaluation of achievement

Coursework, presentation and/or report.

Grade levels are C(60% - less than 70%), B(70- less than 80%), A(80% - less than 90 %) and S(90% or over).

Coursework, presentation and/or report.

Grade levels are C(60% - less than 70%), B(70- less than 80%), A(80% - less than 90 %) and S(90% or over).

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

For any questions, contact your supervisor.

For any questions, contact your supervisor.

Reference URL

N/A

N/A

Office hours

Contact your supervisor.
Contact your supervisor.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
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(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words
Materials, Manufacturing Process
Materials, Manufacturing Process

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

Subject name[English]	Advanced System, Control and Robotics II[Advanced System, Control and Robotics II]				
Schedule number	M41630260	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Thu.4～4	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS55025				

Objectives of class

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

Contents of class

Follow instruction of supervisors.

Follow instruction of supervisors.

Self Preparation and Review

Follow instruction of supervisors.

Follow instruction of supervisors.

Related subjects

Follow instruction of supervisors.

Follow instruction of supervisors.

Notes for textbook

N/A

N/A

Notes for reference

N/A

N/A

Goals to be achieved

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.

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.

Evaluation of achievement

Coursework, presentation and/or report.

Grade levels are C(60% – less than 70%), B(70– less than 80%), A(80% – less than 90 %) and S(90% or over).

Coursework, presentation and/or report.

Grade levels are C(60% – less than 70%), B(70– less than 80%), A(80% – less than 90 %) and S(90% or over).

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

For any questions, contact your supervisor.

For any questions, contact your supervisor.

Reference URL

N/A

N/A

Office hours

Contact your supervisor.

Contact your supervisor.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words

System, Control, Robotics
System, Control, Robotics

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

Subject name[English]	Advanced Energy and Environmental Engineering II[Advanced Energy and Environmental Engineering II]				
Schedule number	M41630280	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Fri.4～4	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_MAS56025				

Objectives of class

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

This lecture aims to provide a broad understanding of the mechanical systems design available for the master thesis research work of a student.

Contents of class

Follow instruction of supervisors.

Follow instruction of supervisors.

Self Preparation and Review

Follow instruction of supervisors.

Follow instruction of supervisors.

Related subjects

Follow instruction of supervisors.

Follow instruction of supervisors.

Notes for textbook

N/A

N/A

Notes for reference

N/A

N/A

Goals to be achieved

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.

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.

Evaluation of achievement

Coursework, presentation and/or report.

Grade levels are C(60% - less than 70%), B(70- less than 80%), A(80% - less than 90 %) and S(90% or over).

Coursework, presentation and/or report.

Grade levels are C(60% - less than 70%), B(70- less than 80%), A(80% - less than 90 %) and S(90% or over).

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

For any questions, contact your supervisor.

For any questions, contact your supervisor.

Reference URL

N/A

N/A

Office hours

Contact your supervisor.
Contact your supervisor.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words
Energy, Environment
Energy, Environment

(M41630340)Advances in Material Science and Manufacturing[Advances in Material Science and Manufacturing]

Subject name[English]	Advances in Material Science and Manufacturing[Advances in Material Science and Manufacturing]				
Schedule number	M41630340	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Fri.2～3	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	伊﨑　昌伸, 戸高　義一 IZAKI Masanobu, TODAKA Yoshikazu				
Numbering	MEC_MAS54025				

Objectives of class

Understand mechanical properties of structural materials, such as lattice defects, strength and fracture, from a microstructural perspective, and also chemical composition and heat treatment procedure of steels and non-ferrous materials including the mechanisms to control mechanical properties.

Understanding fundamental physics of solid materials, such as structure of atoms, electronic state of electron, bonding, symmetry of lattice, and scattering by electron, and the effects of the light and heat on the energy state and related physical properties, electrical and optical properties.

Contents of class

[01st] Chap. 1 ~ 4: Introduction of materials science and engineering, Crystal structures in metals and alloys
[02nd] Chap. 4: Crystal structures in metals and alloys
[03rd] Chap. 6: Imperfections in metals and alloys
[04th] Chap. 7: Diffusion in metals and alloys
[05th] Chap. 8, 9: Mechanical properties, Strengthening mechanisms in metals and alloys
[06th] Chap. 9, 10: Strengthening mechanisms, Failure in metals and alloys
[07th] Chap. 11, 12: Phase Diagrams, Phase transformations in metals and alloys
[08th] Review (45min) & Periodic exam. (45min)

[09th] Chap. 1 : Structure of atoms
[10th] Chap. 1: Electron and quantum number, orbital
[11th] Chap. 2: Symmetry on Lattice
[12th] Chap. 2: Diffraction and Structural factor
[13th] Chap. 2, Reciprocal space
[14th] Chap. 18: Electrical property and semiconductors
[15th] Chap. 19: Optical property and optics
[16th] Review (45min) & Periodic exam. (45min)

Self Preparation and Review

Review every time after the lecture and prepare for next lecture.

Related subjects

Textbook1	**Book title**	Materials Science and Engineering (9th Edition)			**ISBN**	978-1118319222
	Author	William D. Callister, Jr., David G. Rethwisch	**Publisher**	Wiley	**Publish year**	2014

Notes for textbook

It is desirable to purchase the textbook, but the textbook can also be lent, so please consult with the instructor.
The relating handouts will be given in the class.

It is desirable to purchase the textbook, but the textbook can also be lent, so please consult with the instructor.
The relating handouts will be given in the class.

Notes for reference

Goals to be achieved

(1) Understand the crystal structures and imperfections in metals and alloys.
(2) Understand the basics of mechanical properties and strengthening mechanisms of metals and alloys.
(3) Understand the failure in metals and alloys.
(4) Understand the phase diagrams and phase transformations in metals and alloys.

(1) Understand the electronic state of electron
(2) Understand the symmetry of lattice and scattering
(3) Understand the electrical and optical property of materials.

Evaluation of achievement

Evaluation means: Examination (60%), Quiz and Report (40%)
Evaluation basis: Students who attend all classes will be evaluated as follows.
S: achieve all objectives and total marks of reports and exam. over 80.
A: achieve all objectives and total marks of reports and exam. over 80.
B: achieve 3 objectives and total marks of reports and exam. over 70.
C: achieve 3 objectives and total marks of reports and exam. over 60.

Evaluation means: Examination (60%), Report (40%)
Evaluation basis: Students who attend all classes will be evaluated as follows.
S: achieve all objectives and total marks of reports and exam. over 80.
A: achieve all objectives and total marks of reports and exam. over 80.
B: achieve 3 objectives and total marks of reports and exam. over 70.
C: achieve 3 objectives and total marks of reports and exam. over 60.

Examination

定期試験を実施（対面）
Examination(Face to Face)

Details of examination

Other information

D-603, ext.6704, todaka@me.tut.ac.jp
D-505, ext.6694,m-izaki@me.tut.ac.jp

Reference URL

http://martens.me.tut.ac.jp/
http://tf,metut,.ac.jp

Office hours

Please send e-mail in advance for appointment.
Please send e-mail in advance for appointment.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words

metal / alloy, crystal structure, microstructure, lattice defect, strengthening mechanism, phase transformation, electron, quantum number, semiconductor, optics

(M41630430)Microstructure and Properties of Structural Materials[Microstructure and Properties of Structural Materials]

Subject name[English]	Microstructure and Properties of Structural Materials[Microstructure and Properties of Structural Materials]				
Schedule number	M41630430	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Fri.3～3	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	戸高　義一 TODAKA Yoshikazu				
Numbering	MEC_MAS54025				

Objectives of class

Understand mechanical properties of structural materials, such as lattice defects, strength and fracture, from a microstructural perspective, and also chemical composition and heat treatment procedure of steels and non-ferrous materials including the mechanisms to control mechanical properties.

Contents of class

[01st] Chap. 1 ~ 4: Introduction of materials science and engineering, Crystal structures in metals and alloys
[02nd] Chap. 4: Crystal structures in metals and alloys
[03rd] Chap. 6: Imperfections in metals and alloys
[04th] Chap. 7: Diffusion in metals and alloys
[05th] Chap. 8, 9: Mechanical properties, Strengthening mechanisms in metals and alloys
[06th] Chap. 9, 10: Strengthening mechanisms, Failure in metals and alloys
[07th] Chap. 11, 12: Phase Diagrams, Phase transformations in metals and alloys
[08th] Review (45min) & Periodic exam. (45min)

Self Preparation and Review

Review every time after the lecture and prepare for next lecture.

Related subjects

N/A

Textbook1	**Book title**	Materials Science and Engineering (9th Edition)			**ISBN**	978-1118319222
	Author	William D. Callister, Jr., David G. Rethwisch	**Publisher**	Wiley	**Publish year**	2014

Notes for textbook

It is desirable to purchase the textbook, but the textbook can also be lent, so please consult with the instructor.
The relating handouts will be given in the class.

Notes for reference

N/A

Goals to be achieved

(1) Understand the crystal structures and imperfections in metals and alloys.
(2) Understand the basics of mechanical properties and strengthening mechanisms of metals and alloys.
(3) Understand the failure in metals and alloys.
(4) Understand the phase diagrams and phase transformations in metals and alloys.

Evaluation of achievement

Evaluation means: Examination (60%), Quiz and Report (40%)
Evaluation basis: Students who attend all classes will be evaluated as follows.
S: achieve all objectives and total marks of reports and exam. over 80.
A: achieve all objectives and total marks of reports and exam. over 80.
B: achieve 3 objectives and total marks of reports and exam. over 70.
C: achieve 3 objectives and total marks of reports and exam. over 60.

Examination

定期試験を実施（対面）
Examination(Face to Face)

Details of examination

N/A

Other information

D-603, ext.6704, todaka@me.tut.ac.jp

Reference URL

http://martens.me.tut.ac.jp/

Office hours

Please send e-mail in advance for appointment.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(D)グローバルに活躍できるコミュニケーション力
グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で，自らの考えや成果を効果的に表現するコミュニケーション力を身につけている。
(D1)論文，口頭及び情報メディアを通じて，自分の論点や考えなどを国の内外において効果的に表現・発信し，コミュニケーションする能力を身につけている。
(D2)チーム内の個々の要員の価値観を互いに尊重するとともに，協調して，チームとしての目標達成に寄与できる高い能力を身につけている。
(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high skills to mutually respect the values of individual team members; and to contribute to the team's achievements through working cooperatively with other team members
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

metal / alloy, crystal structure, microstructure, lattice defect, strengthening mechanism, phase transformation

(M41630440)Precision Mechatronics[Precision Mechatronics]

Subject name[English]	Precision Mechatronics[Precision Mechatronics]				
Schedule number	M41630440	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Thu.2～2	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	佐藤　海二 SATO Kaiji				
Numbering	MEC_MAS55025				

Objectives of class

本講義を履修することによって，以下の能力を修得する.

1)精密／超精密運動のための機構の基礎知識を身につけ，その精度劣化要因を理解できる.

2)精密／超精密運動のためのセンサの基本原理や制御方法の性質を理解し，適切に選択する ことができる.

Students will acquire the following skills by taking this course.
1) Learn basic knowledge of machines for precision and ultra-precision motions, and gain an understanding of precision deterioration factors.
2) Gain an understanding of basic principles of sensors and properties of control methods for precision and ultra-precision motions, and be able to choose appropriately.

Contents of class

1 週目:精密機械基礎
2 週目:精密・超精密機構の構成と特性(動作範囲が狭い機構)
3 週目:精密・超精密機構の構成と特性(動作範囲が広い機構)
4 週目:精密・超精密機械システムのための測定技術
5 週目:精密・超精密機械システムのための制御技術
6 週目:事例＜1＞ 露光装置 － 役割と性能・構成の変遷 －
7 週目:事例＜2＞ 三次元測定機 － 役割と特徴 －
8 週目:まとめ(45 分)

1st week Introduction
2nd week Design of precision/ultra-precision mechanisms with a short working range
3rd week Design of precision/ultra-precision mechanisms with a long working range
4th week Measurement techniques for precision/ultra-precision motion systems
5th week Control techniques for precision/ultra-precision motion systems
6th week Case study Exposure tools - Aim and transition of performance and configuration
7th week Case study Coordinate measuring machine - Aim and features
8th week Summery of this course (45 min.)

Self Preparation and Review

毎回の講義内容を復習するとともに，次回の内容についてテキスト等を参考に予習してくること.
本講義に関連する書籍，文献，展示会を，自分で調べ情報の収集と理解に努めること.
Students are required to prepare for and review each lecture contents based on handouts provided.
Students are required to make an effort to collect and understand the information and the knowledge from texts, literature and exhibitions regarding this lecture themselves.

Related subjects

メカトロニクス，制御工学．計測工学，機械設計，機械要素
Mechatronics Control Engineering, Measurement and Instrumentation, Machine Design, Mechanical Elements

Notes for textbook

教科書:特定の教科書は使用しない．講義資料を用意するので，各自講義に持参すること.
No textbook is required for this class.

Reference1	**Book title**	Precision machine design			**ISBN**	0-13-690918-3
	Author	Alexander H. Slocum	**Publisher**	Prentice Hall	**Publish year**	1992
Reference2	**Book title**	Foundations of Ultraprecision Mechanism Design			**ISBN**	2-88449-001-9
	Author	S.T.Smith, D.G. Chetwynd	**Publisher**	Gorden and Breach Science Publishers	**Publish year**	1992
Reference3	**Book title**	ナノテクノロジーと超精密位置決め技術			**ISBN**	4-7693-2175-9
	Author	大塚二郎著	**Publisher**	工業調査会	**Publish year**	2005

Notes for reference
N/A

Goals to be achieved
1)精密メカトロニクスの機構やアクチュエータについての基本的な特徴を理解する.
2)精密メカトロニクスのセンサについての基本的な特徴を理解する.
3)精密メカトロニクスの制御技術ついての基本的な特徴を理解する.

1) To understand the fundamental features of mechanisms and actuators for precision mechatronic system.
2) To understand the fundamental features of sensors for precision mechatronic system
3) To understand the the fundamental features of control techniques for precision mechatronic system

Evaluation of achievement
評価方法:毎回の演習・小テスト(50%), レポート(50%)で評価する.

The final grade will be determined by quizzes during lecture 50% and report 50%, comprehensively.

Examination
レポートで実施
By Report

Details of examination
N/A

Other information
Kaiji Sato, Room:D-408, E-mail:sato@me.tut.ac.jp

Reference URL
N/A

Office hours
事前にメールで確認
Need an appointment by e-mail

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し, それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し, それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により, 研究開発に対する方法論を体得して, 研究開発の計画を立案および実践し, 課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words

運動誤差，精密機構，超精密機構，機構設計，案内，軸受，動力伝達要素，アクチュエータ，計測，センサ，制御，超精密加工機，露光装置，三次元測定機
Motion error, precision mechanism, ultra-precision mechanism, mechanism design, guide, bearing, power transmission, actuator, measurement, sensor, control, ultra-precision machine tool, exposure tool, coordinate measuring machine

(M41630460)Advances in Systems, Control and Robotics[Advances in Systems, Control and Robotics]

Subject name[English]	Advances in Systems, Control and Robotics[Advances in Systems, Control and Robotics]				
Schedule number	M41630460	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Thu.2～2,Fri.2～2	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	佐藤　海二, 内山　直樹 SATO Kaiji, UCHIYAMA Naoki				
Numbering	MEC_MAS55025				

Objectives of class

Students will acquire the following skills by taking this course.
1) Learn basic knowledge of machines for precision and ultra-precision motions, and gain an understanding of precision deterioration factors.
2) Gain an understanding of basic principles of sensors and properties of control methods for precision and ultra-precision motions, and be able to choose appropriately.
3) Learn typical mathematical programming approaches that optimize objective functions under constraints.

Contents of class

Lectures provided by Prof. Sato:
1st week Introduction
2nd week Design of precision/ultra-precision mechanisms with a short working range
3rd week Design of precision/ultra-precision mechanisms with a long working range
4th week Measurement techniques for precision/ultra-precision motion systems
5th week Control techniques for precision/ultra-precision motion systems
6th week Case study Exposure tools – Aim and transition of performance and configuration
7th week Case study Coordinate measuring machine – Aim and features
8th week Summery of this course (45 min.)

Lectures provided by Prof. Uchiyama:
1st week: Fundamentals of mathematical programming
2nd week: Fundamentals of linear programming
3rd week: Algorithm of linear programming I
4th week: Algorithm of linear programming II
5th week: Fundamentals of nonlinear programming
6th week: Algorithm of linear programming I
7th week: Algorithm of nonlinear programming II
8th week: Summary (45min) and final examination (45min)

Self Preparation and Review

Students are required to prepare for and review each lecture contents based on handouts provided.
Students are required to make an effort to collect and understand the information and the knowledge from texts, literature and exhibitions regarding this lecture themselves.

Related subjects

Mechatronics Control Engineering, Measurement and Instrumentation, Machine Design, Mechanical Elements, Calculus, Linear algebra

Notes for textbook

No textbook is required for this class.

Reference1	**Book title**	Precision machine design			**ISBN**	0-13-690918-3
	Author	Alexander H. Slocum	**Publisher**	Prentice Hall	**Publish year**	1992
Reference2	**Book title**	Foundations of ultraprecision mechanism design			**ISBN**	2-88449-

						001-9
	Author	S.T. Smith and D.G. Chetwynd	**Publisher**	Gordon and Breach Science Publishers	**Publish year**	1992

Notes for reference

N/A

Goals to be achieved

1) To understand the fundamental features of mechanisms and actuators for precision mechatronic system.
2) To understand the fundamental features of sensors for precision mechatronic system
3) To understand the the fundamental features of control techniques for precision mechatronic system
4) Expected to understand fundamentals of mathematical programming
5) Expected to understand fundamentals of linear programming
6) Expected to understand fundamentals of nonlinear programming

Evaluation of achievement

Lectures provided by Prof. Sato
The final grade will be determined by quizzes during lecture 50% and report 50%, comprehensively.

Lectures provided by Prof. Uchiyama
The grade will be determined by the end-of term examination score only (100 %).

Final grade will be the average of the above two grades.

The credit of this course is given if the score of the above examination is 60% or over.
Grade levels are C (60% – less than 70%), B (70 – less than 80%), A (80 – less than 90%) and S (90% or over).

Examination

その他
Other

Details of examination

N/A

Other information

Naoki Uchiyama, Room:D-406, E-mail:uchiyama@tut.jp
Kaiji Sato, Room:D-408, E-mail:sato@me.tut.ac.jp

Reference URL

N/A

Office hours

Need an appointment by e-mail

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
機械工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1)機械工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2)機械工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about mechanical engineering and related fields and have the practical and creative skills to utilize such knowledge forproblem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about mechanical engineering and related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about mechanical engineering and related fields; to make plans for research and development and put them intopractice; and to create new technologies to solve problems

Key words

Motion error, precision mechanism, ultra-precision mechanism, mechanism design, guide, bearing, power transmission, actuator, measurement, sensor, control, ultra-precision machine tool, exposure tool, coordinate measuring machine, mathematical programming, linear programming, nonlinear programming

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

Subject name[English]	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]				
Schedule number	M42610020	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	S2系教務委員, 2系各教員 2kei kyomu Iin-S, 2kei kakukyouin				
Numbering	ELC_MAS51025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Reference and material will be available from the supervisor.

Notes for reference

Goals to be achieved

To get something new on individual research fields.
To develop his/her research skill including the planning and the presentation.

Evaluation of achievement

Presentation, Thesis, Coursework, and Outcomes are evaluated generally.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]				
Schedule number	M42610020	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S2系教務委員, 2系各教員 2kei kyomu Iin-S, 2kei kakukyouin				
Numbering	ELC_MAS51025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Reference and material will be available from the supervisor.

Notes for reference

Goals to be achieved

To get something new on individual research fields.
To develop his/her research skill including the planning and the presentation.

Evaluation of achievement

Presentation, Thesis, Coursework, and Outcomes are evaluated generally.
Grades: S: 90-100, A:80-89, B:70-79, C:60-69

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; have the ability to set, solve and evaluate technical issues in society
(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team members; to contribute to the team's achievements through working cooperatively with other members
(E) Inquisitive mind and continuous learning ability for changes in the state-of-the-art technology and in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on Electrical and Electronic Information Engineering]				
Schedule number	M4261002T	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～2
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S2系教務委員, 2系各教員 2kei kyomu Iin-S, 2kei kakukyouin				
Numbering	ELC_MAS51025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Reference and material will be available from the supervisor.

Notes for reference

Goals to be achieved

To get something new on individual research fields.
To develop his/her research skill including the planning and the presentation.

Evaluation of achievement

Presentation, Thesis, Coursework, and Outcomes are evaluated generally.
Grades: S: 90-100, A:80-89, B:70-79, C:60-69

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; have the ability to set, solve and evaluate technical issues in society
(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical

and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team members; to contribute to the team's achievements through working cooperatively with other members
(E) Inquisitive mind and continuous learning ability for changes in the state-of-the-art technology and in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering[Seminar on Electrical and Electronic Information Engineering]				
Schedule number	M42610040	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_MAS51015				

Objectives of class

The seminar aims to provide a broad understanding of theoretical and experimental approoches related to the electrical and electronic information engineering for the research work of his/her master thesis.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Textbook or material will be made available from the supervisor. To be announced by individual supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

Coursework, presentation and/or report.
Grades: S: 90-100, A:80-89, B:70-79, C:60-69

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; have the ability to set, solve and evaluate technical issues in society

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team members; to contribute to the team's achievements through working cooperatively with other members
(E) Inquisitive mind and continuous learning ability for changes in the state-of-the-art technology and in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering 1A[Seminar on Electrical and Electronic Information Engineering 1A]				
Schedule number	M42610050	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	4
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_MAS51015				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Textbook or material will be made available from the supervisor. To be announced by individual supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

Coursework, presentation and/or report.
Grades: S: 90-100, A:80-89, B:70-79, C:60-69

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; have the ability to set, solve and evaluate technical issues in society
(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner

(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team members; to contribute to the team's achievements through working cooperatively with other members
(E) Inquisitive mind and continuous learning ability for changes in the state-of-the-art technology and in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering 1B[Seminar on Electrical and Electronic Information Engineering 1B]				
Schedule number	M42610060	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_MAS51015				

Objectives of class

The seminar aims to provide a broad understanding of theoretical and experimental approoches related to the electrical and electronic information engineering for the research work of his/her master thesis.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Textbook or material will be made available from the supervisor. To be announced by individual supervisors.

Notes for reference

Goals to be achieved

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.

Evaluation of achievement

Coursework, presentation and/or report.
Grades: S: 90-100, A:80-89, B:70-79, C:60-69

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(B) Sound ethics and social awareness as advanced-level engineers and researchers
Be conscious of specialized and ethical responsibilities as advanced-level engineers and researchers; have the ability to set, solve and evaluate technical issues in society
(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
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(E) Inquisitive mind and continuous learning ability for changes in the state-of-the-art technology and in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Methodology of R & D 2[Methodology of R & D 2]				
Schedule number	M42630110	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.3～3	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_MAS58025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

N/A

Notes for textbook

To acquire the ability of identifying and formulating research problem, planning and implementing specific research tasks, troubleshooting and communicating outcomes.

Notes for reference

N/A

Goals to be achieved

To acquire the ability of identifying and formulating research problem, planning and implementing specific research tasks, troubleshooting and communicating outcomes.

Evaluation of achievement

Coursework and presentation are evaluated generally.
Grades: S: 90-100, A:80-89, B:70-79, C:60-69.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

N/A

Other information

N/A

Reference URL

N/A

Office hours

N/A

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
電気・電子情報工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 電気・電子情報工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 電気・電子情報工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills toutilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for researchand development and put them into practice; and to create new technologies to solve problems

Key words

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

Subject name[English]	Physics for Electronics 1[Physics for Electronics 1]				
Schedule number	M42630140	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Wed.3～3	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	松田 厚範, 服部 敏明, 加藤 亮 MATSUDA Atsunori, HATTORI Toshiaki, KATOH Ryo				
Numbering	ELC_MAS52025				

Objectives of class

Objectives of this subject are to understand the fundamental aspects on functional materials, and electrodic, and also to have overall knowledge on the latest technologies on these physical phenomena.

Contents of class

"Physics for Electronics 1" is composed of topics of functional materials, photonics, and electrodics, which will be delivered by the 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 category of "electrodics" 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.

Self Preparation and Review

Students must perform their preparation and review of this subject based on the course materials with following the instruction of the teachers.

Related subjects

Physics for Electronics, Analysis of Inorganic Materials, Advanced Materials for Electronics, Functional Materials for Optical Applications,

Textbook1	**Book title**	Physical Chemistry			**ISBN**	0198700725
	Author	Atkins	**Publisher**	Oxford University Press	**Publish year**	200
Textbook2	**Book title**	Inorganic Chemistry			**ISBN**	0199264635
	Author	Shriver	**Publisher**	Oxford University Press	**Publish year**	2006

Notes for textbook

None

Notes for reference

N/A

Goals to be achieved

(1) To understand fundamental aspects on functional materials, photonics, electrodics and spin electronics.
(2) To get the knowledge on the latest technologies on these physical phenomena.

Evaluation of achievement

The final evaluation will be the sum of two categories (50%); functional materials and electrodics.

Examination

試験期間中には何も行わない

None during exam period

Details of examination

Taking examination and submission of report will be explained and required by the teachers during their classes.

Other information

Functional materials; Atsunori Matuda

Electrodics; Toshiaki Hattori and Ryo Kato

Reference URL

http://www.ee.tut.ac.jp/material

Office hours

one hour after every classes

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力

電気・電子情報工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。

(C1) 電気・電子情報工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C2) 電気・電子情報工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills toutilize such knowledge for problem solving in an integrated manner

(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner

(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for researchand development and put them into practice; and to create new technologies to solve problems

Key words

functional materials, ionics, micro-optics, electrodics

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

Subject name[English]	Electrical Technology and Materials 1[Electrical Technology and Materials 1]				
Schedule number	M42630180	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.2～2	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	未定, 稲田 亮史, 村上 義信 To be assigned, INADA Ryoji, MURAKAMI Yoshinobu				
Numbering	ELC_MAS53025				

Objectives of class

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 subcourses to choose from.

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 subcourses to choose from.

Contents of class

Subcourse 1 (Y. Suda)
1. Introduction of carbon nanomaterials and their relationship to electrical engineering
2. Mechanical property of carbon nanomaterials
3. Electrical property of carbon nanomaterials
4. Application of carbon nanomaterials to energy devices
5. Application of carbon nanomaterials to power electronics

Subcourse 2 (R. Inada)
1. Introduction of Electrochemical Energy Conversion Devices
2. Fundamentals of Electrochemical Energy Conversion Devices
3. Lithium-Ion Secondary Batteries (1)
4. Lithium-Ion Secondary Batteries (2)
5. Recent Trend in Electrochemical Energy Conversion Devices

Subcourse 3 (Yo. Murakami)
1. Introduction of Electric Energy Systems (1 week)
2. High Voltage Engineering and Electrical Insulation (2 weeks)
3. Fundamental Properties of Dielectrics and Electrical Insulating Materials(2 weeks)

Subcourse 1 (Y. Suda)
1. Introduction of carbon nanomaterials and their relationship to electrical engineering
2. Mechanical property of carbon nanomaterials
3. Electrical property of carbon nanomaterials
4. Application of carbon nanomaterials to energy devices
5. Application of carbon nanomaterials to power electronics

Subcourse 2(R. Inada)
1. Introduction of Electrochemical Energy Conversion Devices
2. Fundamentals of Electrochemical Energy Conversion Devices
3. Lithium-Ion Secondary Batteries (1)
4. Lithium-Ion Secondary Batteries (2)
5. Recent Trend in Electrochemical Energy Conversion Devices

Subcourse 3 (Yo. Murakami)
1. Introduction of Electric Energy Systems (1 week)
2. High Voltage Engineering and Electrical Insulation (2 weeks)

3. Fundamental Properties of Dielectrics and Electrical Insulating Materials(2 weeks)

Self Preparation and Review

Materials to be used in the lecture will be distributed from the lecturer before starting each subcourse. The lecturers will give a lecture on the premise that all the students have prepared this material before the lecture begins. It may not be possible to attend a lecture if you do not prepare materials.

Materials to be used in the lecture will be distributed from the lecturer before starting each subcourse. The lecturers will give a lecture on the premise that all the students have prepared this material before the lecture begins. It may not be possible to attend a lecture if you do not prepare materials.

Related subjects

Basic electrical power engineering course is prerequisite.

Basic electrical power engineering course is prerequisite.

Notes for textbook

Materials will be prepared by the lecturer.

Materials will be prepared by the lecturer.

Reference1	**Book title**	Fuel Cell Systems Explained			**ISBN**	
	Author	J. Larminie and A. Dicks	**Publisher**	Wiley	**Publish year**	
Reference2	**Book title**	Lithium Ion Batteries: Science and Technologies			**ISBN**	
	Author	M. Yoshio, R.J. Brodd and A. Kozawa	**Publisher**	Springer-Verlag	**Publish year**	
Reference3	**Book title**	High Voltage Engineering			**ISBN**	
	Author	E. Kuffel, W. Zaengel and J. Kuffel	**Publisher**	Newnes	**Publish year**	

Notes for reference

Goals to be achieved

Evaluation of achievement

In final exams we will ask questions on the contents of all subcourses. We evaluate the results only based on the final exam scores. The result is evaluated in the following five stages.
S: If the score of the final exam is 90 points or more
A: If the score of the final exam is 80 points or more
B: If the score of the final exam is 70 points or more
C: If the score of the final exam is 60 points or more
D: If the score of the final exam is less than 60 points

In final exams we will ask questions on the contents of all subcourses. We evaluate the results only based on the final exam scores. The result is evaluated in the following five stages.
S: If the score of the final exam is 90 points or more
A: If the score of the final exam is 80 points or more
B: If the score of the final exam is 70 points or more
C: If the score of the final exam is 60 points or more
D: If the score of the final exam is less than 60 points

Examination

定期試験を実施（対面）
Examination(Face to Face)

Details of examination

In order to obtain good results in final exams, we will also conduct a small test at any time while each subcourse is offered. Therefore, it is desirable to prepare lecture materials beforehand and attend all the lectures.

In order to obtain good results in final exams, we will also conduct a small test at any time while each subcourse is offered. Therefore, it is desirable to prepare lecture materials beforehand and attend all the lectures.

Other information

Reference URL

Office hours

We do not have an office hour, so contact first by e-mail.

We do not have an office hour, so contact first by e-mail.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
電気・電子情報工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
（C1） 電気・電子情報工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
（C2） 電気・電子情報工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills toutilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about electrical and electronic information engineering as well as related fields; to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about electrical and electronic information engineering as well as related fields; to make plans for researchand development and put them into practice; and to create new technologies to solve problems

Key words

(M42630220)LSI Process 1[LSI Process 1]

Subject name[English]	LSI Process 1[LSI Process 1]				
Schedule number	M42630220	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Thu.2～2	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	澤田　和明, 石川　靖彦, 関口　寛人, 髙橋　一浩 SAWADA Kazuaki, ISHIKAWA Yasuhiko, SEKIGUCHI Hiroto, TAKAHASHI Kazuhiro				
Numbering	ELC_MAS54025				

Objectives of class
From the viewpoint of deep understanding of LSI processes, semiconductors devices including material desgin and an example of latest device will be lectured.

Contents of class
Integrated circuits
Device processing
MEMS/NEMS
Latest MOS FETs
Current topics in IC/MEMS

Self Preparation and Review
Review each lecture and prepare for the next class with reference to the textbook.

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

Semiconductor Physics, Master course

Notes for textbook
Physics of Semiconducotr Devices
S.M.Sze, Willy

Notes for reference
N/A

Goals to be achieved
(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.

Evaluation of achievement
routine exeam(100%)

Examination
その他
Other

Details of examination
N/A

Other information
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

Reference URL
http://www.tut.ac.jp/english/introduction/02EE.pdf
(department)

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

(devision)

http://www.tut.ac.jp/english/research/research_highlights.html
(research activities)

Office hours

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

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
電気・電子情報工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 電気・電子情報工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 電気・電子情報工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

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Key words

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

Subject name[English]	Information and Communication Technology 1[Information and Communication Technology 1]				
Schedule number	M42630240	**Subject area**	Advanced Electrical and Electronic Information Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Mon.3～3	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	大平 孝, 上原 秀幸, 竹内 啓悟 OHIRA Takashi, UEHARA Hideyuki, TAKEUCHI Keigo				
Numbering	ELC_MAS55025				

Objectives of class

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.

Contents of class

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

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the black board.

Related subjects

Students who register for this lecture must pass an interview by the professors to check that they satisfy the prerequisites below:

Prerequisite of Course 1:
Deep understanding on electromagnetic field theory, linear passive and reciprocal circuit theory, and sophisticated experience on complex and matrix mathematics.

Prerequisite of Course 2:
Sufficient knowledge about the following; wireless digital modulation and demodulation, radio propagation characteristic, signal processing, probability, random variables and stochastic process.

Prerequisite of Course 3:
Deep understanding on modulation/demodulation, signal processing, probability theory, and information theory is prerequisite. In particular, sufficient knowledge about probability theory is required.

Notes for textbook

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

N/A

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

定期試験を実施(対面)

Examination(Face to Face)

Details of examination

N/A

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

(C)高度な知識を統合的に活用できる実践力・創造力
電気・電子情報工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 電気・電子情報工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 電気・電子情報工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

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development and put them into practice; and to create new technologies to solve problems

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]

Subject name[English]	Seminar on Computer Science and Engineering I[Seminar on Computer Science and Engineering I]				
Schedule number	M43610010	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	4
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S3系教務委員 3kei kyomu Iin-S				
Numbering	CMP_MAS51015				

Objectives of class

各研究室が指定する情報学に関する最先端の技術情報(特に英語による最先端の技術情報)を発見する能力、ならびに、その技術情報を理解、説明、質疑・応答できる能力を養う。

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.

Contents of class

教員が指定する最先端の技術情報(特に英語による最先端の技術情報)について理解したところを説明する。

教員は技術情報の内容の発見、理解、説明、質疑・応答する方法について直接指導を行う。

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.

Self Preparation and Review

教員が指定する内容に関し、予習・復習を行う。

Consult with your advisor.

Related subjects

指導教員に問い合わせること。

Consult with your advisor.

Notes for textbook

指導教員に問い合わせること。

Consult with your advisor.

Notes for reference

Goals to be achieved

(1)最先端の専門分野の英文が理解でき、わかりやすく説明できる。

(2)技術的な情報を扱う英文が解釈でき、作文できる。

(3)論文の標準的な構成ができる。

(4)発表というスタイルでの情報提供ができる。

(5)情報の不足を質問という形式で指摘できる。

(1) To understand English literature on state-of-the-art areas of expertise, and to explain clearly.

(2) To interpret technical information written in English, and to write such information in English.

(3) To make a standard construction of a technical paper.

(4) To provide information by oral presentation.

(5) To point out the lack of information by questions.

Evaluation of achievement

技術情報の発見に向けた自主性、技術情報の理解度、説明の方法、質問への回答、議論への参加の様子等から総合的に指導教員が判定する。

Will be evaluated by taking into accout various factors overall, such as technical explanation, question answering, discussion involvements and so on.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

課題レポートやプレゼンテーションに基づいて評価する。
Your supervisor will evaluate your presentation and your reports.

Other information

Reference URL

Office hours

指導教員に問い合わせること。
Consult with your advisor.

Relations to attainment objectives of learning and education

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about computer science and engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems

Key words

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

Subject name[English]	Seminar on Computer Science and Engineering II[Seminar on Computer Science and Engineering II]				
Schedule number	M43610020	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Computer Science and Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	S3系教務委員 3kei kyomu Iin-S				
Numbering	CMP_MAS61015				

Objectives of class

各研究室が指定する情報学に関する最先端の技術情報(特に英語による最先端の技術情報)を発見する能力、ならびに、その技術情報を理解、説明、質疑・応答できる能力を養う。

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.

Contents of class

教員が指定する最先端の技術情報(特に英語による最先端の技術情報)について理解したところを説明する。

教員は技術情報の内容の発見、理解、説明、質疑・応答する方法について直接指導を行う。

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.

Self Preparation and Review

教員が指定する内容に関し、予習・復習を行う。

Consult with your advisor.

Related subjects

指導教員に問い合わせること。

Consult with your advisor.

Notes for textbook

授業にて指定する。

Consult with your advisor.

Notes for reference

Goals to be achieved

(1)最先端の専門分野の英文が理解でき、わかりやすく説明できる。
(2)技術的な情報を扱う英文が解釈でき、作文できる。
(3)論文の標準的な構成ができる。
(4)発表というスタイルでの情報提供ができる。
(5)情報の不足を質問という形式で指摘できる。

(1) To understand English literature on state-of-the-art areas of expertise, and to explain clearly.
(2) To interpret technical information written in English, and to write such information in English.
(3) To make a standard construction of a technical paper.
(4) To provide information by oral presentation.
(5) To point out the lack of information by questions.

Evaluation of achievement

技術情報の発見に向けた自主性、技術情報の理解度、説明の方法、質問への回答、議論への参加の様子等から総合的に指導教員が判定する。

Will be evaluated by taking into accout various factors overall, such as technical explanation, question answering, discussion involvements and so on.

Examination
試験期間中には何も行わない
None during exam period

Details of examination
試験期間中には何も行わない
Non during exam period

Other information
指導教員に問い合わせること。
Consult with your advisor.

Reference URL

Office hours
指導教員に問い合わせること。
Consult with your advisor.

Relations to attainment objectives of learning and education

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about computer science and engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems

Key words

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

Subject name[English]	Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]				
Schedule number	M43610030	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S3系教務委員，3系各教員，S3系教務委員－23kei kyomu Iin-S, 3kei kakukyouin, 3kei kyomu Iin-S2				
Numbering	CMP_MAS61015				

Objectives of class

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.
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.

Contents of class

It is usually the case that thesis research is carried out on individual bases with specific contents differing from one student to another.
Consult with your advisor for any further details.

Self Preparation and Review

Consult with your advisor for them.

Related subjects

Consult with your advisor for them.

Notes for textbook

Consult with your advisor for them.

Notes for reference

Goals to be achieved

To acquire abilities for doing research and development at technically high level, sophisticated decision making, and leading large scale research projects.

Evaluation of achievement

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.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]				
Schedule number	M43610030	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Computer Science and Engineering			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S3系教務委員, 3系各教員 3kei kyomu Iin-S, 3kei kakukyouin				
Numbering	CMP_MAS61015				

Objectives of class

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.
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Contents of class

It is usually the case that thesis research is carried out on individual bases with specific contents differing from one student to another.
Consult with your advisor for any further details.

Self Preparation and Review

Consult with your advisor for them.

Related subjects

Consult with your advisor for them.

Notes for textbook

Consult with your advisor for them.

Notes for reference

Goals to be achieved

To acquire abilities for doing research and development at technically high level, sophisticated decision making, and leading large scale research projects.

Evaluation of achievement

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.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team members; and to contribute to the team's achievements through working cooperatively with other team members

Key words

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

Subject name[English]	Thesis Research on Computer Science and Engineering[Thesis Research on Computer Science and Engineering]				
Schedule number	M4361003T	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～2
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S3系教務委員, 3系各教員 3kei kyomu Iin-S, 3kei kakukyouin				
Numbering	CMP_MAS61015				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Related subjects

Consult with your advisor.

Notes for textbook

Consult with your advisor.

Notes for reference

Goals to be achieved

To acquire abilities for technical readings in English, logical thinking/explanation, and clear presentation.

Evaluation of achievement

Will be evaluated by taking into accout various factors overall, such as technical explanation, question answering, discussion involvements and so on.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad

through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team members; and to contribute to the team's achievements through working cooperatively with other team members

Key words

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

Subject name[English]	Seminar on Computer Science and Engineering[Seminar on Computer Science and Engineering]				
Schedule number	M43610040	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S3系教務委員 3kei kyomu Iin-S				
Numbering	CMP_MAS61015				

Objectives of class

各研究室が指定する情報学に関する最先端の技術情報(特に英語による最先端の技術情報)を発見する能力、ならびに、その技術情報を理解、説明、質疑・応答できる能力を養う。

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.

Contents of class

教員が指定する最先端の技術情報(特に英語による最先端の技術情報)について理解したところを説明する。

教員は技術情報の内容の発見、理解、説明、質疑・応答する方法について直接指導を行う。

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.

Self Preparation and Review

教員が指定する内容に関し、予習・復習を行う。

Consult with your advisor.

Related subjects

指導教員に問い合わせること。

Consult with your advisor.

Notes for textbook

指導教員に問い合わせること。

Consult with your advisor.

Notes for reference

Goals to be achieved

(1)最先端の専門分野の英文が理解でき、わかりやすく説明できる。

(2)技術的な情報を扱う英文が解釈でき、作文できる。

(3)論文の標準的な構成ができる。

(4)発表というスタイルでの情報提供ができる。

(5)情報の不足を質問という形式で指摘できる。

(1) To understand English literature on state-of-the-art areas of expertise, and to explain clearly.

(2) To interpret technical information written in English, and to write such information in English.

(3) To make a standard construction of a technical paper.

(4) To provide information by oral presentation.

(5) To point out the lack of information by questions.

Evaluation of achievement

技術情報の発見に向けた自主性、技術情報の理解度、説明の方法、質問への回答、議論への参加の様子等から総合的に指導教員が判定する。

Will be evaluated by taking into accout various factors overall, such as technical explanation, question answering, discussion involvements and so on.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

課題レポートやプレゼンテーションに基づいて評価する。
Your supervisor will evaluate your presentation and your reports.

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about computer science and engineering as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems

Key words

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

Subject name[English]	Web Data Engineering 1[Web Data Engineering 1]				
Schedule number	M43630280	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Mon.1～1	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	青野　雅樹 AONO Masaki				
Numbering	CMP_MAS52425				

Objectives of class

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。
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。

Day by day, a massive amount of data has been generated, accumulated, and updated on the Internet, where data include texts, images, sounds, movies, 2D/3D shapes, numeric values, and their composites. Extracting important pieces of information is crucial in many Closed/Open Web applications. The objectives of this lecture is to demonstrate the state-of-the art technologies in data science ranging from data representation, data mining, text mining, natural language processing, information retrieval, information extraction, machine learning (including both unsupervised and supervised learning with/without deep learning frameworks), based on fundamental data science technologies.

Contents of class

(1)はじめに(データ表現を含むデータ科学の基礎)
(2)統計と基礎機械学習技術
(3)情報検索(検索、類似性、言語モデル、次元削減、評価)
(4)Web リンク解析とコンテンツマイニングを含む Web マイニング
(5)教師なし学習(クラスタリング)、評価
(6)教師あり学習(回帰、分類)、評価
(7)マルチメディアの特徴抽出、検索、分類、ディープラーニング入門
(8)最終試験
(1) Introduction (Basics of Data Science including Data Representation)
(2) Statistics and Basic Machine Learning Technologies
(3) Information Retrieval (Search, Similarity, Language Model, Dimensional Reduction, Evaluations)
(4) Web Mining including Web Link Analysis and Content Mining
(5) Unsupervised Learning (Clustering), Evaluations
(6) Supervised Learning (Regression, Classification), Evaluations
(7) Multimedia Feature Extraction, Search, Classification, and Introduction to Deep Learning
(8) Final Exam

Self Preparation and Review

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。
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.

Related subjects

N/A

Notes for textbook

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 availlable at http://www.kde.cs.tut.ac.jp/~aono/myLecture.html.

Reference1	**Book title**	Information Retrieval, Implementing and Evaluating Search Engines			**ISBN**	978-0-262-02651-2
	Author	Stefan Buttcher, Charles L.A. Clarke, Gordon V. Cormack	**Publisher**	MIT Press	**Publish year**	2010
Reference2	**Book title**	Data Mining and Analysis			**ISBN**	978-0-521-76633-3
	Author	Mohammed J. Zaki, Wagner Meira Jr.	**Publisher**	Cambridge University Press	**Publish year**	2014
Reference3	**Book title**	Data Mining Practical Machine Learning Tools and Techniques, Third Edition			**ISBN**	978-0-12-374856-0
	Author	Ian H. Witten, Eibe Frank, and Mark A. Hall	**Publisher**	Morgan Kaufmann	**Publish year**	2011
Reference4	**Book title**	Python Machine Learning			**ISBN**	978-1-78355-513-0
	Author	Sebastian Raschka	**Publisher**	PACKT Publishing	**Publish year**	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。

S: 90 点以上, A: 80 点以上, B: 70 点以上, C: 60 点以上

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

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

S: (>= 90), A: (>=80), B: (>=70), C: (>= 60)

Examination

定期試験を実施（対面）

Examination(Face to Face)

Details of examination

N/A

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

事前に aono@tut.jp まで電子メールで予約をとること。

It is recommended that prior email appointment is preferable.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力

情報・知能工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。

（C1） 情報・知能工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize suchknowledge for problem solving in an integrated manner

(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner

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]

Subject name[English]	Statistical Natural Language Processing[Statistical Natural Language Processing]				
Schedule number	M43630340	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Wed.3～3	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	秋葉 友良 AKIBA Tomoyoshi				
Numbering	CMP_MAS52525				

Objectives of class

Important topics on statistical natural language processing will be discussed by focusing on statistical machine translation.

Contents of class

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

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

Information theory, Formal language theory

Notes for textbook

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

Reference1	**Book title**	Statistical Machine Translation			**ISBN**	978-0521874151
	Author	Philipp Koehn	**Publisher**	Cambridge University Press	**Publish year**	2010
Reference2	**Book title**	A Statistical MT Tutorial Workbook			**ISBN**	
	Author	Kevin Knight	**Publisher**		**Publish year**	

Notes for reference

N/A

Goals to be achieved

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.

Evaluation of achievement

Marks are based on reports (100%).

Examination

レポートで実施

By Report

Details of examination

N/A

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

(C)高度な知識を統合的に活用できる実践力・創造力
情報・知能工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 情報・知能工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize suchknowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words

spoken language processing, natural language processing, human language technology

(M43630430)Information Security[Information Security]

Subject name[English]	Information Security[Information Security]				
Schedule number	M43630430	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Wed.4～4	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	鈴木　幸太郎 SUZUKI Koutarou				
Numbering	CMP_MAS52025				

Objectives of class

情報セキュリティとくに暗号理論について基本的な内容を理解すること
To understand basic topics of information security especially cryptology.

Contents of class

1. 情報セキュリティと暗号理論の概要
2. 公開鍵暗号と証明可能安全性
3. RSA 問題に基づく暗号と署名
4. 離散対数問題に基づく暗号と署名
5. 楕円曲線に基づく暗号と署名
6. より進んだ話題

1. overview of information security and cryptology
2. public key cryptography and provable security
3. encryption and signature schemes based on RSA problem
4. encryption and signature schemes based on discrete logarithm problem
5. encryption and signature schemes based on elliptic curve
6. advanced topics

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

N/A

Notes for textbook

Papers(resume)will be distributed.

Notes for reference

・現代暗号への招待、黒澤、サイエンス社、暗号理論について読みやすく書かれている。
・公開鍵暗号の数理、森山ほか、共立出版、公開鍵暗号系について詳しく書かれている。
・クラウドを支えるこれからの暗号技術、光成、秀和システム、暗号に必要な数学について詳しく書かれている。
下記に公開版がある。
https://herumi.github.io/ango/
The followings are open textbooks of cryptology.
https://www.cs.umd.edu/~waa/414-F11/IntroToCrypto.pdf
https://crypto.stanford.edu/~dabo/cryptobook/

Goals to be achieved

情報セキュリティとくに暗号理論について基本的な内容を理解すること
To understand basic topics of information security especially cryptology.

Evaluation of achievement

レポートに基づき評価する
評価基準は下記のとおり
5 段階評価
S: 達成目標を 90%達成しており、かつレポートの合計点（100 点満点）が 90 点以上
A: 達成目標を 80%達成しており、かつレポートの合計点（100 点満点）が 80 点以上
B: 達成目標を 70%達成しており、かつレポートの合計点（100 点満点）が 70 点以上
C: 達成目標を 60%達成しており、かつレポートの合計点（100 点満点）が 60 点以上
4 段階評価
A: 達成目標を 80%達成しており、かつレポートの合計点（100 点満点）が 80 点以上
B: 達成目標を 65%達成しており、かつレポートの合計点（100 点満点）が 65 点以上

C: 達成目標を 55%達成しており、かつレポートの合計点（100 点満点）が 55 点以上
Evaluation is based on reports.
Evaluation criteria is as follows.
5-grade evaluation:
S: Achieved at least 90% of goals and obtained total points of reports, 90 or high (out of 100 points)
A: Achieved at least 80% of goals and obtained total points of reports, 80 or high (out of 100 points)
B: Achieved at least 70% of goals and obtained total points of reports, 70 or high (out of 100 points)
C: Achieved at least 60% of goals and obtained total points of reports, 60 or high (out of 100 points)
4-grade evaluation:
A: Achieved at least 80% of goals and obtained total points of reports, 80 or high (out of 100 points)
B: Achieved at least 65% of goals and obtained total points of reports, 65 or high (out of 100 points)
C: Achieved at least 55% of goals and obtained total points of reports, 55 or high (out of 100 points)

Examination
試験期間中には何も行わない
None during exam period

Details of examination
N/A

Other information
N/A

Reference URL
N/A

Office hours
授業終了後
After each class.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
情報・知能工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
（C1） 情報・知能工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize suchknowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words
情報セキュリティ
information security

(M43630440)Auditory System and Sound Perception[Auditory System and Sound Perception]

Subject name[English]	Auditory System and Sound Perception[Auditory System and Sound Perception]				
Schedule number	M43630440	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Tue.4～4	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	松井 淑恵 MATSUI Toshie				
Numbering	CMP_MAS53025				

Objectives of class

This course provides an introduction to the human auditory system. It also outlines various psychological experiments for understanding our auditory system, and computational models from the data.

Contents of class

Week 1. Physics of sounds and the auditory system
Week 2. Physiology of the auditory system
Week 3. Loudness
Week 4. Pitch
Week 5. Timber, instrumental sounds and vocal sounds
Week 6. Vocalization mechanism and perception of speech sounds
Week 7 (+0.5). Computational models of the auditory system and its application, and other latest topics

Self Preparation and Review

Lecture materials are disclosed to the official website beforehand. Download them by the day of the lecture.

Related subjects

Visual Perception and Cognition, Speech and Natural Language Processing

Notes for textbook

Papers(resume)will be distributed.

Reference1	**Book title**	The Sense of Hearing, 3rd edition.			**ISBN**	978-1138632
	Author	Christopher J. Plack	**Publisher**	Routledge	**Publish year**	2018
Reference2	**Book title**	An Introduction to the Psychology of Hearing, 6th ediotion.			**ISBN**	978-9004252424
	Author	Brian C. J. Moore	**Publisher**	Brill Academic Pub	**Publish year**	2013

Notes for reference

N/A

Goals to be achieved

1) Understand the relationship between physiological mechanism of the auditory system and its function
2) Learning the perceptual experiment techniques and computational approach to reveal the auditory system

Evaluation of achievement

The evaluation is based primarily on a final report (100 points).
Students who attend all classes will be evaluated as follows:
S: Achieved all goals and obtained point of final report, 90 or higher (out of 100 points).
A: Achieved 90 % of goals and obtained point of final report, 80 or higher (out of 100 points).
B: Achieved 80 % of goals and obtained point of final report, 70 or higher (out of 100 points).
C: Achieved 70 % of goals and obtained point of final report, 60 or higher (out of 100 points).

Examination

レポートで実施
By Report

Details of examination

N/A

Other information

N/A

Reference URL

N/A

Office hours

On a necessary basis. Please contact me by e-mail in advance.

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
情報・知能工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 情報・知能工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize suchknowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words

auditory system, sound perception, music, speech, computational model

(M43630450)Advanced Computer Architecture[Advanced Computer Architecture]

Subject name[English]	Advanced Computer Architecture[Advanced Computer Architecture]				
Schedule number	M43630450	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Thu.3～3	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	佐藤　幸紀 SATO Yukinori				
Numbering	CMP_MAS52125				

Objectives of class
The goal is to obtain the knowledge on the advanced computer architecture seen in the state-of-the-art computing systems.

Contents of class

Self Preparation and Review
Review each lecture and prepare for the next class with reference to the textbook.

Related subjects
N/A

Notes for textbook
Materials will be provided, which are based on a text book:
Computer Architecture, Sixth Edition: A Quantitative Approach
John Hennessy
David Patterson

Reference1	**Book title**	Computer architecture : a quantitative approach			**ISBN**	978-0128119051
	Author	John L. Hennessy, David A. Patterson ; with contributions by Krste Asanović ... [et al.]	**Publisher**	Morgan Kaufmann	**Publish year**	2018

Notes for reference
N/A

Goals to be achieved
At the end of the course, students will:
1: be able to understand the advanced design concepts of modern computing systems
2: be able to explain trade-off among performance and efficiency with consideration for power consumption, programabilitty, and hardware costs

Evaluation of achievement
Evaluations are done by reports (100%)/
S: 90% or more out of 100 points, S:90%, A: 80% or more, B: 70% or more C: 60% or more

Examination
レポートで実施
By Report

Details of examination
N/A

Other information
N/A

Reference URL
N/A

Office hours

Relations to attainment objectives of learning and education

（C）高度な知識を統合的に活用できる実践力・創造力
情報・知能工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
（C1） 情報・知能工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
Before/after the class

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize suchknowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about computer science and engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words

(M44610050)Seminar on Applied Chemistry and Life Science 1[Seminar on Applied Chemistry and Life Science 1]

Subject name[English]	Seminar on Applied Chemistry and Life Science 1[Seminar on Applied Chemistry and Life Science 1]				
Schedule number	M44610050	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	3
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	ENV_MAS55015				

Objectives of class

This course will provide the students with opportunities to study on his/her research subjects on applied chemistry and life science 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 applied chemistry and life science.

Contents of class

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.

Self Preparation and Review

Related subjects

Seminar on Applied Chemistry and Life Science 2
Thesis Research on Applied Chemistry and Life Science
All other relevant subjects in Applied Chemistry and Life Science

Notes for textbook

Supervisor will recommend textbooks, papers, and research materials to students.

Notes for reference

Goals to be achieved

To acquire basic knowledge on applied chemistry and life science
To understand the contents of scientific papers in a given field of applied chemistry and life science
To be able to make oral and poster presentations relevant to papers he/she has read

Evaluation of achievement

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.
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor(s)

Reference URL

http://ens.tut.ac.jp/en/

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team member; and to contribute to the team's achievements through working cooperatively with other team members
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words
Applied chemistry, Life science, Materials science and engineering

(M44610070)Thesis Research on Applied Chemistry and Life Science[Thesis Research on Applied Chemistry and Life Science]

Subject name[English]	Thesis Research on Applied Chemistry and Life Science[Thesis Research on Applied Chemistry and Life Science]				
Schedule number	M44610070	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S4系教務委員, 4系各教員 4kei kyomu Iin-S, 4kei kakukyouin				
Numbering	ENV_MAS68015				

Objectives of class

In the course, the students will perform advanced researches on applied chemistry and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen 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.

Contents of class

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.

Self Preparation and Review

Related subjects

Seminar on Applied Chemistry and Life Science 1
Seminar on Applied Chemistry and Life Science 2

Notes for textbook

Supervisor will recommend textbooks, papers, and research materials to students.

Notes for reference

Goals to be achieved

To acquire basic knowledge on applied chemistry and life science
To master experimental techniques and analytical skills required for research on a given field of applied chemistry and life science
To be able to present and discuss on the results of his/her research
To be able to make safety control in experimental work

Evaluation of achievement

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).
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor

Reference URL

http://ens.tut.ac.jp/en/

Office hours Students are encouraged visiting by appointment.
Relations to attainment objectives of learning and education
Key words Applied chemistry, Life science, Materials science and engineering

(M4461007T)Thesis Research on Applied Chemistry and Life Science[Thesis Research on Applied Chemistry and Life Science]

Subject name[English]	Thesis Research on Applied Chemistry and Life Science[Thesis Research on Applied Chemistry and Life Science]				
Schedule number	M4461007T	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～2
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S4系教務委員, 4系各教員 4kei kyomu Iin-S, 4kei kakukyouin				
Numbering	ENV_MAS68015				

Objectives of class

In the course, the students will perform advanced researches on applied chemistry and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen 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.

Contents of class

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.

Self Preparation and Review

Related subjects

Seminar on Applied Chemistry and Life Science 1
Seminar on Applied Chemistry and Life Science 2

Notes for textbook

Supervisor will recommend textbooks, papers, and research materials to students.

Notes for reference

Goals to be achieved

To acquire basic knowledge on applied chemistry and life science
To master experimental techniques and analytical skills required for research on a given field of applied chemistry and life science
To be able to present and discuss on the results of his/her research
To be able to make safety control in experimental work

Evaluation of achievement

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).
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor(s)

Reference URL

http://ens.tut.ac.jp/en/

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team member; and to contribute to the team's achievements through working cooperatively with other team members
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

Applied chemistry, Life science, Materials science and engineering

(M44610080)Seminar on Applied Chemistry and Life Science[Seminar on Applied Chemistry and Life Science]

Subject name[English]	Seminar on Applied Chemistry and Life Science[Seminar on Applied Chemistry and Life Science]				
Schedule number	M44610080	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	ENV_MAS65015				

Objectives of class

This course will provide the students with the opportunity to study on his/her research subject in applied chemistry and life science 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.

Contents of class

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.

Self Preparation and Review

Related subjects

Thesis Research on Applied Chemistry and Life Science
All other relevant subjects in Applied Chemistry and Life Sciences

Notes for textbook

Supervisor will recommend textbooks and papers to students.

Notes for reference

Goals to be achieved

To acquire basic knowledge on applied chemistry and life science
To understand the contents of scientific papers in a given field of applied chemistry and life science
To be able to make oral and poster presentations relevant to papers he/she has read

Evaluation of achievement

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.
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor

Reference URL

http://ens.tut.ac.jp/en/

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and development and put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(D2) Have high-level skills to mutually respect the values of individual team member; and to contribute to the team's achievements through working cooperatively with other team members
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words
Applied chemistry, Life science, Materials science and engineering

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

Subject name[English]	Special Topics in Applied Organic Chemistry[Special Topics in Applied Organic Chemistry]				
Schedule number	M44630100	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Tue.5～5	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	岩佐 精二, 柴富 一孝 IWASA Seiji, SHIBATOMI Kazutaka				
Numbering	ENV_MAS52225				

Objectives of class

To provide you with a working knowledge of advanced synthesis of molecular materials.

Contents of class

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.

1. Total synthesis of bioactive organic compounds. (Iwasa)
2. Advanced modern synthetic organic reactions using transition metals. (Iwasa)
3. Basic concept of oxidative addition and reductive elimination in catalytic cycles. (Iwasa)
4. Synthetic applications of asymmetric synthesis and asymmetric catalysts. (Iwasa)
5. Basic concept of Lewis acid catalyst and organocatalyst. (Shibatomi)
6. Advanced Lewis acid catalysis in organic synthesis. (Shibatomi)
7. Advanced organocatalysis in organic synthesis. (Shibatomi)
8. Organofluorine chemistry. (Shibatomi)

Self Preparation and Review

Related subjects

Subjects related to Organic Chemistry

Notes for textbook

No textbook is required.
Some of information in WebCT will be help for your understanding on this course.

Notes for reference

Goals to be achieved

A firm understanding on catalyst, stereochemistry, reaction mechanism, and their application for the synthesis of molecular materials is achieved.

Evaluation of achievement

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.
Evaluation basis] Students who attend all classes will be evaluated as follows:
S: Achieved all goals and obtained total points of exam and reports, 90 or higher (out of 100 points).
A: Achieved 80 % 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, 70 or higher (out of 100 points).
C: Achieved 60 % of goals and obtained total points of exam and reports, 60 or higher (out of 100 points).

Examination

レポートで実施
By Report

Details of examination

Other information

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)

Reference URL

http://www.siorgchem.ens.tut.ac.jp/index.html
http://ens.tut.ac.jp/orgchem/

Office hours

anytime.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

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

(M44630110)Developmental Neuroscience[Developmental Neuroscience]

Subject name[English]	Developmental Neuroscience[Developmental Neuroscience]				
Schedule number	M44630110	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Tue.2～2	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	吉田 祥子, 沼野 利佳 YOSHIDA Sachiko, NUMANO Rika				
Numbering	ENV_MAS53225				

Objectives of class

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.

Contents of class

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,
We pick up topics from chapter2 in Neuron To Brain 4th Ed.
(8)Neural inducer in vertebrates
(9)Notch and Delta genes
(10)Polarity and Segmentation
(11)Hox gene function in the nervous system
(12)Topic & Discussion

Self Preparation and Review

Related subjects

A firm understanding on fundamental biochemistry and thermodynamics will be necessary.

Notes for textbook

Web-based text will be distributed.

(Reference)
From Neuron To Brain 4th Ed, Nicholls et. al. (Sinauer, 2001)

Notes for reference

Goals to be achieved

Evaluation of achievement

Yoshida S.
S: Achieved all goals and obtained points of reports and discussions, 90 or higher (out of 100 points).
A: Achieved several goals and obtained points of reports and discussions, 80 or higher (out of 100 points).
B: Achieved two goals and obtained points of reports and discussions, 70 or higher (out of 100 points).
C: Achieved one goal and obtained points of reports and discussions, 60 or higher (out of 100 points).

Numano
Term report; 100%

Examination

その他
Other

Details of examination

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

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(D)グローバルに活躍できるコミュニケーション力
グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で，自らの考えや成果を効果的に表現するコミュニケーション力を身につけている。
(D1) 論文，口頭及び情報メディアを通じて，自分の論点や考えなどを国の内外において効果的に表現・発信し，コミュニケーションする能力を身につけている。
(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

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

Subject name[English]	Advanced Electrical and Electronic Technology for Ecological Engineering[Advanced Electrical and Electronic Technology for Ecological Engineering]				
Schedule number	M44630140	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Fri.4～4	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	田中　三郎, 有吉　誠一郎 TANAKA Saburo, ARIYOSHI Seiichiro				
Numbering	ENV_MAS54225				

Objectives of class

This lecture provides a comprehensive overview of the important technologies for photon detection from the millimeter-wave through the ultraviolet spectral regions.

Contents of class

Attendance students read the recommendation reference book 1 in advance and give presentation in a seminar form about any of the following topics.

1. Introduction
2. Intrinsic photoconductors
3. Extrinsic photoconductors
4. Photodiodes and other junction-based detectors
5. Amplifiers and readouts
6. Arrays
7. Photoemissive detectors
8. Photography
9. Bolometers and other thermal detectors
10. Visible and infrared coherent receivers
11. Submillimeter- and millimeter-wave heterodyne receivers

Self Preparation and Review

Related subjects

Notes for textbook

References are distributed as needed.

Reference1	**Book title**	Detection of Light			**ISBN**	0 521 81636 X
	Author	George Rieke	**Publisher**	Cambridge University Press	**Publish year**	2003

Notes for reference

Goals to be achieved

Evaluation of achievement

[Evaluation basis]

Students who attend all classes basically will be evaluated as follows:

S: Achieved 90 % of goals and obtained total points of presentation and reports, 90 or higher (out of 100 points).

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

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

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

Examination

レポートで実施
By Report

Details of examination

Other information

Seiichiro Ariyoshi, Office: G-404 (phone 6908), E-mail: ariyoshi@ens.tut.ac.jp

Sabro Tanaka, Office: G-605 (phone 6916), E-mail: tanakas@ens.tut.ac.jp

Reference URL

http://ens.tut.ac.jp/terahertz/

Office hours

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

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

Subject name[English]	Advanced Supercritical Fluid Engineering[Advanced Supercritical Fluid Engineering]				
Schedule number	M44630200	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Fri.2～2	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	大門 裕之 DAIMON Hiroyuki				
Numbering	ENV_MAS54125				

Objectives of class

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.

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Contents of class

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

Self Preparation and Review

Related subjects

Advanced Analytical Separation Chemistry, Advanced Industrial Ecology

Advanced Analytical Separation Chemistry, Advanced Industrial Ecology

Notes for textbook

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,Interview during class and Report
More than
90% ; S
80% ; A
70% ; B
60% ; C
Based on Presentation, Interview during class and Report
More than
90% ; S
80% ; A
70% ; B
60% ; C

Examination

レポートで実施
By Report

Details of examination

Other information

Office：Builing G, Floor 6th, Room 602
Tel:0532-44-6905
Email:daimon@ens.tut.ac.jp

Office：Builing 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)

（C）高度な知識を統合的に活用できる実践力・創造力
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(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
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の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
（E）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計画し学習する能力を身につけている。
(D)

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

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

(M44630290)Advanced Biomaterials Engineering[Advanced Biomaterials Engineering]

Subject name[English]	Advanced Biomaterials Engineering[Advanced Biomaterials Engineering]				
Schedule number	M44630290	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Thu.3～3	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	辻 秀人, 手老 龍吾 TSUJI Hideto, TERO Ryugo				
Numbering	ENV_MAS52225				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

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)

Related subjects

Notes for textbook

Printed materials will be distributed (Hideto Tsuji).
Printed materials will be distributed as necessary (Ryugo Tero).

Reference1	**Book title**	Degradation of Poly (Lactide)-Based Biodegradable Materials			**ISBN**	1604565020
	Author	Hideto Tsuji	**Publisher**	Nova Science Pub Inc	**Publish year**	2008
Reference2	**Book title**	Chapter 21 in "Poly(lactic acid): Synthesis, Structures, Properties, Processing, and Applications"			**ISBN**	0470293667
	Author	Hideto Tsuji	**Publisher**	Wiley	**Publish year**	2010
Reference3	**Book title**	Nanoscience: Nanobiotechnology and Nanobiology			**ISBN**	978-3-540-88633-4
	Author	Patrick Boisseau & Marcel Lahmani	**Publisher**	Springer	**Publish year**	2009

Notes for reference

Reference book 3 (Ryugo Tero):
http://link.springer.com/book/10.1007%2F978-3-642-28030-6

Goals to be achieved

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)

[Evaluation basis] Students who attend all classes will be evaluated as follows:
S: Achieved all goals and obtained total points of presentation or reports, 90 or higher (out of 100 points).
A: Achieved 80 % of goals and obtained total points of presentation or reports, 80 or higher (out of 100 points).
B: Achieved 70 % of goals and obtained total points of presentation or reports, 70 or higher (out of 100 points).
C: Achieved 60 % of goals and obtained total points of presentation or reports, 60 or higher (out of 100 points).

Examination

その他
Other

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

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(D)グローバルに活躍できるコミュニケーション力
グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で，自らの考えや成果を効果的に表現するコミュニケーション力を身につけている。
(D1) 論文，口頭及び情報メディアを通じて，自分の論点や考えなどを国の内外において効果的に表現・発信し，コミュニケーションする能力を身につけている。
(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(D) Communication skills for global success
Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members
(D1) Have the skills to effectively express and communicate one's own ideas as well as points in question at home and abroad through papers, oral reports or information media
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and

technology

Key words

(M44630360)Advanced Reactive Plasma[Advanced Reactive Plasma]

Subject name[English]	Advanced Reactive Plasma[Advanced Reactive Plasma]				
Schedule number	M44630360	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring2 term	**Day of the week,period**	Mon.4～4	**Credit(s)**	1
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	髙島 和則 TAKASHIMA Kazunori				
Numbering	ENV_MAS52225				

Objectives of class

近年プラズマを用いたガス状汚染物質の浄化に代表される大気圧プラズマを用いた環境対策技術の研究開発が盛んになっていている。この分野においては放電現象に関する理解は欠くべからざる一つの基礎的事項である。本講義は放電の基礎過程を解説する。

To understand and fundamentals of gas discharge

Contents of class

1週目　　放電の基礎
2週目　　放電の i=V 特性、電子なだれ、α 効果、γ 効果
3、4週目　荷電粒子と原子・分子の衝突課程
5－7週目　 輸送現象、エネルギー分布
week 1:　Introduction
week 2:　I-V characteristics of electric discharge, α effect, γ effect
week 3,4: Collision of charged particles
week 5-7: Transportation of charged particles, energy distribution

Self Preparation and Review

Related subjects

Notes for textbook

必要に応じて資料を配布

Handout will be given as needed

Notes for reference

Goals to be achieved

放電の基礎過程を理解する

To learn fundamentals of gas discharge

Evaluation of achievement

課題レポートにより評価する。
評価基準：原則的に下記のように成績を評価する。
S：達成目標をすべて達成しており，かつレポートの点数（100 点満点）が 90 点以上
A：達成目標の 80%を達成しており，かつレポートの点数（100 点満点）が 80 点以上
B：達成目標の 70%を達成しており，かつレポートの点数（100 点満点）が 70 点以上
C：達成目標の 60%を達成しており，かつレポートの点数（100 点満点）が 60 点以上
Students who attend all classes will be evaluated as follows:
S: Achieved all the goals and obtained points of reports, 90 or higher (out of 100 points).
A: Achieved 80% of goals and obtained points of reports, 80 or higher (out of 100 points).
B: Achieved 70% of goals and obtained points of reports, 70 or higher (out of 100 points).
C: Achieved 60% of goals and obtained points of reports, 60 or higher (out of 100 points).

Examination

レポートで実施

By Report

Details of examination

Other information

高島和則 ー 居室: G-504、内線番号: 6919、メールアドレス: takashima@ens.tut.ac.jp

Dr. Kazunori Takashima
Office: G-504 (phone 6919)
E-mail: takashima@ens.tut.ac.jp

Reference URL

記述なし

Office hours

随時応対可
ただし、事前にメールにて連絡すること。

Make an appointment by e-mail.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(E)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計画し学習する能力を身につけている。

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Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

(M44630380)Advanced Life Science and Biotechnology 2[Advanced Life Science and Biotechnology 2]

Subject name[English]	Advanced Life Science and Biotechnology 2[Advanced Life Science and Biotechnology 2]				
Schedule number	M44630380	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	ENV_MAS53225				

Objectives of class

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 1.

Contents of class

The classes will be given by his/her supervisor. The type and contents of this course depend on his/her supervisor.

Self Preparation and Review

Related subjects

Advanced Life Science and Biotechnology 1

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

The evaluation is based on the scores of reports, presentations, and examination.
His/her supervisor evaluates the scores.
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor

Reference URL

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
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(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(E)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計画し学習する能力を身につけている。

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(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words
Molecular biology and microbiology, genomics, biotechnology and bioengineering

(M44630400)Advanced Materials Chemistry 2[Advanced Materials Chemistry 2]

Subject name[English]	Advanced Materials Chemistry 2[Advanced Materials Chemistry 2]				
Schedule number	M44630400	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	ENV_MAS52225				

Objectives of class

This course will provide the students with the opportunity to study on the selected subject in the realm of further advanced materials chemistry based on the knowledge of the course of Advanced Materials Chemistry 1.

Contents of class

The classes will be given by his/her supervisor. The type and contents of this course depend on his/her supervisor.

Self Preparation and Review

Related subjects

Advanced Materials Chemistry 1

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

The evaluation is based on the scores of reports, presentations, and examination.
His/her supervisor evaluates the scores.
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor

Reference URL

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。
(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

(M44630420)Advanced Chemical Technology 2[Advanced Chemical Technology 2]

Subject name[English]	Advanced Chemical Technology 2[Advanced Chemical Technology 2]				
Schedule number	M44630420	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Applied Chemistry and Life Science			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	ENV_MAS52225				

Objectives of class

This course will provide the students with the opportunity to study on the selected subject in the realm of further advanced chemical technology based on the knowledge of the course of Advanced Chemical Technology 1.

Contents of class

The classes will be given by his/her supervisor. The type and contents of this course depend on his/her supervisor.

Self Preparation and Review

Related subjects

Advanced Chemical Technology 1

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

The evaluation is based on the scores of reports, presentations, and examination.
His/her supervisor evaluates the scores.
S: 90 or higher (out of 100 points),
A: 80 or higher (out of 100 points),
B: 70 or higher (out of 100 points),
C: 60 or higher (out of 100 points)

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Supervisor

Reference URL

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
応用化学・生命工学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 応用化学・生命工学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。
(C2) 応用化学・生命工学およびその関連分野の広範囲の知識の連携により，研究開発に対する方法論を体得して，研究開発の計画を立案および実践し，課題解決のための新たな技術を創造できる能力を身につけている。

(E)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計画し学習する能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about applied chemistry and life science as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about applied chemistry and life science as well as related fields; and to utilize such knowledge in an integrated manner
(C2) Have the skills to learn, by experience, methodologies for research and development through integrating extensive knowledge about applied chemistry and life science as well as related fields; to make plans for research and developmentand put them into practice; and to create new technologies to solve problems
(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment
Have the skills to voluntarily make plans and learn throughout one's life in response to changesin society, environment and technology

Key words

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

Subject name[English]	Seminar on Architecture and Civil Engineering I[Seminar on Architecture and Civil Engineering I]				
Schedule number	M45610010	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	3
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_MAS51015				

Objectives of class

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.

Contents of class

Self Preparation and Review

Related subjects

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

Report

Examination

その他

Other

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Seminar on Architecture and Civil Engineering II[Seminar on Architecture and Civil Engineering II]				
Schedule number	M45610020	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	3
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M2
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_MAS61015				

Objectives of class

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.

Contents of class

Self Preparation and Review

Related subjects

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

Report

Examination

その他

Other

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]				
Schedule number	M45610030	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S5系教務委員, 5系各教員 5kei kyomu Iin-S, 5kei kakukyouin				
Numbering	ARC_MAS51025				

Objectives of class

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).

Contents of class

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).

Self Preparation and Review

Related subjects

TBD by the laboratory

Notes for textbook

TBD by the laboratory

Notes for reference

Goals to be achieved

Evaluation of achievement

This credit is assigned for all the process for the preparation and presentation of the thesis.

Examination

その他

Other

Details of examination

Other information

Refer to administration office.

Reference URL

Refer to the URL of each laboratory

Office hours

Refer to administration office.

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]				
Schedule number	M45610030	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Required
Time of starting a course	2Years	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～1
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1, M2
Charge teacher name[Roman alphabet mark]	S5系教務委員, 5系各教員 5kei kyomu Iin-S, 5kei kakukyouin				
Numbering	ARC_MAS61015				

Objectives of class

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).

Contents of class

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).

Self Preparation and Review

Related subjects

TBD by the laboratory

Notes for textbook

TBD by the laboratory

Notes for reference

Goals to be achieved

Evaluation of achievement

This credit is assigned for all the process for the preparation and presentation of the thesis.

Examination

その他

Other

Details of examination

Other information

Refer to administration office.

Reference URL

Refer to the URL of each laboratory

Office hours

Refer to administration office.

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]				
Schedule number	M4561003T	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～2
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S5系教務委員, 5系各教員 5kei kyomu Iin-S, 5kei kakukyouin				
Numbering	ARC_MAS61015				

Objectives of class

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).

Contents of class

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).

Self Preparation and Review

Related subjects

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

This credit is assigned for all the process for the preparation and presentation of the thesis.

Examination

試験期間中には何も行わない

None during exam period

Details of examination

Other information

Refer to administration office.

Reference URL

Refer to the URL of each laboratory

Office hours

Refer to administration office.

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Seminar on Architecture and Civil Engineering[Seminar on Architecture and Civil Engineering]				
Schedule number	M45610040	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	6
Faculty	Graduate Program for Master's Degree			**Subject grade**	2～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_MAS51015				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Related subjects

Notes for textbook

Notes for reference

Goals to be achieved

Evaluation of achievement

Report

Examination

レポートで実施

By Report

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Advanced Study on Housing System and Housing Policy[Advanced Study on Housing System and Housing Policy]				
Schedule number	M45630130	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.2～2	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	松島 史朗 MATSUSHIMA Shiro				
Numbering	ARC_MAS53025				

Objectives of class

国際世界では気候の変動、地震、内戦、貧困など多様な要因で人々が難民、亡命者、被災者として国境を越え、都市部へ流入し、社会問題化しているのは周知の事実であろう。そのような状況の中で、住宅供給の在り方が問われている。
学生は、各国におけるこうした状況下での住宅供給の状況について事例研究を行い、最終的にはケース教材として発展刺させることを目標とする。

To understand emerging architecture of humanity such as post-disaster temporary housing, refugee camp, and illegal residence. With increasing number of population moving into the urban area from suburbs, there emerge risks with which we have to cope, especially supply of housing and related facility has to be taken into account.
For the final projet, students are expected to conduct research to write a case study on such risks of their countries and examine necessary counter measures.

Contents of class

This course takes several topics about the issues stated above. Two classes are allocated to each topic in principle; in the first class a lecture is given by the instructor and in the second class, the presentation is given by the student who is assigned to each topic.
It may adopt case method with which students are expected to read cases on various topics regarding emerging risks related to architectural
and housing planning, design, and urban development. Students read cases prior to the class and, at the class, they will exchange their ideas
face to face in order to develop their original idas to knowledge. It is also expected to develop skills of debating. Instructor will provide
appropriate instruction in timely manner for the class discussion along with giving lecture at the class.
1. Introduction
2/3. Architecture after 3.11
4/5. Lecture on Architectural and Housing Development of the World
6/7. Revitalising the City and Empowering. Community Tie by the Community (Re) Development in Toyokawa Inari Shrine
Mid-term paper due: proposal of the final project
8/9. Yebisu Garden Place
10. Final Project Interim Presentation and collective review
11/12. Rainbow Town Tokyo Waterfront Development
13. Independent Desk Crit
14/15. Final presentation by students.
16. Editing and compiling the final projects to make a booklet.
For the final project, students will write their own cases based on their research and give presentation at the last class. Final project may be either independent work or group project.
Because this is a small class and students have different backgrounds and interests, the contents of the class and schedule are subject to
change according to her/his disciplines.

This course takes several topics about the issues stated above. Two classes are allocated to each topic in principle; in the first class a lecture is given by the instructor and in the second class, the presentation is given by the student who is assigned to each topic.
It may adopt case method with which students are expected to read cases on various topics regarding emerging risks related to architectural and housing planning, design, and urban development. Students read cases prior to the class and, at the class, they will exchange their ideas
face to face in order to develop their original idas to knowledge. It is also expected to develop skills of debating. Instructor will

provide
appropriate instruction in timely manner for the class discussion along with giving lecture at the class.
1. Introduction
2/3. Architecture after 3.11
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Mid-term paper due: proposal of the final project
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10. Final Project Interim Presentation and collective review
11/12. Rainbow Town Tokyo Waterfront Development
13. Independent Desk Crit
14/15. Final presentation by students.
16. Editing and compiling the final projects to make a booklet.
For the final project, students will write their own cases based on their research and give presentation at the last class. Final project may be either independent work or group project.
Because this is a small class and students have different backgrounds and interests, the contents of the class and schedule are subject to
change according to her/his disciplines.

Self Preparation and Review

教材は簡単にアクセスできるように Dreamcampus にアップし、その場で意見交換などもできるようセットしてあるので。効果的に活用されたい。こうした意見交換や教員の指導を受けながら事例研究をまとめていく。

Read a case and prepare for the answers to each question on the case.
Develop your own ideas in order to exchange them w/ your class mates to have more diverse views. Reading materials are to be uploaded on the Dreamcampus where you can have an easy acceccess to the material, may upload your opinion, and exchange ideasa with other students.
From the review of your project, you may revise and develop your argument for the future. Reflecting yourself by listening to others is the most important aspect to become a good practitioner.

Related subjects

Architectural/Civil Engineering practice experience preferred but not required.

Architectural/Civil Engineering practice experience preferred but not required.

Notes for textbook

Matsushima Shiro, Identity COmmunity Resiliency,Responsibilities of Society, University, and Architecture. Harvard Univerity Graduate School of Design, report on housing policies and their impacts on human life.
Cases shown above. Cases are subject to change.

(Reference)
TBA

Matsushima Shiro, Identity COmmunity Resiliency,Responsibilities of Society, University, and Architecture. Harvard Univerity Graduate School of Design, report on housing policies and their impacts on human life.
Cases shown above. Cases are subject to change.

(Reference)
TBA

Notes for reference

Because this field is getting important more than ever before, there are some new books available and students are encouraged to search for the up-dated information probably via internet.

Because this field is getting important more than ever before, there are some new books available and students are encouraged to search for the up-dated information probably via internet.

Goals to be achieved

To understand the needs or structure for humanity that involves various issues including design, procurement, and distribution systems of architecture from international point of view and from local standpoint.
To develop your own ideas and your ability of discussion based on the comparative research of your country and Japan about the problems discussed here.

To understand the needs or structure for humanity that involves various issues including design, procurement, and distribution systems of architecture from international point of view and from local standpoint.
To develop your own ideas and your ability of discussion based on the comparative research of your country and Japan about the problems discussed here.

Evaluation of achievement

Class participation (30%), final project of case writing (40%) , presentation by the students (30%), and contributiron to make the booklet that features the final projects (10%)
Class participation (30%), final project of case writing (40%) , presentation by the students (30%), and contributiron to make the booklet that features the final projects (10%)

Examination

その他
Other

Details of examination

Other information

D-707, Phone: 44-6835, Email: shirom@ace.tut.ac.jp
D-707, Phone: 44-6835, Email: shirom@ace.tut.ac.jp

Reference URL

http://mlab.ace.tut.ac.jp/
http://mlab.ace.tut.ac.jp/

Office hours

Every Tuesday 12:30 to 14:30 on sign-up basis
or by appointment via email
Every Tuesday 12:30 to 14:30 on sign-up basis
or by appointment via email

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
建築・都市システム学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 建築・都市システム学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about architecture and civil engineering as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about architecture and civil engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words

collective housing, community development, self build, camps

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

Subject name[English]	Advanced Structural System Planning and Design II[Advanced Structural System Planning and Design II]				
Schedule number	M45630200	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_MAS52025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

N/A

Notes for textbook

Papers(resume)will be distributed.

Notes for reference

N/A

Goals to be achieved

Evaluation of achievement

This credit is assigned for all the process for the oral presentation or report.

Examination

レポートで実施

By Report

Details of examination

Report

Other information

N/A

Reference URL

N/A

Office hours

Before/after the class

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力

建築・都市システム学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。

(C1) 建築・都市システム学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about architecture and civil engineering as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner

(C1) Have the skills to voluntarily acquire theories and applied knowledge about architecture and civil engineering as well as

related fields; and to utilize such knowledge in an integrated manner

Key words

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

Subject name[English]	Advanced Environmental System Planning and Design II[Advanced Environmental System Planning and Design II]				
Schedule number	M45630220	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_MAS54025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

N/A

Notes for textbook

N/A

Notes for reference

N/A

Goals to be achieved

Understand the contents of the latest research papers and debate with supervisor.
Create a research paper (including English).

Evaluation of achievement

This credit is assigned for all the process for the oral presentation or report.

Examination

レポートで実施
By Report

Details of examination

Report

Other information

N/A

Reference URL

N/A

Office hours

N/A

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力
建築・都市システム学およびその関連分野に関する高度な知識を修得し，それらを課題解決のために統合的に活用できる実践的・創造的能力を身につけている。
(C1) 建築・都市システム学およびその関連分野の理論・応用知識を自発的に獲得し，それらを統合的に活用できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about architecture and civil engineering as well as related fields; and have the practical and creative skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about architecture and civil engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words

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

Subject name[English]	Advanced Regional System Planning and Design II[Advanced Regional System Planning and Design II]				
Schedule number	M45630240	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Intensive	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_MAS53025				

Objectives of class

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.

Contents of class

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.

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

N/A

Notes for textbook

Papers(resume)will be distributed.

Notes for reference

N/A

Goals to be achieved

Evaluation of achievement

This credit is assigned for all the process for the oral presentation or report.

Examination

レポートで実施

By Report

Details of examination

Report

Other information

N/A

Reference URL

N/A

Office hours

N/A

Relations to attainment objectives of learning and education

(C)高度な知識を統合的に活用できる実践力・創造力

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(C) Practical and creative skills to utilize advanced knowledge in an integrated manner

Have advanced knowledge about architecture and civil engineering as well as related fields; and have the practical and creative

skills to utilizesuch knowledge for problem solving in an integrated manner
(C1) Have the skills to voluntarily acquire theories and applied knowledge about architecture and civil engineering as well as related fields; and to utilize such knowledge in an integrated manner

Key words

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

Subject name[English]	Building science:Thermal Environment and vernacular architecture[Building science:Thermal Environment and vernacular architecture]				
Schedule number	M45630340	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Wed.4～4	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	都築　和代 TSUZUKI Kazuyo				
Numbering	ARC_MAS54125				

Objectives of class

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.

Contents of class

The contents are as follows:
1. Actual situations of environmental impact to global environment affected by buildings and cities
2. Environmental impact evaluation affected by buildings and cities
3. LCA evaluation of buildings and cities
4. Comprehensive assessment system for built environment efficiency
5. Sustainable buildings
6. Eco city
7. Adaptive thermal comfort 1
8. Adaptive thermal comfort 2
9. Building science: Thermal Environment and vernacular architecture 1
10.Building science: Thermal Environment and vernacular architecture 2
11.Guidelines, codes and standard
12. Research and Development on thermal environment
13. Research and Development on IAQ
14. Discussion on IAQ related issues
15. Supplementary lecture

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

Building climate design, Building services design

Notes for textbook

Environmental Science in Building by Randall McMullan is available to lend during the school semester. Hand-outs related this course will be distributed.

Reference1	**Book title**	Environmental Science in Building			**ISBN**	
	Author	Randall McMullan	**Publisher**	Palgrave macmillan	**Publish year**	2012

Notes for reference

N/A

Goals to be achieved

Achievement of this class is to understand the adaptive thermal comfort and building science for sustainable building design and urban energy management.

Evaluation of achievement

The grades will be evaluated by comprehensive consideration based on discussion (30%) and reports (70%) in the course.

[Evaluation basis] Students who attend all classes will be evaluated as follows:
A: Achieved all goals and obtained total points of reports, 80 or higher (out of 100 points).
B: Achieved 70 % of goals and obtained total points of reports, 65 or higher (out of 100 points).
C: Achieved 60 % of goals and obtained total points of reports, 55 or higher (out of 100 points).

Examination

レポートで実施
By Report

Details of examination

Other information

Phone: ext. 6840, Email: ktsuzuki@ace.tut.ac.jp

Reference URL

N/A

Office hours

K.tsuzuki: Monday, 15:00-17:00

Relations to attainment objectives of learning and education

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Key words

(M45630350)Water Environment Engineering[Water Environment Engineering]

Subject name[English]	Water Environment Engineering[Water Environment Engineering]				
Schedule number	M45630350	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.3～3	**Credit(s)**	2
Faculty	Graduate Program for Master's Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	M1
Charge teacher name[Roman alphabet mark]	井上 隆信, 横田 久里子 INOUE Takanobu, YOKOTA Kuriko				
Numbering	ARC_MAS54025				

Objectives of class

To know and understand the water quality change in environment and treatment system.
To know and understand the water quality management.

Contents of class

water quality change in environment and treatment system.
1 fundamental equation of the mass balance
2 piston flow model
3 complete mixing model
4 reaction rate
5 complete mixing model with reaction
6 piston flow model with reaction

drinking water treatment and waste water treatment
7 rapid sand filtration process
8 activated sludge treatment process
(Inoue)

Water pollutants and management
9-10 environmental standard
11-13 nutrients, organic matter
14-15 chemicals in water environment
(Yokota)

Self Preparation and Review

Review each lecture and prepare for the next class with reference to the textbook.

Related subjects

N/A

Notes for textbook

No textbook is required for this class.

Notes for reference

N/A

Goals to be achieved

To understand the water pollution and environmental quality standard.
To understand the piston flow and complete mixing model

Evaluation of achievement

[Evaluation basis] Students who attend all classes will be evaluated as follows:
S: Achieved all goals and obtained total points of reports and presentation, 90 or higher (out of 100 points).
A: Achieved 80 % of goals and obtained total points of reports and presentation, 80 or higher (out of 100 points).
B: Achieved 70 % of goals and obtained total points of reports and presentation, 70 or higher (out of 100 points).
C: Achieved 60 % of goals and obtained total points of reports and presentation, 60 or higher (out of 100 points).

Examination

レポートで実施
By Report

Details of examination
N/A

Other information
N/A

Reference URL
N/A

Office hours
Wednesday 12:00– 13:00

Relations to attainment objectives of learning and education

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Key words