Syllabus

International Doctoral Degree Program

（2018-Spring Term）

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

Subject name[English]	Advanced Seminar on Mechanical Engineering 1[Advanced Seminar on Mechanical Engineering 1]				
Schedule number	D51010010	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_DOC71015				

Objectives of class

The seminar aims to enhance the ability of each student to plan and accomplish research in the field of mechanical engineering through reviewing, reading, and discussing technical papers related to his/her doctor thesis research topic.

Contents of class

Each student reads English technical papers related to his/her doctor thesis, introduces the contents of the papers and discusses them with other students and his/her supervisor.

Self Preparation and Review

Related subjects

Inquire this of your supervisor.

Notes for textbook

Inquire this of your supervisor.

Notes for reference

Goals to be achieved

To acquire the ability of each student to discuss his/her doctor thesis research topic and topics related to his/her research field with his/her supervisor and specialists in his/her field.
To acquire the ability to write English technical papers.

Evaluation of achievement

The achivement is evaluated based on the results of paper introduction, understanding of papers, answers to questions, and on the contribution to discussion.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Inquire this of your supervisor.

Reference URL

Office hours

Inquire this of your supervisor.

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Advanced Seminar on Mechanical Engineering 2[Advanced Seminar on Mechanical Engineering 2]				
Schedule number	D51010020	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Required
Time of starting a course	Year	**Day of the week,period**	Intensive	**Credit(s)**	1
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	2～
Department Offered	Mechanical Engineering			**Beggining grade**	D2
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_DOC71015				

Objectives of class

The seminar aims to enhance the ability of each student to plan and accomplish his/her research in the field of mechanical engineering through reviewing, reading, and discussing technical papers related to his/her doctor thesis research topic.

Contents of class

Each student reads English technical papers related to his/her doctor thesis, introduces the contents of the papers and discusses them with other students and his/her supervisor.

Self Preparation and Review

Related subjects

Inquire this of your supervisor.

Notes for textbook

Inquire this of your supervisor.

Notes for reference

Goals to be achieved

To acquire the ability of each student to discuss his/her doctor thesis research topic and topics related to his/her research field with his/her supervisor and specialists in his/her field.
To acquire the ability to write English technical papers.

Evaluation of achievement

The achivement is evaluated based on the results of paper introduction, understanding of papers, answers to questions, and on the contribution to discussion.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Inquire this of your supervisor.

Reference URL

Office hours

Inquire this of your supervisor.

Relations to attainment objectives of learning and education

Key words

(D51030010)Advanced Mechanical Systems[Advanced Mechanical Systems]

Subject name[English]	Advanced Mechanical Systems[Advanced Mechanical Systems]				
Schedule number	D51030010	**Subject area**	Advanced Mechanical Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Mon.2～2	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	河村 庄造, 足立 忠晴, 竹市 嘉紀 KAWAMURA Shozo, ADACHI Tadaharu, TAKEICHI Yoshinori				
Numbering	MEC_DOC73025				

Objectives of class

The class aims to give advanced knowledge on solid mechanics, vibration engineering or tribology.

Contents of class

Prof. S. Kawamura
From 1st to 5th weeks
Vibration engineering of machines and structures is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the vibration engineering, and must present them. Practical modeling and simulation of structural vibration are understood through discussion based on the presentations.
Topics: Vibration engineering, Modeling and simulation of dynamic phenomena and so on.

Prof. T. Adachi
From 6th to 10th weeks
Mechanics of solids and structures including materials science is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the mechanics, and must present them. Practical mechanics and design of engineering materials and mechanical structures are understood through discussion based on the presentations.
Topics: Mechanics of solids and structures, Mechanical properties of materials, Design of mechanical components and so on.

Associate Prof. Y. Takeichi
From 11th to 15th weeks
Fundamentals of tribology including materials science are lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the tribology, and must present them. Practical lubrication engineering and design of sliding mechanical components are understood through discussion based on the presentations.
Topics: Tribology, Lubrication engineering, Surface properties, Wear of materials, Tribological coatings and so on.

Self Preparation and Review

Related subjects

Fundamental knowledge on solid mechanics, vibration engineering or tribology.

Notes for textbook

Handouts will be prepared

Notes for reference

Goals to be achieved

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

Evaluation of achievement

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

Examination

その他
Other

Details of examination

Other information

Tadaharu Adachi: Room D-305, E-mail: adachi@me.tut.ac.jp
Shozo Kawamura: Room D-404, E-Mail: kawamura@me.tut.ac.jp
Yoshinori Takeichi: Room D-304, E-Mail: takeichi@tut.jp

Reference URL

Office hours ask us by E-Mail
Relations to attainment objectives of learning and education
Key words solid mechanics, vibration engineering, tribology

(D51030030)Advanced Manufacturing Processes[Advanced Manufacturing Processes]

Subject name[English]	Advanced Manufacturing Processes[Advanced Manufacturing Processes]				
Schedule number	D51030030	**Subject area**	Advanced Mechanical 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 Doctoral Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	福本 昌宏, 伊﨑 昌伸, 横山 誠二, 安井 利明 FUKUMOTO Masahiro, IZAKI Masanobu, YOKOYAMA Seiji, YASUI Toshiaki				
Numbering	MEC_DOC74025				

Objectives of class

1. Production and manufacturing of materials
This subject incorporates the solid state physics, chemical thermodynamics, and transport phenomena.
Students will learn coating process and properties of coated materials to improve performance of materials and to prepare solar cells, and so on. In addition, students will learn physical chemistry to produce steels and to use steels at high temperature.
2. Joining process
Students will learn principle and practical technique of newest joining process, especially, surface manufacturing process. This subject incorporates the mechanics, solid state physics, chemical thermodynamics, and transport phenomena.

Contents of class

1st week: Production and manufacturing of materials1 – Chemical thermodynamics for aqueous solution.(Izaki)
2nd week: Production and manufacturing of materials 2 – Solid state physics of inorganic thin solid film (electron theory).(Izaki)
3rd week: Production and manufacturing of materials 3 – Solid state physics of inorganic thin solid film (crystal).(Izaki)
4th week: Production and manufacturing of materials 4 – Preparation and application of inorganic thin solid film with the process of soft solution.(Izaki)
5th week: Production and manufacturing of materials 5 – Fundamentals and application of evaporation .(Yokoyama)
6th week: Production and manufacturing of materials 6 – Metallurgical reaction at high temperature.(Yokoyama)
7th week: Production and manufacturing of materials 7 – Iron and steel-making process.(Yokoyama)
8th week: Production and manufacturing of materials 8 – Resource and recycling.(Yokoyama)
9th week: Joining process 1 – Introduction. (Fukumoto)
10th week: Joining process 2 – Processing and its principle of Preparation of particle distributed composite. (Fukumoto)
11th week: Joining process 3 – Bulk joining process. (Fukumoto)
12th week: Joining process 4 – Frontier and new development of spray forming. (Fukumoto)
13th week: Joining process 5 – Introduction of surface process, PVD and CVD. (Yasui)
14th week: Joining process 6 – Fundamentals of PVD and CVD. (Yasui)
15th week: Joining process 6 – New development of PVD and CVD. (Yasui)
16th week: Writing reports

Self Preparation and Review

Review after every class, and read the text before next class.

Related subjects

Joining process, surface process engineering, materials science, Physical chemistry of materials.

Notes for textbook

Text will be distributed.

Reference1	**Book title**	Principles of Extractive Metallurgy			**ISBN**	0470115394
	Author	Rosenqvist	**Publisher**	Tapir Academic Press	**Publish year**	2006
Reference2	**Book title**	Growth and Transport in Nanostructured Materials: The Fundamentals of PVD, CVD and ALD			**ISBN**	3319246704
	Author	Angel Yanguas-Gil	**Publisher**	Springer	**Publish year**	2015
Reference3	**Book title**	Solid State Physics			**ISBN**	0123850304
	Author	Giuseppe Grosso,	**Publisher**	Academic	**Publish**	2013

		Giuseppe Pastori Parravicini		Press	**year**	

Notes for reference

Goals to be achieved

1) To understand crystal structure and electron state.
2) To understand evaporation pressure, activity, pH, electron potential.
3) To comprehend equilibrium and kinetics of reaction.
4) To comprehend urban mine and recycling.
5) To understand principles and mechanics on joining of metals and ceramics.
6) To understand principles, mechanics and characteristics of preparation process of thin and thick film.
7) To understand mechanical properties of composites
8) To understand how to vacuum and mean free path.
9) To understand generation of plasma and its application.

Evaluation of achievement

Each instructor will give students assignments. Average score is used for evaluation.

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

Examination

その他
Other

Details of examination

Other information

Reference URL

Office hours

Any time, but inform us your visit by e-mail before your visit.

Relations to attainment objectives of learning and education

A broad range of expertise and the ability to carry out technological development in materials and manufacturing.

Key words

thin solid film, coating, evaporation, activity, spray forming, transport phenomena, thermodynamics

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

Subject name[English]	Engineering of Intelligent Robotics[Engineering of Intelligent Robotics]				
Schedule number	D51030050	**Subject area**	Advanced Mechanical 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 Doctoral Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	佐藤 海二, 三好 孝典, 佐野 滋則, 真下 智昭 SATO Kaiji, MIYOSHI Takanori, SANO Shigenori, MASHIMO Tomoaki				
Numbering	MEC_DOC75025				

Objectives of class

Students will acquire the basic knowledge of mechanisms, actuators, measurement and control methods which are fundamental and useful for intelligent robots by taking this course

Contents of class

The following contents are provided;
1st week: Sensors and actuators 1
2nd week: Sensors and actuators 2
3rd week: Sensors and actuators 3
4th week: Report 1
5th week: Precision Motion Mechanisms – Basic mechanical characteristics
6th week: Precision Motion Mechanisms – Representative actuators
7th week: Precision Motion Mechanisms – Unique precision positioning systems
8th week: Report 2
9th week: Planer Kinematics of robot
10th week: Statics of robot
11th week: Dynamics of robot
12th week: Report 3
13th week: Modeling for robot system
14th week: System identification and validation
15th week:Observer and State Estimation
16th week: Report 4

Self Preparation and Review

Read the handouts before and after the lecture.

Related subjects

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

Notes for textbook

Handouts will be prepared.

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

Notes for reference

Goals to be achieved

(1) Understand sensors and actuators used for robotics
(2) Understand characteristics of components and their effective use in precision motion mechanisms
(3) Understand the kinematics and dynamics of robot
(4) Understand the basic of system identification

Evaluation of achievement

Report (100 %)

A：Score of the report is 80 or higher.
B：Score of the report is 65 or higher.
C：Score of the report is 55 or higher.

Examination

レポートで実施
By Report

Details of examination

Other information

Tomoaki Mashimo, D-611, 7242,mashimo@eiiris.tut.ac.jp
Shigenori Sano, D-407, 6677, sano@me.tut.ac.jp
Takanori Miyoshi, D-509, 6698, miyoshi@me.tut.ac.jp
Kaiji Sato, D-408, 6678, sato@me.tut.ac.jp

Reference URL

Basic knowledge on robotics and control are required.

Office hours

Contact the professors by e-mail first.

Relations to attainment objectives of learning and education

Key words

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

(D51030070)Advanced Energy Engineering[Advanced Energy Engineering]

Subject name[English]	Advanced Energy Engineering[Advanced Energy Engineering]				
Schedule number	D51030070	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Mechanical Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	鈴木 孝司, 中村 祐二 SUZUKI Takashi, NAKAMURA Yuji				
Numbering	MEC_DOC76025				

Objectives of class

The aim of the present lecture is to understand the basic equation governed by the reactive thermo-fluid system (known as "complex" physics), and how to simplify to predict the phenomena.

Contents of class

*Introduction : (2 weeks)
Classification of reactive thermo-fluid system
Analytical concept for multi-phase fluid system
Introduction of basic equation
Ways to a simplification
*Fundamental theory for Non-reacting, multi-phase flow system (4 week)
Physics on surface boundary
Instability analysis
Optical method for visualization
Dynamic behavior of droplets (break up, merging etc)
*Chemical reaction -reactive system without transport effect- (2 weeks)
Overview of fundamental idea of chemical reaction
equilibrium state
reaction rate expression, reaction model (simplified)
*Ignition theory -chemical system with simplified transport effect- (1 weeks)
Frank-Kamenetskii' s theory
*Premixed flame theory -chemical system with transport effect (1); chemical-controlled- (2 weeks)
Rankine-Hugoniot equation
Premixed flame structure (asymptotic analysis)
*Diffusion flame theory -chemical system with transport effect (2); transport-controlled- (2 weeks)
Mixture fraction analysis
Burke-Schumann flame theory
*Combustion modeling : (2 weeks)
Prediction of regression rate of solid propellant
Fire modeling
*Final Exam (1 week)

Self Preparation and Review

Students MUST be pre-studied the related area, especially for applied mathematics, fluid dynamics and thermodynamics (advance level is strongly preferred).

Related subjects

Applied mathematics, fluid dynamics, thermodynamics for advanced level.
Basic combustion (preferred)

Notes for textbook

Instructors will provide the materials, if necessary.

Reference1	**Book title**	The Molecular Theory of Gases and Liquids			**ISBN**	
	Author	J.O. Hirschfelder, C.F. Curtiss, R.B. Bird	**Publisher**	John Wiley and Sons	**Publish year**	1954
Reference2	**Book title**	Combustion Physics			**ISBN**	
	Author	C.K. Law	**Publisher**	Cambridge	**Publish year**	2006

				University Press		
Reference3	**Book title**	Combustion Theory			**ISBN**	
	Author	F.A. Williams	**Publisher**	Addison-Wesley	**Publish year**	1985

Notes for reference

[additional references]

- Fundamentals of Fire Phenomena／J.G. Quintiere：John Wiley and Sons, 2009
- Fundamental Aspects of Combustion／A. Linan & F.A. Williams：Oxford Univ. Press, 1993
- Combustion Analysis (in Japanese)／T. Niioka：Tohoku Univ. Press, 2003
- any textbook for applied math book dealing with asymptotic analysis (purturbation theory) is good to have in your hand

Goals to be achieved

The goal is to understand the combustion theory; learn one of effective ways to simplify the complex (multi-scale, multi-physics) problem.

Evaluation of achievement

50%: assignments (several assignments are requested during the term), 50%: final exam.

[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

定期試験を実施（対面）

Examination(Face to Face)

Details of examination

Final exam will be interview style (oral examination): it could be replaced to the written exam based on the judgement by instructor (mainly number of students are key to this judge)

Student can bring any printed items during the examination.

Detail will be announced in the class.

Other information

M/A

Reference URL

Office hours

Anytime when instructor is available: send mail to instructor to book your time for personal meeting

Relations to attainment objectives of learning and education

Key words

Reactive thermo-fluid analysis, Multi-scale and multi-physics problem

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering 2[Seminar on Electrical and Electronic Information Engineering 2]				
Schedule number	D52010020	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_DOC71015				

Objectives of class

The seminar aims to provide a broad understanding of theoretical and experimental approoches related to the electrical and electronic 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.

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

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering 3[Seminar on Electrical and Electronic Information Engineering 3]				
Schedule number	D52010030	**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)**	1
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	2～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	D2
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_DOC71015				

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.

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

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

Subject name[English]	Advanced Electronic Materials 1[Advanced Electronic Materials 1]				
Schedule number	D52030010	**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.4～4	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	福田 光男, 内田 裕久, 中村 雄一 FUKUDA Mitsuo, UCHIDA Hironaga, NAKAMURA Yuichi				
Numbering	ELC_DOC72025				

Objectives of class

Objective of this subject is to learn about the forefront research and development on spin electronics and photonics in electronic materials, materials processing, and thermoelectrics.

Contents of class

1. Photonics.
You will learn about optoelectronic materials and some typical device structures.
1) Light emitting device, 2) optical detector, 3) Optical modulator, 4)nanomaterial.

2. Spin electronics.
You will learn about advanced magnetic materials and area from fundamentals to applications of magnetics.
1) Magnetic materials, 2) Applications of magnetics and magnetic materials, 3) Correlations between spins and various physical quantities, 4) Micro-magnetic devices and systems, 5) Spintronics and spin photonics.

3. Caloritronics
You will learn about materials processing and thermoelectric conversion.
1) thermodynamics, 2) processing and 3) thermoelectrics

Self Preparation and Review

Related subjects

Notes for textbook

Lecture materials will be distributed.

Notes for reference

Goals to be achieved

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

Evaluation of achievement

The reports or tests will be set in each categories.
The result is evaluated from the sum of those marks.
Grades: A:80-100, B:65-79, C:55-64.

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Photonics: Mitsuo Fukuda: fukuda@ee.tut.ac.jp
Spin electronics: Hironaga Uchida: uchida@ee.tut.ac.jp
Caloritronics: Yuuichi Nakamura: nakamura@ee.tut.ac.jp

Reference URL
Office hours Please make an appointment via e-mail.
Relations to attainment objectives of learning and education
Key words spin electronics, photonics, processing, thermoelectrics.

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

Subject name[English]	Advanced Electrical Systems 2[Advanced Electrical Systems 2]				
Schedule number	D52030040	**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.2～2	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	須田　善行, 稲田　亮史, 村上　義信 SUDA Yoshiyuki, INADA Ryoji, MURAKAMI Yoshinobu				
Numbering	ELC_DOC73025				

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 sub courses 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 sub courses to choose from.

Contents of class

Sub Course 1(Y. Suda)
1. Fundamental concept of electrical energy engineering
2. Three-phase systems
3. Power electronics

Sub Course 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

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

Sub Course 1(Y. Suda)
1. Fundamental concept of electrical energy engineering
2. Three-phase systems
3. Power electronics

Sub Course 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

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

Self Preparation and Review

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

Marks are based on examinations(100%).

Marks are based on examinations(100%).

Examination

定期試験を実施(対面)

Examination(Face to Face)

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

(D52030050)Advanced Microelectronics 1[Advanced Microelectronics 1]

Subject name[English]	Advanced Microelectronics 1[Advanced Microelectronics 1]				
Schedule number	D52030050	**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.1～1	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	D1
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_DOC74025				

Objectives of class

From the viewpoint of deep understanding of advanced microelectronics, physics of semiconductors including material design and an example of latest device will be lectured.

From the viewpoint of deep understanding of advanced microelectronics, physics of semiconductors including material design and an example of latest device will be lectured.

Contents of class

a) Physics and Properties of Semiconductors
  Crystal growth and device processing
  Energy band engineering
    Alloy semiconductor
    Strain effect
    Superlattice
  Carrier transport phenomena
    Tummeling effect
b)Metal-Semiconductor Contacts
  Schottky barrier
  Current transport processes
  Ohmic contact

c) Integrated circuits
  device processing
  MEMS/NEMS
  Latest MOS FETs
  Current topics in IC/MEMS

a) Physics and Properties of Semiconductors
  Crystal growth and device processing
  Energy band engineering
    Alloy semiconductor
    Strain effect
    Superlattice
  Carrier transport phenomena
    Tummeling effect
b)Metal-Semiconductor Contacts
  Schottky barrier
  Current transport processes
  Ohmic contact

c) Integrated circuits
  device processing
  MEMS/NEMS
  Latest MOS FETs
  Current topics in IC/MEMS

Self Preparation and Review

Related subjects

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

Semiconductor Physics, Master course
The basic knowledge on the quantum mechanics, thermodynamics, and electronics are desirable.

Semiconductor Physics, Master course

Notes for textbook

Physics of Semiconducotr Devices
S.M.Sze, Willy
Physics of Semiconducotr Devices
S.M.Sze, Willy

Notes for reference

Goals to be achieved

(1) To understand fundamental aspects on microelectronics, and physics of semiconductors including material design.
(2) To get the knowledge on the latest technologies on microelectronics.
(1) To understand fundamental aspects on microelectronics, and physics of semiconductors including material design.
(2) To get the knowledge on the latest technologies on microelectronics.

Evaluation of achievement

Reports (100%)
Reports (100%)

Examination

レポートで実施
By Report

Details of examination

Other information

K. Sawada (C-605)
sawada@ee.tut.ac.jp
ext. 6739
Y. Ishikawa (C-607)
ishikawa@ee.tut.ac.jp
ext. 6741
H. Sekiguchi (C-610)
sekiguchi@ee.tut.ac.jp
ext. 6744
K. Takahashi (C-606)
takahashi@ee.tut.ac.jp
ext. 6740
K. Sawada (C-605)
sawada@ee.tut.ac.jp
ext. 6739
Y. Ishikawa (C-607)
ishikawa@ee.tut.ac.jp
ext. 6741
H. Sekiguchi (C-610)
sekiguchi@ee.tut.ac.jp
ext. 6744
K. Takahashi (C-606)
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)
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.
book an apopintment by e-mail, phone, etc.

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Advanced Information and Communication Systems 1[Advanced Information and Communication Systems 1]				
Schedule number	D52030070	**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.2～2	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Electrical and Electronic Information Engineering			**Beggining grade**	D1
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_DOC75025				

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

Related subjects

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

Course 2:
The students who will take this course are supposed to have sufficient knowledge about the following; wireless digital modulation and demodulation, radio propagation characteristic, signal processing, probability, random variables and stochastic process.

Course 3:
Basic understanding on modulation/demodulation, signal processing, probability theory, and information theory are prerequisite.

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

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

Other information

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

Reference URL

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

Office hours

Appoint a time slot via email

Relations to attainment objectives of learning and education

Key words

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

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

Subject name[English]	Seminar on Computer Science and Engineering 1[Seminar on Computer Science and Engineering 1]				
Schedule number	D53010010	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	S3系教務委員, S3系教務委員－23kei kyomu Iin-S, 3kei kyomu Iin-S2				
Numbering	CMP_DOC71015				

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

Key words

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

Subject name[English]	Seminar on Computer Science and Engineering 2[Seminar on Computer Science and Engineering 2]				
Schedule number	D53010020	**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)**	1
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	2～
Department Offered	Computer Science and Engineering			**Beggining grade**	D2
Charge teacher name[Roman alphabet mark]	S3系教務委員, S3系教務委員－23kei kyomu Iin-S, 3kei kyomu Iin-S2				
Numbering	CMP_DOC71015				

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

Key words

(D53030090)Molecular Simulation[Molecular Simulation]

Subject name[English]	Molecular Simulation[Molecular Simulation]				
Schedule number	D53030090	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.5～5	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	後藤　仁志 GOTO Hitoshi				
Numbering	CMP_DOC73125				

Objectives of class

The objective of this class is to understand chemical, molecular biological and biophysical phenomena that can be solved by molecular simulation technologies.
In achieving this objective, students will be required to attempt to acquire the elementary concepts in molecular mechanics (MM) method, molecular dynamics (MD) method, molecular orbital (MO) method, and will learn about thermodynamic and electronic properties of small molecules (drug candidate compunds and organic materials) and biopolymers (proteins, RNA and DNA).

Contents of class

Considering the preliminary knowledge of the participates in this class, some topics from the following things will be chosen to be learned.
(1) Outline of molecular simulation (1st week)
(2) Molecular mechanics (MM) method and local/grobal minimum search method (2nd and 3rd weeks)
(3) Molecular dynamics (MD) method and motion equation (4th and 5th weeks)
(4) Basis of quantum chemistry and molecular orbital (MO) method (6th, 7th and 8th weeks)
(5) Stereochemistry, statistical thermodynamics and measurement techniques (9th week)
(6) Analyses of chemical reaction and crystal structure of organic molecules (10 and 11th weeks)
(7) Biopolymer simulations and bioinformatics (12th and 13rd weeks)
(8) Chemoinformatics (machine learning) and molecular design theory (14th and 15th weeks)

Self Preparation and Review

Related subjects

Notes for textbook

documents distributed

Reference1	**Book title**	Introduction to Computational Chemistry, 3nd Ed.			**ISBN**	978-1118825990
	Author	Frank Jensen	**Publisher**	Wiley	**Publish year**	2016

Notes for reference

Goals to be achieved

The objective of this class is to understand chemical, molecular biological and biophysical phenomena that can be solved by molecular simulation technologies.

Evaluation of achievement

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

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

Examination

レポートで実施

By Report

Details of examination

Other information

Contact: F-307, {gotoh}@tut.jp

Reference URL

under construction

Office hours

Please check the schedule by E-mail in advance.

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, understanding the methodology of research, creating original technology, and integrating all knowledges organically

Key words

Molecular Mechanics, Molecular Dynamics, Quantum Chemistry, Quantum Mechanics, Chemoinformatics

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

Subject name[English]	Web Data Engineering, Advanced 1[Web Data Engineering, Advanced 1]				
Schedule number	D53030150	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	青野　雅樹 AONO Masaki				
Numbering	CMP_DOC72425				

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

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。

A: 80 点以上, B: 65 点以上, C: 55 点以上

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

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

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

Examination

定期試験を実施（対面）

Examination(Face to Face)

Details of examination

Other information

C-511、TEL: 6764, Email: aono@tut.jp

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

Reference URL

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

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

Office hours

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

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

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

Subject name[English]	Biological Information System Engineering 1[Biological Information System Engineering 1]				
Schedule number	D53030170	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring1 term	**Day of the week,period**	Mon.4～4	**Credit(s)**	1
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	福村　直博 FUKUMURA Naohiro				
Numbering	CMP_DOC73025				

Objectives of class

巧みな運動を実現する生体の情報処理メカニズムの理解のための計算論的なアプローチの手法を理解する。

This course lectures on advanced studies on information processing in the nervous systems and computational models for motor controls of the human movements.

Contents of class

1．運動情報処理システムのイントロダクション
　運動制御への計算論的アプローチ
2．運動制御の処理システム、筋肉、運動神経
3−4．ヒト腕運動の学習制御モデル
5−6．ヒト腕運動の運動計画モデル
7．ヒトの把持運動モデル
8．定期試験

1. Introduction to the computational neuroscience in the motor control system
2. Information processing in the motor system of the brain
3-4. Motor control models of the human arm movements
5-6. Models for motor planning in the human arm movements
7. Models for motor planning in the human hand movements
8. Examination

Self Preparation and Review

講義資料を事前に Dream Campus にて公開するので、講義当日までにダウンロードしておくこと。

Lecture material is disclosed to Dream Campus system beforehand.

Related subjects

視覚認知科学特論（博士前期）、システム・知能科学特論（博士前期）

Visual Perception and Cognition, Advanced System and Knowledge Scieces

Notes for textbook

講義資料を事前に Dream Campus にて公開するので、講義当日までにダウンロードしておくこと。

Lecture material is disclosed to Dream Campus system beforehand, so you should download it.

Reference1	**Book title**	Human motor control		**ISBN**	0123742269
	Author	David A. Rosenbaum	**Publisher** Academic	**Publish year**	2010

Notes for reference

Goals to be achieved

1） 脳機能を明らかにするための計算論的なアプローチの手法を理解する
2） ヒトの滑らかな運動を実現する情報処理システムや学習機能について理解する

1） Understand the method of computational approach to reveal brain function
2） Understand the information processing system and learning function to achieve a skillful movement of the human

Evaluation of achievement

レポート 50%　最終日のプレゼンテーション 50%　左記の割合で総合的に評価する

A：達成目標をすべて達成しており，かつテスト・レポートの合計点（100 点満点）が 80 点以上
B：達成目標を〇%達成しており，かつテスト・レポートの合計点（100 点満点）が 65 点以上
C：達成目標を〇%達成しており，かつテスト・レポートの合計点（100 点満点）が 55 点以上

Report 50% Final presentation 50%, A: 100-80, B: 79-65, C: 64-55, D (fail): 54-0
Students who attend all classes will be evaluated as follows:
A: Achieved all goals and obtained total point of report and final presentation, 80 or higher (out of 100 points).
B: Achieved 85 % of goals and obtained total point of report and final presentation, 65 or higher (out of 100 points).
C: Achieved 70 % of goals and obtained total point of report and final presentation, 55 or higher (out of 100 points).

Examination
レポートで実施
By Report

Details of examination

Other information

Reference URL

Office hours
Monday 16:20-17:50
Monday 16:20-17:50

Relations to attainment objectives of learning and education

Key words
生体情報、運動情報処理、ニューラルネットワーク、計算論
Biological information, Motor Control System, Neural network, Computational theory

(D53030230)Advanced Statistical Natural Language Processing[Advanced Statistical Natural Language Processing]

Subject name[English]	Advanced Statistical Natural Language Processing[Advanced Statistical Natural Language Processing]				
Schedule number	D53030230	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	秋葉 友良 AKIBA Tomoyoshi				
Numbering	CMP_DOC72525				

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

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

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

Other information

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

Reference URL

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

Office hours

16:25-17:40, Tuesday and Wednesday

Relations to attainment objectives of learning and education

Key words

spoken language processing, natural language processing, human language technology

(D53030240)Computers and Education, Advanced[Computers and Education, Advanced]

Subject name[English]	Computers and Education, Advanced[Computers and Education, Advanced]				
Schedule number	D53030240	**Subject area**	Advanced Computer Science and Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Mon.5～5	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Computer Science and Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	河合　和久 KAWAI Kazuhisa				
Numbering	CMP_DOC72025				

Objectives of class

The purpose of the class is to deepen and broaden students' knowledge of their own expertise in relation to the society in learning about computers and technology in education.

The purpose of the class is to deepen and broaden students' knowledge of their own expertise in relation to the society in learning about computers and technology in education.

Contents of class

Students will be offered some overviews of computers and education. Students will give some presentations on the following problems: (1) to make the teaching plan of their own research subjects for pupils or junior high school students, (2) to make a simulated class based on the plan, (3) to discuss the simulated class. At the end of term, students are required to submit an essay on computers and education.

1.Guidance, Lecture#1(Introduction to subject "Information".)
2.Lecture#2(Computer system for education. and Software as course material.)
3.Lecture#3(Cooperation with the period of integrated study.)
4.Lecture#4(Simulated class: plan and evaluation.)
5.Lecture#5(Keep an "Information" teacher. and Teaching plan.)
6.Lecture#6(Information sending and presentation.)
7.Lecture#7(Group work by collaboration and presentation.)
8.Lecture#8(Media literacy., Information ethics education. and Network.)
9.Presentations of Teaching Plans #1
10.Presentations of Teaching Plans #2
11.Lecture#9(Expression of information and multimedia. and Topics in information society.)
12.Lecture#10(Algorithm and programming. and Information retrieval and database.)
13.Simulated Classes #1
14.Simulated Classes #2
15.Simulated Classes #3
16.Presentations of Final Reports

Students will be offered some overviews of computers and education. Students will give some presentations on the following problems: (1) to make the teaching plan of their own research subjects for pupils or junior high school students, (2) to make a simulated class based on the plan, (3) to discuss the simulated class. At the end of term, students are required to submit an essay on computers and education.

1.Guidance, Lecture#1(Introduction to subject "Information".)
2.Lecture#2(Computer system for education. and Software as course material.)
3.Lecture#3(Cooperation with the period of integrated study.)
4.Lecture#4(Simulated class: plan and evaluation.)
5.Lecture#5(Keep an "Information" teacher. and Teaching plan.)
6.Lecture#6(Information sending and presentation.)
7.Lecture#7(Group work by collaboration and presentation.)
8.Lecture#8(Media literacy., Information ethics education. and Network.)

9.Presentations of Teaching Plans #1
10.Presentations of Teaching Plans #2
11.Lecture#9(Expression of information and multimedia. and Topics in information society.)
12.Lecture#10(Algorithm and programming. and Information retrieval and database.)
13.Simulated Classes #1
14.Simulated Classes #2
15.Simulated Classes #3
16.Presentations of Final Reports

Self Preparation and Review

Students are required to solve the problems mentioned above.

Students are required to solve the problems mentioned above.

Related subjects

Notes for textbook

Students will be offered some overviews of "JOUHOUKA KYOUIKUHOU" (the following reference) using WWW.
Students will be offered some overviews of "JOUHOUKA KYOUIKUHOU" (the following reference) using WWW.

Reference1	**Book title**	JOUHOUKA KYOUIKUHOU (KAITEI SAN-HAN) *** in JAPANESE ***			**ISBN**	978-4-274-21920-7
	Author	Yasushi Kuno, et al.	**Publisher**	OHM-SHA	**Publish year**	2016

Notes for reference

Goals to be achieved

At the end of the course, students will be able to deepen and broaden students' knowledge of their own expertise in relation to the society, and to represent them using computers and technology in education.

At the end of the course, students will be able to deepen and broaden students' knowledge of their own expertise in relation to the society, and to represent them using computers and technology in education.

Evaluation of achievement

Written reports 50%, In class work 50%.
Written reports 50%, In class work 50%.

Examination

授業を実施
Regular Class

Details of examination

Other information

Reference URL

http://www.ita.cs.tut.ac.jp/~kawai/kpe/ (Some pages are written in Japanese.)

http://www.ita.cs.tut.ac.jp/~kawai/kpe/ (Some pages are written in Japanese.)

Office hours

Office hours; Wednesday 2nd period and Friday 2nd period in Room F1-206.

Office hours; Wednesday 2nd period and Friday 2nd period in Room F1-206.

Relations to attainment objectives of learning and education

Key words

Informatics, Computer Literacy, Scientific Communication.
Informatics, Computer Literacy, Scientific Communication.

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

Subject name[English]	Seminar on Environmental & Life Sciences 2[Seminar on Environmental & Life Sciences 2]				
Schedule number	D54010020	**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)**	1
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	2～
Department Offered	Environmental and Life Sciences			**Beggining grade**	D2
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	ELC_DOC71015				

Objectives of class

This course will provide the students with opportunities to study on his/her research subjects on advanced environmental and life sciences by reading scientific papers under the guidance of his/her supervisor. The aim of the lessen for the students is to expand the knowledge and presentation skills acquired in Seminar on Environmental and Life Science 1.

Contents of class

The students will be required to read scientific papers written by other language than Japanese, especially English, which are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.

Self Preparation and Review

Related subjects

Seminar on Environmental & Life Sciences 1
All other relevant subjects in Advanced Environmental and Life Sciences

Notes for textbook

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

Notes for reference

Goals to be achieved

To acquire advanced knowledge on environmental and life sciences
To understand the contents of scientific papers in a given field of environmental and life sciences
To be able to make oral and poster presentations relevant to papers he/she has read.

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.

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

Key words

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

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

Subject name[English]	Advanced Environmental Technology 1[Advanced Environmental Technology 1]				
Schedule number	D54030010	**Subject area**	Advanced Applied Chemistry and Life Science	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Environmental and Life Sciences			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	髙島 和則 TAKASHIMA Kazunori				
Numbering	ENV_DOC74225				

Objectives of class

This course will provide students with the opportunity to study on his/her research subject in electrostatics, discharge plasma and their relation with environmental technology 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 in English 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

Notes for textbook

Notes for reference

Goals to be achieved

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

試験期間中には何も行わない
None during exam period

Details of examination

Other information

TAKASHIMA: Room: G-504, Phone: 6919, E-mail: takashima@ens.tut.ac.jp

Reference URL

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

Office hours

Relations to attainment objectives of learning and education

Key words

(D54030030)Advanced Ecological Engineering[Advanced Ecological Engineering]

Subject name[English]	Advanced Ecological Engineering[Advanced Ecological Engineering]				
Schedule number	D54030030	**Subject area**	Advanced Applied Chemistry and Life Science	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Environmental and Life Sciences			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	中野 裕美, 大門 裕之, 東海林 孝幸 NAKANO Hiromi, DAIMON Hiroyuki, TOKAIRIN Takayuki				
Numbering	ENV_DOC74225				

Objectives of class

The course provides students with the opportunity to improve their level in the skills(reading, writing, presentation) through reading current research articles.

The course provides students with the opportunity to improve their level in the skills(reading, writing, presentation) through reading current research articles.

Contents of class

1. Students have to select at least three articles in the field of one of professors.
Three weeks/professor & one week
2. Students prepare both reports and present slides.
3. The key words will be given at the first class.

1. Students have to select at least three articles in the field of one of professors.
Three weeks/professor & one week
2. Students prepare both reports and present slides.
3. The key words will be given at the first class.

Self Preparation and Review

Related subjects

Knowledge of environmental chemistry, chemical engineering and materials science is desirable.

Knowledge of environmental chemistry, chemical engineering and materials science is desirable.

Notes for textbook

Notes for reference

Goals to be achieved

To improve presentation skills(writing of reports and preparing of slides).

To improve presentation skills(writing of reports and preparing of slides).

Evaluation of achievement

30% Report, 70% Presentation(30-45 min)

30% Report, 70% Presentation(30-45 min)

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

Anytime, but reservation is desirable.

Anytime, but reservation is desirable.

Relations to attainment objectives of learning and education

Key words
environmental chemistry, chemical engineering, materials science, sustainable engineering
environmental chemistry, chemical engineering, materials science, sustainable engineering

(D54030040)Advanced Biotechnology 1[Advanced Biotechnology 1]

Subject name[English]	Advanced Biotechnology 1[Advanced Biotechnology 1]				
Schedule number	D54030040	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Fri.2～2	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Environmental and Life Sciences			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	浴 俊彦, 田中 照通, 中鉢 淳 EKI Toshihiko, TANAKA Terumichi, NAKABACHI Atsushi				
Numbering	ENV_DOC73225				

Objectives of class

This course will provide the students with the opportunity to study on advanced life sciences (e.g., genomics, molecular genetics, microbiology, and biotechnology).

Contents of class

In this course, the students will be expected to read several papers on the current progress in advanced life science (e.g., genomics, molecular genetics, microbiology, and biotechnology) to understand the frontier of these scientific fields. This course will be given by three instructors as described below (Eki, Tanaka, and Nakabachi).

1st~5th week: Genome and gene sciences (Dr. T. Eki)
6th~10th week: Genetic and Protein engineering (Dr. T. Tanaka)
11th~15th week: Animal-microbe symbioses (Dr. A. Nakabachi)

Self Preparation and Review

Related subjects

The knowledge of basic molecular biology and biochemistry is absolutely essential.

Notes for textbook

Papers and references will be given by each instructor in the course.

Notes for reference

Goals to be achieved

To understand the current status in advanced life sciences including genomics, molecular genetics, microbiology and biotechnology by summarizing, and making presentations and/or reports.

Evaluation of achievement

Grades for the course will be based on the average of the subject scores (by Eki, Tanaka, and Nakabachi).

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

Examination

試験期間中には何も行わない
None during exam period

Details of examination

Other information

Dr. Toshihiko Eki: Room: G-505, Phone: 6907, E-mail: eki@ens.tut.ac.jp
Dr. Terumichi Tanaka: Room: G-506. Phone: 6920, E-mail: terumichi-tanaka@tut.jp
Dr. Atsushi Nakabachi: Room: G-502, Phone: 6901, E-mail: nakabachi@eiiris.tut.ac.jp

Reference URL

Office hours

Please make an appointment.

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Advanced Molecular Function Chemistry 1[Advanced Molecular Function Chemistry 1]				
Schedule number	D54030060	**Subject area**	Advanced Applied Chemistry and Life Science	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.1～1	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Environmental and Life Sciences			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	伊津野　真一, 岩佐　精二, 柴富　一孝, 原口　直樹 ITSUNO Shinichi, IWASA Seiji, SHIBATOMI Kazutaka, HARAGUCHI Naoki				
Numbering	ENV_DOC72225				

Objectives of class

This course focuses on state-of-the-art technology of functional polymers and synthesis as for bioactive organic compounds. Synthesis and various applications of the functional polymers and bioactive organic compounds will be discussed.

Contents of class

(1) General aspects of functional polymers (Itsuno, Haraguchi)
(2) Precise molecular design of functional polymers(Itsuno, Haraguchi)
(3) Preparation of highly functionalized polymers(Itsuno, Haraguchi)
(4) Reactive polymer synthesis(Itsuno, Haraguchi)
(5) Optically active polymers(Itsuno, Haraguchi)
(6) Asymmetric synthesis and polymerization(Itsuno, Haraguchi)
(7) Synthesis and structure-function relationship of biobased and biodegradable polymers(Itsuno, Haraguchi)
(8) Bioactive natural products (Iwasa)
(9) Total synthesis of natural products (Iwasa)
(10) Transition metal complexes and 18 electron rule (Iwasa)
(11) Chiral catalysts and their applications (S. Iwasa)
(12) Advanced Lewis acid catalysis. (Shibatomi)
(13) Advanced organocatalysis. (Shibatomi)
(14) Asymmetric synthesis of halogenated compounds and their synthetic applications. (Shibatomi)
(15) Advanced organofluorine chemistry (Shibatomi)

Self Preparation and Review

Related subjects

D34030060 Advanced Molecular Function Chemistry 1
M44630100 Special Topics in Applied Organic Chemistry
M24630460 応用有機化学特論

Notes for textbook

No textbooks are required.

Notes for reference

Goals to be achieved

To understand the latest trend of the research on functional polymers.
To understand the latest trend of the research on total synthesis of natural products and their synthetic methods.

Evaluation of achievement

Presentation (50%) and discussion (50%)
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

S. Itsuno: itsuno@ens.tut.ac.jp 6813 (office: B-502)
N. Haraguchi: haraguchi@ens.tut.ac.jp 6812 (office: B-403)
S. Iwasa: office:B-506, tel: 6817, email: iwasa@ens.tut.ac.jp
K. Shibatomi: shiba@ens.tut.ac.jp (room: B-507)

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

Key words

functional polymer, asymmetric catalyst, transition metal, organocatalyst, Lewis acid, fluorine

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

Subject name[English]	Seminar on Architecture and Civil Engineering 1[Seminar on Architecture and Civil Engineering 1]				
Schedule number	D55010010	**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)**	4
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_DOC71015				

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

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

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

Subject name[English]	Seminar on Architecture and Civil Engineering 2[Seminar on Architecture and Civil Engineering 2]				
Schedule number	D55010020	**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)**	1
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	2～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	D2
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin-S				
Numbering	ARC_DOC71015				

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

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

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

Subject name[English]	Advanced Building Environmental Engineering and Building Services[Advanced Building Environmental Engineering and Building Services]				
Schedule number	D55030030	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Mon.5～5	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	都築　和代 TSUZUKI Kazuyo				
Numbering	ARC_DOC71025				

Objectives of class

The goal of this course is to help professionals update related to the recent research and development on life cycle assessment (LCA) for buildings, environmental symbiotic technologies, climatic building design and urban energy management.

Contents of class

The course consists of the following topics.
1. Buildings and its Impact on the Global Environment
2. Impact Assessment indices for Buildings
3. Life Cycle Inventory for Buildings
4. Overview of CASBEE
5. Environmental Symbiotic Technologies (1)
6. Environmental Symbiotic Technologies (2)
7. Ecological Building Design (1)
8. Ecological Building Design (2)
9. Climatic Building Design (1)
10. Climatic Building Design (2)
11. Sustainable Building Design (1)
12. Sustainable Building Design (2)
13. Energy and Buildings (1)
14. Energy and Buildings (2)
15. Compact city –urban energy management–

Self Preparation and Review

The course materials such book chapter or academic paper related to this course will be appeared or provided at the first class or orientation.

Related subjects

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

Notes for textbook

The related handouts will be distributed.

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

Notes for reference

Goals to be achieved

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

Evaluation of achievement

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

Examination

レポートで実施
By Report

Details of examination

Other information

Kazuyo Tsuzuki: D-711, Phone: 0532-44-6839, Fax: 0532-44-6831, E-mail: ktsuzuki@ace.tut.ac.jp

Reference URL

Office hours

Kazuyo Tsuzuki: Thurdsday 13:00-14:30

Relations to attainment objectives of learning and education

Key words

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

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

Subject name[English]	Advanced Transportation Systems and Economics[Advanced Transportation Systems and Economics]				
Schedule number	D55030090	**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 Doctoral Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	宮田 譲, 渋澤 博幸, 杉木 直 MIYATA Yuzuru, SHIBUSAWA Hiroyuki, SUGIKI Nao				
Numbering	ARC_DOC71025				

Objectives of class

To obtain the advanced knowledge of theories and methods for policies and planning for the environment, cities, regions and transportation.

To obtain the advanced knowledge of theories and methods for policies and planning for the environment, cities, regions and transportation.

Contents of class

By using books, reports and papers on the environment, cities, regions and infrastructure, students learn the advanced transportation systems and transportation economics. Discussion between the lecturer and students will be performed in the lecture time.

By using books, reports and papers on the environment, cities, regions and infrastructure, students learn the advanced transportation systems and transportation economics. Discussion between the lecturer and students shall be performed in the lecture time.

Self Preparation and Review

Related subjects

Transportation systems
Analysis of environmental economics
Policy for industry
Econometrics
Transportation systems
Analysis of environmental economics
Policy for industry
Econometrics

Notes for textbook

Textbooks and scientific papers will be announced at the start of the class.

Textbooks and scientific papers will be announced at the start of the class.

Notes for reference

Goals to be achieved

1.To understand the necessity and significance of policy and planning for the environment, cities, regions and infrastruncure.
2.To understand the concept of policy and planning for the above mentioned fields.
3.To undestand methodologies in the above mentioned fields.

1.To understand the necessity and significance of policy and planning for the environment, cities, regions and infrastruncure.

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

Evaluation of achievement

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

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

Examination

レポートで実施

By Report

Details of examination

Other information

Miyata: room(D-806), miyata@ace.tut.ac.jp, phone: 0532-44-6963
Shibusawa: room(B-409), hiro-shibu@tut.jp, phone: 0532-44-6955
Sugiki: room(D-705), sugiki@ace.tut.ac.jp, phone: 0532-44-6833
Miyata: room(D-806), miyata@ace.tut.ac.jp, phone: 0532-44-6963
Shibusawa: room(B-409), hiro-shibu@tut.jp, phone: 0532-44-6955
Sugiki: room(D-705), sugiki@ace.tut.ac.jp, phone: 0532-44-6833

Reference URL

Miyata：http://pm.hse.tut.ac.jp/kakenA/
Shibusawa: http://www.pm.ace.tut.ac.jp
Sugiki： https://sites.google.com/site/trlabotut/home-en
Miyata：http://pm.hse.tut.ac.jp/kakenA/
Shibusawa: http://www.pm.ace.tut.ac.jp
Sugiki： https://sites.google.com/site/trlabotut/home-en

Office hours

Yuzuru Miyata: 16:00-17:00 in every Tuesday
Nao Sugiki: At any time. Please contact Sugiki by e-mail in advance.
Yuzuru Miyata: 16:00-17:00 on every Tuesday

Relations to attainment objectives of learning and education

Key words

planning process, social & economic evaluation method, forecasting models
planning process, social & economic evaluation method, forecasting models

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

Subject name[English]	Advanced Management of Technology[Advanced Management of Technology]				
Schedule number	D55030110	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Tue.5～5	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	藤原 孝男, 渋澤 博幸 FUJIWARA Takao, SHIBUSAWA Hiroyuki				
Numbering	ARC_DOC71025				

Objectives of class

The main objective is to understand the function of technological entrepreneurship for commercialization of basic research results from a perspective of financial engineering.
Especially the decision-making model is examined for irreversible investment under uncertainty(Fujiwara).

In this course, students learn the regional and urban economic modeling techniques and the urban and regional policy evaluation methodology(Shibusawa).

Contents of class

Fujiwara
From a view point regarding the technological development as risky but competitive investment, this class has following topics:
1-2:Technological entrepreneurship
3-5:Investment decision
6-8:Basic real options
9-11:Optio valuation methods
12-15:Application and cases

For each week class discussion, self-preview & review are expected.

Shibusawa
1-2:Urban and Regional Policy and Evaluation
3-5:Modeling of the Urban and Regional Economic Systems
6-8:Policies and the Evaluation Methodology
9-11:Evaluation Techniques and Tools
12-13:Case Studies of the urban and regional policy
14-15:Evaluating Case Studies

Self Preparation and Review

Related subjects

Fujiwara
Management Science (English), Operations Management (Japanese), Real Options (Japanese), Game Theory (Japanese), Finance (Japanese), & Entrepreneurship (Japanese),

Shibusawa
Economics, Policy, Simulation

Notes for textbook

Fujiwara
Studying materials will be introduced at first class time.

Shibusawa
Papers will be distributed.

Notes for reference

Goals to be achieved

Fujiwara

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

Shibusawa
Advanced Urban and Regional Economics
Advanced Economic Simulation Model
Policy Evaluation Methodology

Evaluation of achievement

Fujiwara
Evaluation method: Scoring is based on reports .
Evaluation criteria:
Ph.D 1st year S: 90 or higher, A: 80 or higher, B: 70 or higher, C: 60 or higher (Maximum scoring 100).
The other students A: 80 or higher, B: 65 or higher, C: 55 or higher (Maximum scoring 100).

Shibusawa
Policy evaluation reports must be submitted.
A: 80 Points or higher, B: 65 points or higher, C:55 points or higher, D: Less than 55 points

Examination

レポートで実施
By Report

Details of examination

Other information

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

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

Reference URL

Office hours

Fujiwara
Anytime if available.

Shibusawa
Tuesday 10:00-12:00

Relations to attainment objectives of learning and education

Key words

Real Options, Game Theory, & Technological Entreprneurship

(D55030130)Advanced Western Culture[Advanced Western Culture]

Subject name[English]	Advanced Western Culture[Advanced Western Culture]				
Schedule number	D55030130	**Subject area**	Advanced Architecture and Civil Engineering	**Required or elective**	Elective
Time of starting a course	Spring term	**Day of the week,period**	Fri.2～2	**Credit(s)**	2
Faculty	Graduate Program for Doctoral Degree			**Subject grade**	1～
Department Offered	Architecture and Civil Engineering			**Beggining grade**	D1
Charge teacher name[Roman alphabet mark]	相京　邦宏 AIKYO Kunihiro				
Numbering	ARC_DOC71025				

Objectives of class

Research on a history of scientific ideas in the ancient world.
Research on a history of scientific ideas in the ancient world.

Contents of class

Lecture on a view of nature and science in the ancient world.
Modern scinece and ancient 'science'. What are similarities or differneces between the two?

Program of lecture

1. Orientation(outline of the lecture)
2. Purpose of the Series
3. Science in Antiquity?
4. Modern Science 1
5. Modern Science 2
6. History and Philosophy
7. Building Histories 1
8. Building Histories 2
9. Building Histories 3
10. Intellectual Paternities 1
11. Intellectual Paternities 2
12. Selective Survival of Texts
13. Resources for History 1
14. Resources for History 2
15. Summery of the lecture

Lecture on a view of nature and science in the ancient world.
Modern scinece and ancient 'science'. What are similarities or differneces between the two?

Program of lecture

1. Orientation(outline of the lecture)
2. Purpose of the Series
3. Science in Antiquity?
4. Modern Science 1
5. Modern Science 2
6. History and Philosophy
7. Building Histories 1
8. Building Histories 2
9. Building Histories 3
10. Intellectual Paternities 1
11. Intellectual Paternities 2
12. Selective Survival of Texts
13. Resources for History 1
14. Resources for History 2
15. Summery of the lecture

Self Preparation and Review

Preparation & review of text
Preparation & review of text

Related subjects

Notes for textbook

Notes for reference

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

Goals to be achieved

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

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

Evaluation of achievement

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

Examination

レポートで実施
By Report

Details of examination

Other information

Reference URL

Office hours

pm. 1-4(Wednesday)

pm. 1-4(Wednesday)

Relations to attainment objectives of learning and education

Key words

ancient, science, history
ancient, science, history