# Syllabus

# International Master's Degree Program (2015-Spring Term)

#### (M40030010)Management Science[Management Science]

Subject name[English]	Management Science[Management Science]						
Schedule number	M40030010	Subject area	General	Required or	Elective		
			courses	elective			
Time of starting a course	Spring term	Day of the	Thu.2~2	Credit(s)	2		
		week,period					
Faculty	Graduate Progr	am for Master's Degre	e	Subject grade	1~2		
Department Offered	Common			Beggining grade	M1, M2		
Charge teacher name[Roman	宮田 譲,藤原	孝男 MIYATA Yuzuru	, FUJIWARA Tal	kao			
alphabet mark]							
Numbering							

#### **Objectives of class**

In Management Science 1, the class objective is to learn the introductory finance on the firm value and capital cost from the management point of view.

In Management Science 2, the lecture will focus on the statistical methodology frequently applied in management science. In particular, multivariate analysis will be emphasized in the lecture.

In addition, this subject is lectured in English for foreign students in English course.

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In Management Science 2, the lecture will focus on the statistical methodology frequently applied in management science. In particular, multivariate analysis will be emphasized in the lecture.

In addition, this subject is lectured in English for foreign students in English course.

#### Contents of class

In Management Science 1, the class content will be explained about the fundamental ideas of pricing options in financial derivatives, based on the basic probability, normal random variables, geometric Brownian motion, interest rate, arbitrage, Black-Scholes formula, valuing by expected utility, exotic options, and so on. Materials are provided by Moodle. 8th week will be examination.

our week will be exa

1)Probability

2)Normal Random Variables

3)Geometric Brownian Motion

4)Interest Rates and Present Value

5)Pricing Contracts via Arbitrage

6)Arbitrage Theorem

7)Black-Scholes Model

8)Examination

In Management Science 2, the lecture includes mathematical expression of multivariate statistical data, multivariate regression analysis, principal component analysis, and so on.

The handout will be distributed to students. Students must learn the contents of the handout before and after each lecture. In Management Science 1, the class content will be explained about the fundamental ideas of pricing options in financial derivatives, based on the basic probability, normal random variables, geometric Brownian motion, interest rate, arbitrage, Black-Scholes formula, valuing by expected utility, exotic options, and so on. Materials are provided by Moodle. 8th week will be examination.

1)Probability

2)Normal Random Variables

3)Geometric Brownian Motion

4)Interest Rates and Present Value

5)Pricing Contracts via Arbitrage

6)Arbitrage Theorem

7)Black-Scholes Model

8)Examination

In Management Science 2, the lecture includes mathematical expression of multivariate statistical data, multivariate regression analysis, principal component analysis, and so on.

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Related subjects	
-	hnology, Modeling Regional Environment, Industrial Policies, Advanced Computational Economics hnology, Modeling Regional Environment, Industrial Policies, Advanced Computational Economics
Notes for textbook	
In Management Scie	nce 1: Sheldon M. Ross, An Introduction to Mathematical Finance, Cambridge University Press, 1999.
(Reference)	
1st part: David G. L	uenberger, Investment Science, Oxford University Press, 1998.
0	ence 2, the lecture materials will be distributed to students at the class. Ence 1: Sheldon M. Ross, An Introduction to Mathematical Finance, Cambridge University Press, 1999.
(Reference)	
1st part: David G. L	uenberger, Investment Science, Oxford University Press, 1998.
In Management Scie <b>Notes for reference</b>	nce 2, the lecture materials will be distributed to students at the class.
Goals to be achieve	-
	nathematical finance theory and multivariate analysis.
	nathematical finance theory and multivariate analysis.
Evaluation of achiev	
In Management Scie	nce 1, scoring assignment will consist of term examination 80% and reports 20%.
In Management Scie	ence 2, students will be evaluated by a term report on the lecture (100%).
	since 1, scoring assignment will consist of term examination $80\%$ and reports $20\%$ .
In Management Scie	ence 2, students will be evaluated by a term report on the lecture (100%).
Examination	
試験期間中には何	っ行わない
None during exam p	
Details of examinat	on
Other information	
-	e 1: Takao Fujiwara,Office#:B-313,phone:44-6946,e-mail:fujiwara@las.tut.ac.jp 5:00 PM, on Wednesdays (Fujiwara)
Management Scienc	e 2: Yuzuru Miyata, Office#:B-411, phone:44-6955,e-mail:miyata@ace.tut.ac.jp
Office Hour: 4 o'clo	sk to 5 o'clock in the afternoon, Tuesday (Prof. Miyata)
Management Scienc	e 1: Takao Fujiwara,Office#:B-313,phone:44-6946,e-mail:fujiwara@las.tut.ac.jp
-	5:00 PM, on Wednesdays (Fujiwara)
Management Scienc	e 2: Yuzuru Miyata, Office#:B-411, phone:44-6955,e-mail:miyata@ace.tut.ac.jp
Office Hour: 4 o'clo	sk to 5 o'clock in the afternoon, Tuesday (Prof. Miyata)
Reference URL	
http://pm.hse.tut.ac	.jp/kakenA/
http://pm.hse.tut.ac	.jp/kakenA/
Office hours	
Management Scienc	e 1: Takao Fujiwara,Office Hour: 4:00 to 5:00 PM, on Wednesdays
Management Scienc	e 2: Yuzuru Miyata,Office Hour: 4 o'clock to 5 o'clock in the afternoon, Tuesday
-	e 1: Takao Fujiwara,Office Hour: 4:00 to 5:00 PM, on Wednesdays
Management Solong	e 2: Yuzuru Miyata,Office Hour: 4 o'clock to 5 o'clock in the afternoon, Tuesday

finance, stochastic process, multivariate analysis finance, stochastic process, multivariate analysis

# (M40030023)Industrial Policies[Industrial Policies]

Subject name[English]	Industrial Po	licies[Industrial Polic	cies]			
Schedule number	M40030023		Subject area	General courses	Required or elective	Elective
lime of starting a course	Spring term		Day of the week,period	Thu.5~5	Credit(s)	2
Faculty	Graduate Pro	ogram for Master's [			Subject grade	1~2
Department Offered	Common				Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	渋澤 博幸 S	HIBUSAWA Hiroyuk	ci			
Numbering						
Objectives of class In this course, students In this course, students Contents of class 1: Introduction and Over 2–6:Input–Output Analys 7–8: Numerical Example: 9–13:Input–Output Analys	learn the funda view sis at the Nation s and Case Stu	mental of input-out nal Level dies at the National	put analysis and t			
14–15: Numerical Examp	-		nal Level			
2-6:Input-Output Analys 7-8: Numerical Examples 9-13:Input-Output Analy 14-15: Numerical Examp Self Preparation and Re	s and Case Stu vsis at the Regi les and Case S	dies at the National onal Level				
Related subjects						
Economics, Policy, Simu						
Economics, Policy, Simu	lation					
Notes for textbook	d					
Papers will be distribute	α.					
Reference : Miller and Bl	air, Input-Outpu	ut Analysis(Second I	Edition), Cambridg	e University Press, 3	2009	
Papers will be distribute	d.					
Reference : Miller and Bl	air, Input-Outpu	ut Analysis(Second E	Edition), Cambridg	e University Press,	2009	
Reference1	Book title	Input-Output Ana	alysis(Second Edit	ion)	ISBN	978-0-521 73902
	Author	Miller and Blair	Publisher	Cambridge University	Publish year	2009
				Press		
Notes for reference				Press		
Notes for reference Goals to be achieved				Press		
Goals to be achieved	Analysis			Press		
<b>Notes for reference</b> <b>Goals to be achieved</b> Advanced Input-Output Advanced Economic Sim	-	ls		Press		
<b>Goals to be achieved</b> Advanced Input-Output	ulation Method	s		Press		

### Evaluation of achievement

 $\label{eq:constraint} \begin{array}{l} Test(50\%) + Report(50\%) = 100\% \\ A: 80 \mbox{ Points or higher, B:65 points or higher, C:55 points or higher, D: Less than 55 points \\ Test(50\%) + Report(50\%) = 100\% \end{array}$ 

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

Examination

試験期間中には何も行わない

None during exam period **Details of examination** 

Docano or oxaminado

# Other information

Room: B-409 Tel:6963

E-mail:hiro-shibu@tut.jp Room: B-409 Tel:6963

E-mail:hiro-shibu@tut.jp

Reference URL

www.pm.ace.tut.ac.jp

www.pm.ace.tut.ac.jp
Office hours

Wednesday 9:00-10:00

Wednesday 9:00-10:00

Relations to attainment objectives of learning and education

#### Key words

Industrial Policy, Economics, Simulation Industrial Policy, Economics, Simulation

# (M40030030)Culture and Communication I[Culture and Communication I]

Subject name[English]		nmunication I[Culture			1
Schedule number	M40030030	Subject area	General	Required or	Elective
			courses	elective	
Time of starting a course	Spring term	Day of the	Wed.3~3	Credit(s)	2
		week,period			
Faculty	0	am for Master's Degre	e	Subject grade	1~2
Department Offered	Common 社河中 古田 Q			Beggining grade	M1, M2
Charge teacher name[Roman	社河内 友里 SI	HAKOUGHI Yuri			
alphabet mark]					
Numbering					
Objectives of class					
To deepen understanding of trai	nsformation of Am	nerican culture by ex	ploring the histor	ry of American con	nics from postwa
period to present					
To develop ability to discuss in a	clear argument in	English			
To deepen understanding of trai	nsformation of Am	nerican culture by ex	ploring the histor	ry of American con	nics from postwa
period to present					
To develop ability to discuss in a	clear argument in	English			
Contents of class					
Week 1 Introduction					
Week 2 Understanding comics					
Week 3 Understanding comics					
Week 4 Understanding comics					
Week 5 Mainstream comics and u	Inderground comic	S			
Week 6 Mainstream comics and u	Inderground comic	S			
Week 7 Mainstream comics and u	Inderground comic	S			
Week 8 Mainstream comics and u	Inderground comic	S			
Week 9 Alternative comics					
Week 10 Alternative comics					
Week 11 Alternative comics					
Week 12 Alternative comics					
Week 13 Comics post 9.11					
Week 14 Comics post 9.11					
Week 15 Review					
Week 1 Introduction					
Week 2 Understanding comics					
Week 3 Understanding comics					
Week 4 Understanding comics					
Week 5 Mainstream comics and u	Inderground comic	S			
Week 6 Mainstream comics and u	inderground comic	S			
Week 7 Mainstream comics and u	Inderground comic	S			
Week 8 Mainstream comics and u	Inderground comic	S			
Week 9 Alternative comics					
Week 10 Alternative comics					
Week 11 Alternative comics					
Week 12 Alternative comics					
Week 13 Comics post 9.11					
Week 14 Comics post 9.11					
Week 15 Review					
Self Preparation and Review					
-	g materials for eac	h class. Read them a	nd prepare for the	e class.	
<b>Self Preparation and Review</b> The instructor will provide readin The instructor will provide readin	-				
The instructor will provide readin The instructor will provide readin	-				
The instructor will provide readin The instructor will provide readin <b>Related subjects</b>	g materials for eac	h class. Read them a			
The instructor will provide readin The instructor will provide readin <b>Related subjects</b> 英米文化論亚 [British Culture	-	h class. Read them a ure 3]			

Notes for textbook
The instructor will provide all materials for this class.
The instructor will provide all materials for this class.
Notes for reference
Goals to be achieved
Students will have gained deeper understanding of American culture and ability to discuss in a clearer argument in English.
Students will have gained deeper understanding of American culture and ability to discuss in a clearer argument in English.
Evaluation of achievement
Students will be evaluated according to their participation (30%), little presentation (30%)
and a final report (40%).
Grade Distribution:
A: 80% or above
B: 65-79%
C: 55-64%
D: Under 55%
Students will be evaluated according to their participation (30%), little presentation (30%)
and a final report (40%).
Grade Distribution:
A: 80% or above
B: 65-79%
C: 55–64%
D: Under 55%
<b>z</b> •
Examination
レポートで実施
By Report
Details of examination
Other information
Reference URL
Office hours
Please make an appointment by email.
Please make an appointment by email.
Deletions to other most abianting of learning and advantage
Relations to attainment objectives of learning and education
Key words
American culture, comics
American culture, comics

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

Subject name[English]	Japanese Life Today[Japanese Life Today]					
Schedule number	M40030050 Subject area General		General	Required or	Elective	
			courses	elective		
Time of starting a course	Spring term	Day of the	Wed.3~3	Credit(s)	2	
		week,period				
Faculty	Graduate Program	n for Master's Degre	e	Subject grade	1~2	
Department Offered	Common			Beggining grade	M1, M2	
Charge teacher name[Roman	Lim Pang Boey, 泷	歮谷 晃,大門 裕之	2. 齊藤 大樹, 穗積	責 直裕,髙嶋 孝明	月,井佐原 均,藤	
alphabet mark]	原 孝男,寺嶋 -	-彦,加藤 三保子,	,柴崎 一郎,鈴木	新一,岩佐 精二	., 福本 昌宏 Lim	
	Pang Boey, SH	IBUYA Akira, DA	IMON Hiroyuki,	SAITOH Taiki, H	OZUMI Naohiro,	
	TAKASHIMA Taka	aaki, ISAHARA Hito	shi, FUJIWARA Ta	kao, TERASHIMA ł	Kazuhiko, KATOH	
	Mihoko, SHIBASA	KI Ichiro, SUZUKI S	hinichi, IWASA Seij	ji, FUKUMOTO Mas	ahiro	
Numbering						

# Objectives of class

In this series of lectures, the excellent experts of our university from different areas will impart for the engineering students highly interesting insider knowledge. The participants will get to know Japan of today from technical, economic and social viewpoints.

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#### Contents of class

1. Lim Pang Boey "Japanese Education System"

Learn about the Japanese education system and what the life of a student is like in Japan?

2. Terashima "Robot in Japan"

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

3. Daimon "Working in Japanese Company"

Learn and discuss about working in Japanese company and what you should do for it.

#### 4. Daimon "Waste Management"

Learn and discuss about the policy and concept on waste management in Jpanese society.

5. Shibuya This lecture aims to introduce Japan's international cooperation and mainly focuses on its historical background, basic implementation framework/system and activities of Official Development Assistance (ODA) of Japanese Government, and further, current issues for sustainable development of developing countries.

6. Isahara "Computer and Japanese"

Japanese language is very much different from other languages. Problems caused by such differences during computer processing of Japanese are discussed in this lecture.

#### 7. Hozumi "Japan's Modernization Suppoted by Electric Power"

Japan's modernization started in the middle of 19 th centry when a long period of isolation policy has been terminated. Her repid growth until now has been strongly supported by electric power. Now Japan's power supply is recognized as the best quality in the world. In the lecture, history and state of the art of Japan's electric power will be presented.

8. Saito "Earthquake safety of buildings in Japan"

The purpose of this lecture is to understand the history of earthquake disasters in Japan and lessons learned from those disasters for the safety of buildings.

9. Iwasa "The Range of Organic Chemistry

I will give a talk on the following subjects as one of scene of science and technology in Japan:

♦ Organic Chemistry in Environment —Amazing Natural Products—

◆Development of Life Environment —Molecular Sensor as an Basic Technology in all of Science—

New Horizon of Catalytic Asymmetric Synthesis -C1 Asymmetric Catalyst-

10. Fukumoto "Introduction of advanced surface modofication and welding technology in Japan"

Two advanced materials processing will be introduced. One is on the surface modification technology based on the particles deposition. Thermal spray, Cold spray and Aero-sol deposition will be explained. Another is on the welding technology based on the friction stirring. Fundamental aspects on FSW will be given in the lecture.

11. Takashima "A global company doing business in Japan"

IBM, a global enterprise, is running business in Japan more than 75 years. A history and transformation of IBM's business in Japan are introduced. An insight that the lecturer got from the experience of working in IBM for 32 years is also shared.

12 Kato "Japanese culture and their mind"

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

13. Shibazaki In this lecture, I will give an example of reseach and development of new technology by Japanese company. The thin film Hall element or Hall sensor is a high sensitivity magnetic sensor which can detect magnetic flux density by using Hall effect. The main application is magnetic sensors to detect angular velocity of permanent magnet rotor of DC brushless motor or Hall motor. Why the Hall element must be developed and used so much is an interesting story. It may be also shown that how mass prosuction technology of Hall sensors was developed.

14. Fujiwara "Japaneses-style Business Management"

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

15. Suzuki "Relativety, Energy and Japan"

Energy is one of the biggest issues for Japan. The class reviews the origin of the concept of nuclear energy and the relation between nuclear energy and Japan.

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15. Suzuki "Relativety, Energy and Japan"

Energy is one of the biggest issues for Japan. The class reviews the origin of the concept of nuclear energy and the relation between nuclear energy and Japan.

Self Preparation and Review

# Related subjects

N/A

Notes for textbook

Notes for reference

Goals to be achieved

#### Evaluation of achievement

Scoring will be performed by sum of each report evaluation. Scoring will be performed by sum of each report evaluation.

# Examination

レポートで実施 By Report

# Details of examination

Other information

Reference URL

Office hours

After each class. After each class.

Relations to attainment objectives of learning and education

# Key words

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

#### (M40030060)Intercultural Communication[Intercultural Communication]

Subject name[English]	Intercultural Communication[Intercultural Communication]	tercultural Commu	nication]				
Schedule number	M40030060	Subject area	General	Required or	Elective		
			courses	elective			
Time of starting a	Spring term	Day of the	Mon.2~2	Credit(s)	2		
course		week,period					
Faculty	Graduate Program for Master's	Degree		Subject	1~2		
				grade			
Department Offered	Common			Beggining	M1, M2		
				grade			
Charge teacher	村松 由起子 MURAMATSU Yu	ıkiko					
name[Roman alphabet							
mark]							
Numbering							
Objectives of class							
This is a Japanese conver	sation class mixed with Japanes	e students of the r	egular course. You	ı will learn eleme	ntary Japanese		
grammar to speak Japanes	se through conversation with Jap	oanese students.					
This is a Jananese conver	sation class mixed with Japanes	e students of the r	egular course. You	ı will learn eleme	ntary Jananese		
	se through conversation with Jap		ogulur oouroo. roo		intary suparious		
Branniar to oppoart paparto							
Contents of class							
This class has the followin	g three parts						
	(10:20, 11.0)	0)					
• • •	rammar explanations (10:30-11:00		) (11.00 11.45)				
	②Group activities with Japanese students (conversation practice & discussion) (11:00–11:45)						
(3)Elementary Japanese lessons(11:45–12:00)							
	ssons(11:45-12:00)						
			"				
Students will learn the foll	owing lessons in Japanese textb	ook <sup>″</sup> Minna no Nih	ongo".				
Students will learn the foll 1. Pronunciation of Japane	owing lessons in Japanese textb ese & Lesson 1	ook <sup>″</sup> Minna no Nih	ongo″.				
Students will learn the foll 1. Pronunciation of Japane 2. Pronunciation of Japane	owing lessons in Japanese textb ese & Lesson 1	ook <sup>″</sup> Minna no Nih	ongo".				
Students will learn the foll 1. Pronunciation of Japane 2. Pronunciation of Japane 3. Lesson 3,4	owing lessons in Japanese textb ese & Lesson 1	ook <sup>″</sup> Minna no Nih	ongo″.				
Students will learn the foll 1. Pronunciation of Japane 2. Pronunciation of Japane 3. Lesson 3,4 4. Lesson 5,6	owing lessons in Japanese textb ese & Lesson 1	ook ″Minna no Nih	ongo″.				
Students will learn the foll 1. Pronunciation of Japane 2. Pronunciation of Japane 3. Lesson 3,4 4. Lesson 5,6 5. Lesson 7,8	owing lessons in Japanese textb ese & Lesson 1	ook ″Minna no Nih	ongo″.				
Students will learn the foll 1. Pronunciation of Japane 2. Pronunciation of Japane 3. Lesson 3,4 4. Lesson 5,6	owing lessons in Japanese textb ese & Lesson 1	ook <sup>‴</sup> Minna no Nih	ongo″.				

9. Lesson 15,16 10.Lesson 17,18 11.Lesson 19,20 12.Lesson 21,Nonverbal communication 13.Nonverbal communication 14.Lesson 22,23 15.Lesson 24,25

This class has the following three parts.

①Elementary Japanese grammar explanations (10:30-11:00)
 ②Group activities with Japanese students (conversation practice & discussion) (11:00-11:45)
 ③Elementary Japanese lessons(11:45-12:00)

Students will learn the following lessons in Japanese textbook "Minna no Nihongo".

1. Pronunciation of Japanese & Lesson 1

2. Pronunciation of Japanese & Lesson 2

3. Lesson 3,4

4. Lesson 5,6

Lesson 7,8
 Lesson 9,10
 Lesson 11,12
 Lesson 13,14
 Lesson 15,16
 Lesson 17,18
 Lesson 19,20
 Lesson 21,Nonverbal communication
 Nonverbal communication
 Lesson 22,23
 Lesson 24,25

#### Self Preparation and Review

#### **Related subjects**

Basic Japanese Classes (Nihongo Hokoo): If you want to know more details, please contact the International Affairs Division (Kokusaikooryuuka).

Basic Japanese Classes (Nihongo Hokoo): If you want to know more details, please contact the International Affairs Division (Kokusaikooryuuka).

#### Notes for textbook

Reference1	Book title	版」(Minnna		•文法解説 英語 Translation & 000	ISBN	
	Author		Publisher	スリーエーネッ トワーク	Publish year	

Notes for reference

#### Goals to be achieved

You will be able to settle into conversation with Japanese students in easy Japanese. You will be able to settle into conversation with Japanese students in easy Japanese.

# Evaluation of achievement

Homework & Group activities 40% The term examination  $(L.1 \sim L.22)60\%$  Homework & Group activities 40% The term examination  $(L.1 \sim L.22)60\%$ 

# Examination

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

#### Other information

office: B-513 e-mail: yukiko@cir.ignite.tut.ac.jp phone: 44-6962 office: B-513 e-mail: yukiko@cir.ignite.tut.ac.jp phone: 44-6962 Reference URL

# Office hours

Monday 13:00-13:30 Monday 13:00-13:30

Relations to attainment objectives of learning and education

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

	Seminar on Mecl	hanical Engineering I	Seminar on Mecha	anical Engineering I]	
Schedule number	M41610010	Subject area	Advanced	Required or	Required
			Mechanical	elective	
			Engineering		
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	4
Faculty	Graduate Progra	m for Master's Degr	e	Subject grade	1~2
Department Offered	Mechanical Engir	neering		Beggining grade	M1
Charge teacher name[Roman alphabet mark]	S1系教務委員	1kei kyomu Iin−S		<b>.</b>	I
Numbering					
Objectives of class					
•	waad uurdawatan din a	of the mechanical a	المعانية مرينية مريقا ملا	a fau tha maatau tha	ala waaaawah af d
The seminar aims to provide a b	road understanding	, of the mechanical e	ngineering availabi	e for the master the	esis research of a
student.		<b>C</b> .1			
The seminar aims to provide a b	road understanding	; of the mechanical e	ngineering availabl	e for the master the	esis research of a
student.					
Contents of class					
The class provides both of fund	lamental knowledge	of his/her master t	hesis research wo	ork and the most ad	vanced results ir
the related field by reading res	earch papers and	monographs. The co	ontents of the cla	ss depend on the s	supervisor. To be
announced by individual supervis	sors.				
The class provides both of fund	lamental knowledge	of his/her master t	hesis research wo	ork and the most ad	vanced results ir
the related field by reading res	earch papers and	monographs. The co	ontents of the cla	ss depend on the s	supervisor. To be
announced by individual supervis	sors.				
Self Preparation and Review					
Delete d suble ste					
Related subjects					
Notes for textbook					
Textbook or material will be mad	le available from the	e supervisors.			
Textbook or material will be mad	le available from the	e supervisors.			
N . C C					
Notes for reference					
Notes for reference					
Goals to be achieved		anah fialda			
Goals to be achieved To acquire fundamental knowled	-				
Goals to be achieved	-		and the presentat	tion skill.	
<b>Goals to be achieved</b> To acquire fundamental knowled	-		and the presenta	tion skill.	
Goals to be achieved To acquire fundamental knowled	blems, the ability to	o solve the problems	and the presenta	tion skill.	
<b>Goals to be achieved</b> To acquire fundamental knowled To acquire the ability to find pro	blems, the ability to	o solve the problems earch fields.			
<b>Goals to be achieved</b> To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled	blems, the ability to	o solve the problems earch fields.			
<b>Goals to be achieved</b> To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled	blems, the ability to	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement	blems, the ability to ge of individual rese blems, the ability to	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Coursework, presentation and/o	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Examination	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Coursework, presentation and/o Examination 試験期間中には何も行わない	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
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Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Coursework, presentation and/o Examination 試験期間中には何も行わない None during exam period	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Coursework, presentation and/o Examination 試験期間中には何も行わない None during exam period Details of examination	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
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Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Coursework, presentation and/o 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	blems, the ability to ge of individual rese blems, the ability to r report.	o solve the problems earch fields.			
Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/o Coursework, presentation and/o 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	blems, the ability to ge of individual rese blems, the ability to r report. r report.	o solve the problems earch fields. o solve the problems			

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

	Seminar on wec	nanical Engineering I	Seminar on Niec	hanical Engineering II	
Schedule number	M41610020	Subject area	Advanced	Required or	Required
			Mechanical	elective	
			Engineering		
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	2
Faculty	Graduate Progra	m for Master's Degr	ee	Subject grade	2~2
Department Offered	Mechanical Engi	neering		Beggining grade	M2
Charge teacher name[Roman alphabet mark]	S1系教務委員	1kei kyomu Iin−S			
Numbering					
<b>Objectives of class</b> The seminar aims to provide a b student. The seminar aims to provide a b student.	_	-			
Contents of class					
the related field by reading res announced by individual supervis The class provides both of fund the related field by reading res announced by individual supervis <b>Self Preparation and Review</b>	sors. damental knowledge search papers and	e of his/her master	hesis research w	ork and the most ad	vanced results ir
Related subjects					
-					
Notes for textbook	de evcilable from th				
<b>Notes for textbook</b> Textbook or material will be mad		•			
<b>Notes for textbook</b> Textbook or material will be mad		•			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference		•			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved	de available from the	e supervisors.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference	de available from the	e supervisors. earch fields.	and the presenta	ation skill.	
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro	de available from the dge of individual rese oblems, the ability to dge of individual rese	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro	de available from the dge of individual rese oblems, the ability to dge of individual rese	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement	de available from the dge of individual reso oblems, the ability to dge of individual reso oblems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/or	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/of Coursework, presentation and/of	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire fundamental knowled To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/or Coursework, presentation and/or Examination	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire the ability to find pro To acquire the ability to find pro Coursework, presentation and/or Coursework, presentation and/or Examination 試験期間中には何も行わない	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire the ability to find pro To acquire the ability to find pro Coursework, presentation and/or Coursework, presentation and/or Examination 試験期間中には何も行わない None during exam period	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire the ability to find pro To acquire the ability to find pro Evaluation of achievement Coursework, presentation and/or Coursework, presentation and/or Examination 試験期間中には何も行わない	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be made Textbook or material will be made Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find proceed To acquire fundamental knowled To acquire the ability to find proceed To acquire the ability to acquire the acquire	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find pro To acquire the ability to find pro To acquire the ability to find pro Coursework, presentation and/or Coursework, presentation and/or Examination 試験期間中には何も行わない None during exam period	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			
Notes for textbook Textbook or material will be made Textbook or material will be made Notes for reference Goals to be achieved To acquire fundamental knowled To acquire the ability to find proceed To acquire fundamental knowled To acquire the ability to find proceed To acquire the abilit	de available from the dge of individual rest oblems, the ability to dge of individual rest oblems, the ability to polems, the ability to	e supervisors. earch fields. o solve the problems earch fields.			

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

Subject name[English]	Thesis Research	on Mechanical E	ngineering[Thesis Res	search on Mechanica	al Engineering]			
Schedule number	M41610030	Subject area	Advanced	Required or	Required			
			Mechanical	elective				
			Engineering					
Time of starting a course	2Years	Day of t	e Intensive	Credit(s)	6			
		week,period						
Faculty	Graduate Program for Master's Degree Subject grade 1~2							
Department Offered	Mechanical Engineering Beggining M1, M2							
		grade						
Charge teacher name[Roman	S1系教務委員	1kei kyomu Iin−S						
alphabet mark]								
Numbering								
Objectives of class								
The thesis research aims to pr	ovide a practical	experience of re	search work, and to	acquire research s	kills with a deep			
understanding of relevant knowle	dge.							
The thesis research aims to pr	ovide a practical	experience of re	search work, and to	acquire research s	kills with a deep			
understanding of relevant knowle	dge.							
Contents of class								
The research subject depends	on the supervisor	and the resear	h group you join. Ir	ndividual students w	vill have different			
research subjects. Discuss with y			-					
The research subject depends	on the supervisor	and the researc	h group you join. Ir	ndividual students w	vill have different			
research subjects. Discuss with y	our supervisor.							
Self Preparation and Review								
Related subjects								
Notes for textbook								
Reference and material will be av	ailable from the su	pervisor.						
Reference and material will be av		•						
Notes for reference		•						
Goals to be achieved								
To get something new on individu	al research fields.							
To develop your research skills in		nd presentation s	vills.					
To get something new on individu								
To develop your research skills in		nd presentation s	kills.					
Evaluation of achievement								
Examination								
Details of examination								
Other information								
Reference URL								
Office hours								
Relations to attainment objective	s of learning and o	education						
	-							

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

Subject name[English]	Thesis Research	on Mechanical Engir	neering[Thesis Res	earch on Mechanica	I Engineering]		
Schedule number	M41610030	Subject area	Advanced	Required or	Required		
			Mechanical	elective			
			Engineering				
Time of starting a course	2Years	Day of the week,period	Intensive	Credit(s)	6		
Faculty	Graduate Progran	n for Master's Degre	e	Subject grade	1~1		
Department Offered	Mechanical Engin	eering		Beggining grade	M1, M2		
Charge teacher name[Roman	S1系教務委員, 1	1系各教員 1kei kyoi	mu Iin−S, 1kei kaku	•	l		
alphabet mark]							
Numbering							
Objectives of class							
The thesis research aims to pr	rovide a practical	experience of rese	arch work and to	acquire research	skills with deep		
understanding of the relevant kno	-	experience of rese	arch work, and to	acquire research	skills with deep		
Contents of class	meuge.						
The research subject depends	on the supervisor	and the recearch	group you join. In	dividual students w	ill have different		
research subjects. Discuss with y		and the research	Broap you join. Inc	arvidual students W	m nave unterefft		
Self Preparation and Review							
Sell Freparation and Neview							
Related subjects							
Notes for textbook							
Reference and material will be av	ailable from the sup	pervisor.					
Notes for reference							
Goals to be achieved							
To get something new on individu	al research fields.						
To develop your research skills in	cluding planning an	d presentation skills	<b>.</b>				
Evaluation of achievement							
Examination							
その他							
None during exam period							
Details of examination							
Other information							
Reference URL							
Office hours	Office hours						
Relations to attainment objective	s of learning and e	ducation					
Key words							

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

	Theois Decord	on Machanic - L E.	noring These - D	oorob on Mailari	Engine and
Subject name[English] Schedule number	M4161003T	_	Advanced	earch on Mechanica	
Schequie number	19141010031	Subject area		Required or	Required
			Mechanical	elective	
			Engineering		-
Time of starting a course	Year	Day of the	Intensive	Credit(s)	6
		week,period			
Faculty	-	n for Master's Degr	e	Subject grade	2~2
Department Offered	Mechanical Engin	eering		Beggining	M2
-				grade	
Charge teacher name[Roman	S1系教務委員1	kei kyomu Iin−S			
alphabet mark]					
Numbering					
Objectives of class					
The thesis research aims to pro-	ovide a practical e	experience of resea	rch work, and to	acquire research s	kills with a deer
understanding of relevant knowled			i oni norra, ana to		
	ugo.				
<b>-</b>					
The thesis research aims to pr		experience of resea	rch work, and to	acquire research si	kills with a deep
understanding of relevant knowle	age.				
Contents of class					
The research subject depends	on the supervisor	and the research	group you join. In	dividual students w	ill have different
research subjects. Discuss with y	our supervisor.				
The research subject depends	on the supervisor	and the research	group you join. In	dividual students w	ill have differen
research subjects. Discuss with y	our supervisor.				
Self Preparation and Review					
Notes for textbook					
Reference and material will be av	ailable from the su	pervisor.			
Reference and material will be av					
Reference and material will be av Reference and material will be av					
Reference and material will be av Reference and material will be av Notes for reference					
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved	ailable from the su				
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu	ailable from the sup al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in	ailable from the sup al research fields. ncluding planning ar	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu	ailable from the sup al research fields. Including planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in	ailable from the sup al research fields. Including planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu	ailable from the sup al research fields. Including planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills ir To get something new on individu To develop your research skills ir Evaluation of achievement Examination 試験期間中には何も行わない None during exam period	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない None during exam period	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills ir To get something new on individu To develop your research skills ir Evaluation of achievement Examination 試験期間中には何も行わない None during exam period	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない None during exam period	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills ir To get something new on individu To develop your research skills ir Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination Other information Reference URL	ailable from the sup al research fields. ncluding planning an al research fields.	pervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills in To get something new on individu To develop your research skills in Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination Other information Reference URL Office hours	ailable from the sup ual research fields. ncluding planning ar ual research fields. ncluding planning ar	bervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills ir To get something new on individu To develop your research skills ir Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination Other information Reference URL	ailable from the sup ual research fields. ncluding planning ar ual research fields. ncluding planning ar	bervisor.			
Reference and material will be av Reference and material will be av Notes for reference Goals to be achieved To get something new on individu To develop your research skills ir To get something new on individu To develop your research skills ir Evaluation of achievement Examination 試験期間中には何も行わない None during exam period Details of examination Other information Reference URL Office hours	ailable from the sup ual research fields. ncluding planning ar ual research fields. ncluding planning ar	bervisor.			

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

Subject name[English]	Seminar on Mech	hanical Engineering[S	Seminar on Mecha	nical Engineering]	
Schedule number	M41610040	Subject area	Advanced	Required or	Required
			Mechanical	elective	
			Engineering		
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	6
Faculty	Graduate Progra	m for Master's Degr	ee	Subject grade	2~2
Department Offered	Mechanical Engir	neering		Beggining grade	M2
Charge teacher name[Roman alphabet mark]	S1系教務委員1	1kei kyomu Iin−S			I
Numbering					
Objectives of class The seminar aims to provide a br student. The seminar aims to provide a br student. Contents of class The class provides both of funda the related field by reading rese announced by individual supervise The class provides both of funda the related field by reading rese announced by individual supervise Self Preparation and Review Related subjects	road understanding amental knowledge earch papers and ors. amental knowledge earch papers and	of the mechanical e of his/her master t monographs. The co of his/her master t	engineering availat thesis research w ontents of the cl	ole for the master the rork and the most ad ass depend on the s rork and the most ad	esis research of a vanced results in supervisor. To be vanced results in
Notes for reference Goals to be achieved To acquire fundamental knowledge	ge of individual rese	earch fields.			
To acquire the ability to find prob	plems, the ability to	solve the problems	, and the presenta	ation skill.	
To acquire fundamental knowledg			and the	tion okill	
To acquire the ability to find prob	piems, the ability to	solve the problems	, and the presenta	ation skill.	
<b>Evaluation of achievement</b> Coursework, presentation and/or	roport				
Coursework, presentation and/or Coursework, presentation and/or	•				
Examination	i eport.				
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					

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

Subject	Applied Mechanics of M	aterials[Applied Mechanics of the second s	of Materials]		
name[English] Schedule number	M41630030	Subject area	Advanced Mechanical	Required or elective	Elective
Time of starting a course	Spring1 term	Day of the week.period	Engineering Tue.2~2	Credit(s)	1
Faculty	Graduate Program for N		<u> </u>	Subject grade	1~2
Department Offered	Mechanical Engineering			Beggining grade	M1, M2
Charge teacher	足立 忠晴 ADACHI Tad	daharu			
name[Roman					
alphabet mark]	L				
Numbering					
Objectives of class					
To understand mechar	nical performances of st	tructures, and mechanical	behaviors of so	lid and structures	, fundament
mechanics of solid and	structure is lectured. E	Especially, mechanics of thi	in-walled structu	res which is usefu	l for practic
design of mechanical str	ructures is explained in de	etail.			
To understand mechar	nical performances of st	tructures, and mechanical	behaviors of so	lid and structures	, fundament
mechanics of solid and	structure is lectured. E	specially, mechanics of thi	in-walled structu	res which is usefu	l for practic
	ructures is explained in de				
Contents of class					
Chapter 1. Introduction					
•	Structures from View of S	olid Mechanics			
•	structure, Loading to auto				
-	-	e of automobile structure			
	s of Structural Mechanics				
Fundamental equations		5			
•	Moments Applying to Stru	otures			
	ce, bending moment, torsio				
	Mechanics of Structures				
Torsion and bending of t					
	f Thin-Walled Structures				
•					
Torsion and bending of t		nt			
-	s of Dynamic Measureme				
	rain gage, Load cell, Acce	ierator			
Chapter 8. Summary					
Chapter 1. Introduction	······	- Ital Marala			
	Structures from View of S				
•	structure, Loading to auto				
		e of automobile structure			
•	s of Structural Mechanics	<b>b</b>			
Fundamental equations	in solid mechanics Noments Applying to Stru	oturac			
•					
	ce, bending moment, torsion Mechanics of Structures				
Torsion and bending of t					
-	f Thin-Walled Structures				
Torsion and bending of t					
0	ls of Dynamic Measureme	nt			
•	rain gage, Load cell, Acce				
Chapter 8. Summary	ram gage, Luau cell, ACCe				
Self Preparation and Re	view				
Related subjects	Elasticity Solid Mochanic	26			
Mechanics of Materials,	Elasticity, Solid Mechanic				
Mechanics of Materials,	Elasticity, Solid Mechanic Elasticity, Solid Mechanic				

Reference 1	Book title	A First Course in C	ontinuum Mech	anics	ISBN	
	Author	Fung YC	Publisher	Prentice-Hall	Publish year	
Reference2	Book title	Mechanics of Engin	eering Materials	 \$	ISBN	
	Author	Benham PP,	Publisher	Longman	Publish year	
		Crawford RJ and Armstrong CG		5		
Reference3	Book title	Classical and Comp	outational Solid	Mechanics	ISBN	
	Author	Fung YC and Pin	Publisher	World Scientific	Publish year	2001
Reference4	Book title	T Theory of Elastici Vol.7	ty, Course of	Theoretical Physics	ISBN	
	Author	Landau L.D. and Lifshitz E.M.	Publisher		Publish year	1970
Reference5	Book title	Aircraft Structures	for Engineering	Students	ISBN	
	Author	Megson THG	Publisher	Butterworth-	Publish year	2007
				Heinemann		
To understand phys To deeply understa beam. To understand mec	sical meaning funda nd elementary mea hanics of thin-wall	ed structures.		erials); tension of bar,	torsion of axis a	and bending
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To understand phys To deeply understan beam. To understand mect To know concept of <b>Evaluation of achiev</b> Examinations, 80 % Examination レポートで実施 By Report	sical meaning funda nd elementary mea hanics of thin-wall f dynamic measure <b>vement</b> and attendances, 2 and attendances, 2	ment of deformation. Imental equations in s chanics of materials ( ed structures. <u>ment of deformation.</u> 20 %			torsion of axis a	and bending
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(M41630080)Science an	d Technology	of Thin Films[Science	and Technology	of Thin Films]		
Subject	Science and	Technology of Thin Fil	ms[Science and <sup>-</sup>	Technology of Thin	Films]	
name[English]						
Schedule number	M41630080		Subject area	Advanced Mechanical	Required or elective	Elective
Time of starting a	Spring2 term		Day of the	Engineering Fri.2~2	Credit(s)	1
course Faculty	Graduate Pro	gram for Master's Deg	week,period		Subject grade	1~2
Department Offered	Mechanical E	ngineering			Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	伊崎 昌伸 🛛	ZAKI Masanobu				
Numbering						
Objectives of class	•					
To understand fundame	ntal thermodyn	amics and solid state	physics of thin fil	m and the applicatio	ons	
To understand fundame	ntal thermodyn	amics and solid state	physics of thin fil	m and the applicatio	ons	
Contents of class						
1. Introduction to Thin f	ilm and prepara	ition				
2. Thermodynamics in s	olution chemica	al process(I)				
3. Thermodynamics in s	olution chemica	al process(II)				
4. Electronic state in ind	organic thin film	IS				
5. Crystal structure and	symmetry on t	hin films				
6. Structural analysis of	thin films					
7. Physical properties of	f thin films					
8. Oxide semiconductor	thin films and	application				
1. Introduction to Thin f	ilm and prepara	ition				
2. Thermodynamics in s	olution chemica	al process(I)				
3. Thermodynamics in s	olution chemica	al process(II)				
4. Electronic state in inc	organic thin film	IS				
5. Crystal structure and	symmetry on t	hin films				
6. Structural analysis of	thin films					
7. Physical properties of	f thin films					
8. Oxide semiconductor	thin films and	application				
Self Preparation and Re	oview					
This class deals with th	e deposition m	echanism based on the	e thermodynamic	s and the character	istics of structu	re, optical and
electrical properties bas	sed on solid sta	te physics.				
This class deals with th	e deposition m	echanism based on the	e thermodynamic	s and the character	istics of structu	re, optical and
electrical properties bas	sed on solid sta	te physics.				
Related subjects						
Basic knowledge of che						
Basic knowledge of che	mistry and solid	I-state physics				
Notes for textbook						
Reference1	Book title	Modern Electroplatin	ng, 5 th edition		ISBN	978-0-
						16778-6
	Author	M. schlesinger, M. Paunovic	Publisher	Weily & Sons	Publish year	2010
Notes for reference						
Goals to be achieved						
1. Understanding of the	modunamio in	soft-solution processi	ng			
=	-	-	-			
2. Understanding of the						
<ol> <li>Understanding of the</li> <li>Understanding of the</li> </ol>	-	-	-			
Evaluation of achieveme		e physics of thin films	>			
Reports(50%) and preser						
Treports(30%) and prese	ntation(30%)					

# Reports(50%) and presentation(50%)

Examination レポートで実施

By Report

# Details of examination

### Other information

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

# Office hours

as-needed

as-needed

Relations to attainment objectives of learning and education

Key words

thin films, thermodynamics, physics, semiconductor thin films, thermodynamics, physics, semiconductor

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

	Advanced Mecha	nical Systems Desig	II II[Auvaliceu Nie	chanical Systems De	Joight II]
Schedule number	M41630220	Subject area	Advanced	Required or	Elective
			Mechanical	elective	
			Engineering		
Time of starting a course	Spring term	Day of the	Mon.4~4	Credit(s)	2
E It	0	week,period		O this start in the	1.0
Faculty	_	n for Master's Degre	e	Subject grade	1~2
Department Offered	Mechanical Engin	eering		Beggining grade	M1, M2
Charge teacher name[Roman	S1系教務委員1	kei kvomu Iin-S		grauo	
alphabet mark]					
Numbering					
Objectives of class					
Objectives of class		of the mechanical a	veterne desime ev	ailabla fay tha maat	
This lecture aims to provide a bro work of a student.	ad understanding	of the mechanical s	ystems design av	allable for the maste	er thesis research
This lecture aims to provide a bro	ad understanding	of the mechanical s	veteme decim av	ailable for the maste	r thesis research
work of a student.		or the meenamears	ystems design av		
Contents of class					
The class provides both of fundar	mental knowledge	of his/her master t	hesis research w	ork and the most or	lvanced results in
the related field by reading resea					
announced by individual supervisor		nonographo. The Gu			
The class provides both of fundar		of his/her master t	hesis research w	ork and the most ac	lvanced results in
the related field by reading resea	-				
announced by individual supervisor					
Self Preparation and Review					
Related subjects					
Noiatou subjects					
Notes for textbook					
Textbook or material will be made		•			
Textbook or material will be made Notes for reference	available from the	supervisors.			
Or als to be eaching a					
Goals to be achieved	<u>.</u>				
To acquire fundamental knowledge					
To acquire the ability to find proble	ems, the ability to	solve the problems	and the presentat	tion skill.	
To acquire fundamental knowledge					
To acquire the ability to find proble	ems, the ability to	solve the problems	and the presentat	tion skill.	
Evaluation of achievement					
Coursework, presentation and/or	•				
Coursework, presentation and/or i	•				
Coursework, presentation and/or Examination	•				
Coursework, presentation and/or i Examination 試験期間中には何も行わない	•				
Coursework, presentation and/or i Examination 試験期間中には何も行わない None during exam period	•				
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Coursework, presentation and/or r Examination 試験期間中には何も行わない None during exam period Details of examination Other information	•				

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

Subject name[English]	Process II]	erials and Manufactur	ing Process II[A	dvanced Materials a	nd Manufacturir
Schedule number	M41630240	Subject area	Advanced Mechanical Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Tue.4~4	Credit(s)	2
Faculty	Graduate Progr	am for Master's Degre	ee	Subject grade	1~2
Department Offered	Mechanical Eng	ineering		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	S1系教務委員	1kei kyomu Iin−S			
Numbering					
Objectives of class This lecture aims to provide a bi research work of a student. This lecture aims to provide a bi research work of a student. Contents of class		-			
The class provides both of fund the related field by reading res- announced by individual supervis The class provides both of fund the related field by reading res- announced by individual supervis <b>Self Preparation and Review</b>	earch papers and ors. amental knowledg earch papers and	monographs. The co e of his/her master t	ontents of the cl	ass depend on the s vork and the most ac	supervisor. To k Ivanced results
Related subjects					
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference		•			
<b>Goals to be achieved</b> To acquire fundamental knowled To acquire the ability to find prol			and the presenta	ntion skill	
To acquire fundamental knowled To acquire the ability to find prol	ge of individual res	search fields.			
<b>Evaluation of achievement</b> Coursework, presentation and/or	•				
Coursework, presentation and/or Examination 試験期間中には何も行わない	report.				
None during exam period Details of examination					
Other information					
Reference URL					

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

Subject name[English]	Advanced System	m, Control and Robo	tics IILAdvanced S	System, Control and	Robotics II]
Schedule number	M41630260	Subject area	Advanced	Required or	Elective
		-	Mechanical	elective	
			Engineering		
Time of starting a course	Spring term	Day of the	Thu.4~4	Credit(s)	2
		week,period	1110.1		-
Faculty	Graduate Progra	am for Master's Degr		Subject grade	1~2
Department Offered	Mechanical Engir	-		Beggining	M1, M2
	Meenanical Engli	neering		grade	1411, 1412
Charge teacher name[Barran	01 乙	1 kai lavanav Tin-S		grauo	
Charge teacher name[Roman	S1系教務委員1	Tkel kyönnu Im-3			
alphabet mark]					
Numbering					
Objectives of class					
This lecture aims to provide a b	road understanding	of the control and r	obotics available f	or the master thesis	research work o
a student.	0				
This lecture aims to provide a b	road understanding	of the control and r	obotics available f	or the master thesis	research work o
a student.					
Contents of class					
		of his /her	ikanin wasaani	الحجيب والعامين والم	
The class provides both of func	-				
the related field by reading res		monographs. The co	ontents of the cla	ass depend on the s	supervisor. To be
announced by individual supervis					
The class provides both of func	lamental knowledge	e of his/her master	hesis research w	ork and the most ad	vanced results in
the related field by reading res	earch papers and	monographs. The c	ontents of the cla	ass depend on the s	supervisor. To be
announced by individual supervis	sors.				
Self Preparation and Review					
-					
Delated as blocks					
Related subjects					
Notes for textbook					
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Notes for textbook Textbook or material will be mad		•			
<b>Notes for textbook</b> Textbook or material will be mad Textbook or material will be mad		•			
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## (M41630280)Advanced Energy and Environmental Engineering II[Advanced Energy and Environmental Engineering II]

Subject name[English]	Advanced Energy Engineering II]	y and Environmenta	al Engineering IIL	Advanced Energy ar	nd Environment
Schedule number	M41630280	Subject area	Advanced Mechanical Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Fri.4~4	Credit(s)	2
Faculty	Graduate Program	n for Master's Degre	e	Subject grade	1~2
Department Offered	Mechanical Engin	eering		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	S1系教務委員1	kei kyomu Iin−S			
Numbering					
Objectives of class	·				
This lecture aims to provide a br research work of a student. This lecture aims to provide a br research work of a student. <b>Contents of class</b>					
The class provides both of fund the related field by reading res announced by individual supervis The class provides both of fund the related field by reading res announced by individual supervis Self Preparation and Review	earch papers and r ors. amental knowledge earch papers and r	nonographs. The co of his/her master t	ntents of the cla hesis research w	ass depend on the s ork and the most ad	supervisor. To k vanced results
Related subjects					
Related subjects Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference		•			
<b>Notes for textbook</b> Textbook or material will be mad Textbook or material will be mad		•			
Notes for textbook Textbook or material will be mad Textbook or material will be mad Notes for reference	e available from the	supervisors.			
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Subject name[English]	High-Speed Mechanics and	d Optical Measurement[H	-	nics and Optical N	- leasurement]
Schedule number	M41630300	Subject area	Advanced	Required or	Elective
		-	Mechanical	elective	
			Engineering		
Time of starting a	Spring2 term	Day of the	Tue.2~2	Credit(s)	1
course		week,period			
Faculty	Graduate Program for Mast	ter's Degree		Subject	1~2
<b>D</b> · · · <b>OC</b> · ·				grade	141 140
Department Offered	Mechanical Engineering			Beggining grade	M1, M2
Charge teacher	鈴木 新一 SUZUKI Shinich	hi		grauo	
name[Roman alphabet					
mark]					
Numbering					
Objectives of class					
•	ight and atom, and principle o	of lasers			
	ric circuit of pulsed lasers.	1 103013.			
	methods on dynamic fracture	e mechanics			
	hods in mechanical engineerir				
		5			
1 Interaction between li	ight and atom, and principle o	of lasers			
	ric circuit of pulsed lasers.				
	methods on dynamic fractur	e mechanics			
	hods in mechanical engineerir				
Contents of class					
1st week Interaction be	etween light and atoms				
2nd week Interaction be	-				
3rd week Principle of la	-				
4th week Reflection an	d polarization of light, Brewst	ter window.			
5th week Birefringence	material and Pockels cell.				
6th week Principle of p	ulsed lasers.				
7th week Principle of p	ulsed lasers.				
8th week Photoelasticit	ty				
9th week Residual stre	ss measurement by photoela	sticity			
10th week Moire interfe	erometry.				
11th week Measuremer	nt of crack opening displacem	nent by Moire interferome	etry.		
12th week Holography.					
	holographic microscopy for d	-			
-	cture mechanics, stress inter		elease rate.		
ioth week Energy relea	ase rate at rapid crack bifurca	ation.			
4	. P. 1. P. 7				
1st week Interaction be	-				
2nd week Interaction be 3rd week Principle of la					
		ter window			
	d polarization of light, Brewst material and Pockels cell.				
6th week Principle of p					
7th week Principle of p					
8th week Photoelasticit					
	ss measurement by photoela	sticity			
10th week Moire interfe		-			
11th week Measuremer	nt of crack opening displacem	nent by Moire interferome	etry.		
12th week Holography.					
13th week High-speed	holographic microscopy for d	lynamic fracture mechani	cs.		
14th week Dynamic fra	cture mechanics, stress inter	nsity factor and energy re	elease rate.		
15th week Energy relea	ase rate at rapid crack bifurca	ation.			

## Self Preparation and Review

## **Related subjects**

Physics I, Physics II, Physics III, Physics IV, Strength of Materials, Theory of elasticity, Fracture mechanics. Physics I, Physics II, Physics III, Physics IV, Strength of Materials, Theory of elasticity, Fracture mechanics. **Notes for textbook** 

Reference1	Book title	The Quantum Theo	ry of Light	ISBN		
	Author	Loudon,R.	Publisher	Oxford Science Publications	Publish year	2000
Reference2	Book title	Photonics			ISBN	
	Author	Yariv,A. and Yeh,P.	Publisher	Publish year	2007	

## Notes for reference

(1) Suzuki,S., et al., Measurement of energy release rate and energy flux

of rapidly bifurcating crack in Homalite 100 and Araldite B by high-speed holographic microscopy, J. Mech. Phys. Solids, Vol.55 (2007), 1487-1512.

(2) Suzuki,S. and Miyashita,T., Measuremet of Opening Displacement and Stress Intensity Factor of Bifurcated Notch by Moire Interferometry, J. Solid Mech. Materials Eng., Vol.2 (2008), 25–37.

(3) Shinichi Suzuki, et al., Measurement of Residual Stress of Light Bulbs for Automobiles by Photoelasticity, J. Japanese Soc. Experimental Mech., Vol.11 (2011), 188–194.

(1) Suzuki,S., et al., Measurement of energy release rate and energy flux

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(3) Shinichi Suzuki, et al., Measurement of Residual Stress of Light Bulbs for Automobiles by Photoelasticity, J. Japanese Soc. Experimental Mech., Vol.11 (2011), 188–194.

### Goals to be achieved

1. Can understand the structure, optical system and electric circuit of pulsed lasers.

2. Can oscillate pulsed lasers with alining its optical components.

3. Can take place experiments with high speed holographic microscopy.

1. Can understand the structure, optical system and electric circuit of pulsed lasers.

2. Can oscillate pulsed lasers with alining its optical components.

3. Can take place experiments with high speed holographic microscopy.

### **Evaluation of achievement**

Evaluation by a written homework assignment

Evaluation by a written homework assignment

## Examination レポートで実施

#### By Report Details of examination

## Other information

Office: D-408 Tel: 0532-44-6678 e-mail: shinichi@tut.jp Office: D-408 Tel: 0532-44-6678 e-mail: shinichi@tut.jp

## Reference URL

## Office hours

From 4:00 to 5:00pm, every Tuesday. From 4:00 to 5:00pm, every Tuesday. Relations to attainment objectives of learning and education

## Key words

Interaction of light and atoms, Laser, Optical measurement, Dynamic fracture mechanics Interaction of light and atoms, Laser, Optical measurement, Dynamic fracture mechanics

## (M41630330)Advances in Mechanical Design[Advances in Mechanical Design]

Subject name[English]	Advances in Me	Advances in Mechanical Design[Advances in Mechanical Design]						
Schedule number	M41630330	Subject area	Required or elective	Elective				
Time of starting a course	Year	Day of the week,period		Credit(s)	2			
Faculty	Graduate Progr	am for Master's Degre	Subject grade	2~2				
Department Offered	Mechanical Eng	ineering	Beggining grade	M2				
Charge teacher name[Roman alphabet mark]	森 謙一郎, 足	森 謙一郎, 足立 忠晴 MORI Ken-Ichiro, ADACHI Tadaharu						
Numbering								

#### **Objectives of class**

This class is separated into two parts:

#### Prof. Mori

With the recent development of computers, numerical methods tend to be used in the field of manufacturing processes. The finite element method is mainly explained in this lecture. The finite element method is widely applied to engineering problems such as solid mechanics, fluid mechanics, etc.

## Prof. Adachi

To understand mechanical performances of structures, and mechanical behaviors of solid and structures, fundamental mechanics of solid and structure is lectured. Especially, mechanics of thin-walled structures which is useful for practical design of mechanical structures is explained in detail.

This class is separated into two parts:

## Prof. Mori

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## Prof. Adachi

To understand mechanical performances of structures, and mechanical behaviors of solid and structures, fundamental mechanics of solid and structure is lectured. Especially, mechanics of thin-walled structures which is useful for practical design of mechanical structures is explained in detail.

## **Contents of class**

#### Prof. Mori

1st week: Numerical Methods: finite difference method, finite element method and boundary element method

2nd week: Finite difference method for heat conduction: discretizaton of differential equation governing heat conduction,

calculation of temperature distribution

3rd week: Basic equations in solid mechanics: three-dimensional stress and strain, equilibrium equations, constitutive equations in elasticity and plasticity, yield criteria, incompressibility condition, etc.

4th week: Finite element method for elastic deformation: triangular elements, distributions of displacement and strain

5th week: Equilibrium equations of nodal forces, stiffness matrix,

6th week: Treatment of boundary conditions

7th week: Plasticity, elastic-plastic finite element method 8th week: Summary

Prof. Adachi Chapter 1. Introduction Chapter 2. Automobile Structures from View of Solid Mechanics Purpose of automobile structure, Loading to automobile structure Deformation of automobile structure, Performance of automobile structure Chapter 3. Fundamentals of Structural Mechanics

Fundamental equations in solid mechanics Chapter 4. Forces and Moments Applying to Structures Normal force, shear force, bending moment, torsional moment Chapter 5. Elementary Mechanics of Structures Torsion and bending of thin-walled beams Chapter 6. Mechanics of Thin-Walled Structures Torsion and bending of thin-walled beams Chapter 7. Fundamentals of Dynamic Measurement Frequency response, Strain gage, Load cell, Accelerator Chapter 8. Summary Prof. Mori 1st week: Numerical Methods: finite difference method, finite element method and boundary element method 2nd week: Finite difference method for heat conduction: discretizaton of differential equation governing heat conduction, calculation of temperature distribution 3rd week: Basic equations in solid mechanics: three-dimensional stress and strain, equilibrium equations, constitutive equations in elasticity and plasticity, yield criteria, incompressibility condition, etc. 4th week: Finite element method for elastic deformation: triangular elements, distributions of displacement and strain 5th week: Equilibrium equations of nodal forces, stiffness matrix, 6th week: Treatment of boundary conditions 7th week: Plasticity, elastic-plastic finite element method 8th week: Summary Prof. Adachi Chapter 1. Introduction Chapter 2. Automobile Structures from View of Solid Mechanics Purpose of automobile structure. Loading to automobile structure Deformation of automobile structure, Performance of automobile structure Chapter 3. Fundamentals of Structural Mechanics Fundamental equations in solid mechanics Chapter 4. Forces and Moments Applying to Structures Normal force, shear force, bending moment, torsional moment Chapter 5. Elementary Mechanics of Structures Torsion and bending of thin-walled beams Chapter 6. Mechanics of Thin-Walled Structures Torsion and bending of thin-walled beams Chapter 7. Fundamentals of Dynamic Measurement Frequency response, Strain gage, Load cell, Accelerator Chapter 8. Summary Self Preparation and Review **Related subjects** Mechanics of Materials, Elasticity, Solid Mechanics Mechanics of Materials, Elasticity, Solid Mechanics Notes for textbook Part 1 (Prof. Mori): handout Text for Part (2) (Prof. Adachi) will be distributed in class. Part 1 (Prof. Mori): handout Text for Part (2) (Prof. Adachi) will be distributed in class. Notes for reference Goals to be achieved Part (1) (Prof. Mori) To understand the finite element method Part (2) (Prof. Adachi) To understand physical meaning fundamental equations in solid mechanics. To deeply understand elementary mechanics of materials (strength of materials); tension of bar, torsion of axis and bending of beam

	mechanics of thin-walled structures.
	pt of dynamic measurement of deformation.
To understand	the finite element method
Part (2) (Prof. /	Adachi)
To understand	physical meaning fundamental equations in solid mechanics.
To deeply unde	erstand elementary mechanics of materials (strength of materials); tension of bar, torsion of axis and bending o
beam.	
To understand	mechanics of thin-walled structures.
To know conce	pt of dynamic measurement of deformation.
Evaluation of a	chievement
Part 1 (Prof. M	ori): Reports of every week
Part 2 (Prof A	dachi): Examinations, 80 % and attendances, 20 %
	ori): Reports of every week
Part 2 (Prof. Ad	dachi): Examinations, 80 % and attendances, 20 %
Examination	
レポートで実施	
By Report	
Details of exam	ination
Other informati	
Prof. Mori: roon	n number: D-606, extension number: 6707
	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp
Prof. Mori: roon	n number: D-606, extension number: 6707
Prof. Mori: roon Prof. Adachi: Re	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp
Prof. Mori: room Prof. Adachi: Reference URL	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp -
Prof. Mori: room Prof. Adachi: Reference URL Part(2) (Prof A	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp - dachi) http://solid.me.tut.ac.jp/solid/
Prof. Mori: room Prof. Adachi: R Reference URL Part(2) (Prof A Part(2) (Prof A	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp -
Prof. Mori: room Prof. Adachi: Reference URL Part(2) (Prof A	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp - dachi) http://solid.me.tut.ac.jp/solid/
Prof. Mori: room Prof. Adachi: R Reference URL Part(2) (Prof A Part(2) (Prof A Office hours	oom D-305, Extension phone 6664, Email adachi@me.tut.ac.jp - dachi) http://solid.me.tut.ac.jp/solid/

Strength of materials, Mechanics of materials, solid mechanics, Structural mechanics, Thin-walled Structure, Numerical methods, Forming processes

## (M41630330)Advances in Mechanical Design[Advances in Mechanical Design]

Subject name[English]	Advances in Mec	hanical Design[Adva	nces in Mechanica	al Design]	
Schedule number	M41630330	Subject area	Advanced	Required or	Elective
			Mechanical	elective	
			Engineering		
Time of starting a course	Fall2+Spring1	Day of the week,period	Tue.1~1	Credit(s)	2
Faculty	Graduate Program	n for Master's Degre	e	Subject grade	2~
Department Offered	Mechanical Engin	leering		Beggining	M2
				grade	
Charge teacher name[Roman alphabet mark]	河村 庄造,柴田	隆行 KAWAMURA	Shozo, SHIBATA	Takayuki	
Numbering					
Objectives of slass					
<b>Objectives of class</b> This class is separated into two <sub>I</sub>	oarts:				
Part 1 (Prof. Shibata):					
	to introduce funder	nentals of micromo-	hining technologia	e (microfabrication +	echnologica)
The objectives of this course is their application in the development					
their application in the developme	EIL WIGTO EIECTTO	wechanical System	(WIEIVIS) and MI	bro Total Analysis Sy	stem ( $\mu$ 1AS)
Part 2 (Prof. Kawamura):	audadaa ay alba C		autoulau th	التلاسية معامله	
The class aims to give basic kn	iowieage on vibrati	on engineering, in p	articular, on the	modeling of multi-de	gree-ot-treedo
system and modal analysis. This close is concerned into two y	· <b>t</b> - ·				
This class is separated into two	parts:				
Part 1 (Prof. Shibata):				/ · · · · · ·	
The objectives of this course is		mentals of micromac	hining technologie	s (microfabrication to	echnologies), ar
	. "		(115110)"	<b>T</b> · · · · · · · ·	· /··· <b>T</b> • • • • "
their application in the development	ent "Micro Electro	Mechanical System	(MEMS)" and "Mi	cro Total Analysis Sy	rstem ( $\mu$ TAS)"
their application in the developme	ent "Micro Electro	Mechanical System	(MEMS)″ and ″Mio	cro Total Analysis Sy	rstem ( $\mu$ TAS)"
	ent "Micro Electro	Mechanical System	(MEMS)″ and ″Mio	cro Total Analysis Sy	vstem ( $\mu$ TAS)″
Part 2 (Prof. Kawamura):					
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis.					
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b>					
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Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata):					
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering	owledge on vibrati				
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Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and <i>μ</i> T	owledge on vibrati				
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching	owledge on vibrati	on engineering, in p	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography	owledge on vibrati	on engineering, in p	articular, on the		
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Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering	owledge on vibrati AS D) and Chemical va ulk micromachining	on engineering, in p por deposition (CVD	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of	Nowledge on vibrati AS D) and Chemical va ulk micromachining	on engineering, in p por deposition (CVD MDOF system)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF system	Nowledge on vibrati AS D) and Chemical va ulk micromachining freedom system(N stem (eigenvalue an	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys	Nowledge on vibrati AS D) and Chemical va ulk micromachining freedom system(N stem (eigenvalue an	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys Part 1 (Prof. Shibata):	Nowledge on vibrati AS D) and Chemical va ulk micromachining freedom system(N stem (eigenvalue an	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys Part 1 (Prof. Shibata): Micromachining Engineering	AS AS D) and Chemical va ulk micromachining freedom system(N stem (eigenvalue an tem (Component m	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes	AS AS D) and Chemical va ulk micromachining freedom system(N stem (eigenvalue an tem (Component m	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and $\mu$ T	AS AS D) and Chemical va ulk micromachining freedom system(N stem (eigenvalue an tem (Component m	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.)	articular, on the		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching	AS -freedom system(N -freedom system(N stem (eigenvalue an tem (Component m AS	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.) node synthesis metho	articular, on the r		
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Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming	AS -freedom system(N -freedom system(N stem (eigenvalue an tem (Component m AS	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.) node synthesis metho	articular, on the r		
Part 2 (Prof. Kawamura): The class aims to give basic kn system and modal analysis. <b>Contents of class</b> Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI 5. Plating and Electroforming 6. Bonding processes 7. Surface micromachining and B 8. Presentation and discussion Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of 3&4. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys 5-7. Modal analysis of MDOF sys Part 1 (Prof. Shibata): Micromachining Engineering 1. Introduction of MEMS and μ T 2. Photolithography 3. Wet etching and Dry etching 4. Physical vapor deposition (PVI	AS ) and Chemical va ulk micromachining -freedom system(N stem (eigenvalue an tem (Component m AS ) and Chemical va	on engineering, in p por deposition (CVD MDOF system) nalysis, etc.) node synthesis metho por deposition (CVD	articular, on the r		

Part 2 (Prof. Kawamura): Vibration Engineering 1&2. Modeling of multi-degree-of-freedom system(MDOF system) 3&4. Modal analysis of MDOF system (eigenvalue analysis, etc.) 5-7. Modal analysis of MDOF system (Component mode synthesis method) Self Preparation and Review Part 1 (Prof. Shibata) Students are required to prepare and review each lesson. Useful information on MEMS technologies can be obtained from the following website; http://www.memsnet.org/mems/ Part 1 (Prof. Shibata): Students are required to prepare and review each lesson. Useful information on MEMS technologies can be obtained from the following website; http://www.memsnet.org/mems/ **Related subjects** Part 1 (Prof. Shibata): A fundamental knowledge of physics and chemistry is required. Part 2 (Prof. Kawamura): Fundamental knowledge on vibration engineering and mathematics on linear algebra and ordinary differential equation, and engineering mechanics. Part 1 (Prof. Shibata): A fundamental knowledge of physics and chemistry is required. Part 2 (Prof. Kawamura): Fundamental knowledge on vibration engineering and mathematics on linear algebra and ordinary differential equation, and engineering mechanics. Notes for textbook Part 1 (Prof. Shibata): handout Part 2 (Prof. Kawamura): handout Part 1 (Prof. Shibata): handout Part 2 (Prof. Kawamura): handout Notes for reference Part 1 (Prof. Shibata): Useful information on MEMS technologies can be obtained from the following website; http://www.memsnet.org/mems/ Reference: (1) M.J. Madou, "Fundamentals of Microfabrication, 2nd ed.", CRC Press, 2002. (2) S. Franssila, "Introduction to Microfabrication", John Wiley & Sons, 2004. (3) M. Gad-El-Hak, "The MEMS Handbook, 2nd ed.", CRC Pr I Llc, 2006. Part 1 (Prof. Shibata) Useful information on MEMS technologies can be obtained from the following website; http://www.memsnet.org/mems/ Reference: (1) M.J. Madou, "Fundamentals of Microfabrication, 2nd ed.", CRC Press, 2002. (2) S. Franssila, "Introduction to Microfabrication", John Wiley & Sons, 2004. (3) M. Gad-El-Hak, "The MEMS Handbook, 2nd ed.", CRC Pr I Llc, 2006. Goals to be achieved Part (1) (Prof. Shibata) To gain an understanding of the principles of micromachining technologies and to apply knowledge of the technologies to the design and manufacturing of a microdevice. Part (2) (Prof. Kawamura) get the basic knowledge on vibration engineering and some of their analytical methods. Part (1) (Prof. Shibata) To gain an understanding of the principles of micromachining technologies and to apply knowledge of the technologies to the design and manufacturing of a microdevice. Part (2) (Prof. Kawamura) get the basic knowledge on vibration engineering and some of their analytical methods. Evaluation of achievement Part 1 (Prof. Shibata) Presentation (70%) and classroom performance (30%). An oral presentation on micromachining technologies for the fabrication of MEMS and  $\mu$  TAS devices will be imposed during the course of class.

Part 2 (Prof. Kawamura):	
Some short reports during the class	s (30%) and a comprehensive report after final class (70%)
Part 1 (Prof. Shibata):	
Presentation (70%) and classroom p	performance (30%). An oral presentation on micromachining technologies for the fabrication
of MEMS and $\mu{ m TAS}$ devices will be	e imposed during the course of class.
Part 2 (Prof. Kawamura):	
Some short reports during the class	s (30%) and a comprehensive report after final class (70%)
Examination	
レポートで実施	
By Report	
Details of examination	
Other information	
Prof. Shibata: Room number D-605,	, Extension phone 6693, E-mail shibata@me.tut.ac.jp
Prof. Kawamura: Room D-404, Exte	nsion phone 6674, E-mail kawamura@me.tut.ac.jp
Prof. Shibata: Room number D-605,	Extension phone 6693, E-mail shibata@me.tut.ac.jp
	nsion phone 6674, E-mail kawamura@me.tut.ac.jp
Reference URL	
Office hours	
Anytime. Contact me by email befor	re coming if possible.
Anytime. Contact me by email befor	
Relations to attainment objectives	of learning and education
(E)国内外において活躍できる表現 技術文章,技術論文,口頭での報行 表現し、コミュニケーションする能力	見力・コミュニケーションカ 告・発表及び情報メディアを通じ, 自分の論点や考え, 研究成果などを国の内外に効果的に
Key words	hing, Deposition, Plating, Bonding / Prof. Kawamura: vibration, modal analysis, Componen

Prof. Shibata: Microfabrication, Etching, Deposition, Plating, Bonding / Prof. Kawamura: vibration, modal analysis, Component modes Synthesis

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

Subject name[English]	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research on							
	Electrical and Ele	Electrical and Electronic Information Engineering]						
Schedule number	M42610020	Subject area	Advanced Electrical and	Required or elective	Required			
			Electronic					
			Information					
			Engineering					
Time of starting a course	2Years	Day of the	Intensive	Credit(s)	6			
		week,period						
Faculty	Graduate Progran	n for Master's Degr	ee	Subject grade	1~2			
Department Offered	Electrical and Ele	ctronic Information	Beggining grade	M1, M2				
Charge teacher name[Roman alphabet mark]	S2系教務委員 2	2系教務委員 2kei kyomu Iin-S						
Numbering								

### **Objectives of class**

The thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.

The thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.

### **Contents of class**

The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.

The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.

## Self Preparation and Review

## **Related subjects**

#### Notes for textbook

Reference and material will be available from the supervisor. Reference and material will be available from the supervisor.

#### Notes for reference

#### Goals to be achieved

To get something new on individual research fields.

To develop his/her research skill including the planning and the presentation.

To get something new on individual research fields.

To develop his/her research skill including the planning and the presentation.

## Evaluation of achievement

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

Details of examination

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

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

Subject name[English]	Thesis Researc	h on Electrical and E	lectronic Informat	ion Engineering[The	esis Research o
	Electrical and E	lectronic Information	Engineering]		
Schedule number	M42610020	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Required
Time of starting a course	2Years	Day of the week,period	Intensive	Credit(s)	6
Faculty	Graduate Progra	am for Master's Degre	e	Subject grade	1~2
Department Offered	Electrical and E	lectronic Information	Engineering	Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark] Numbering	S2系教務委員,	, 2系各教員 2kei kyoi	mu Iin−S, 2kei kakuł	-	
Objectives of class					
<b>Contents of class</b> The research subject depends or research subject. For more details <b>Self Preparation and Review</b>				very student will h	nave an individua
Related subjects					
Notes for textbook					
Reference and material will be ava	ailable from the s	upervisor.			
Notes for reference					
Goals to be achieved					
To get something new on individu					
To develop his/her research skill <b>Evaluation of achievement</b>	including the plan	ining and the presenta			
Presentation, Thesis,Coursework,	and Outcomes a	re evaluated generally	,		
Examination	and Outcomes a	re evaluated generally	/.		
その他					
None during exam period					
Details of examination					
Other information					
Reference URL					
Office hours					
Relations to attainment objective	s of learning and	education			
Relations to attainment objective	s of learning and	education			

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

Subject name[English]	Thesis Research on Electrical and Electronic Information Engineering[Thesis Research of							
	Electrical and Electronic Information Engineering]							
Schedule number	M4261002T	Subject are	a	Advanced	Required or	Required		
				Electrical and	elective			
				Electronic				
				Information				
				Engineering				
Time of starting a course	Year	Day of	the	Intensive	Credit(s)	6		
		week,period	I					
Faculty	Graduate Progran	n for Master's	Subject grade	2~2				
Department Offered	Electrical and Ele	ctronic Inform	Beggining	M2				
					grade			
Charge teacher name[Roman	S2系教務委員 2	S2系教務委員 2kei kyomu Iin−S						
alphabet mark]								
Numbering								

### **Objectives of class**

The thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.

The thesis research aims to provide a practical experience of research work, and to acquire his/her research skill with deep understanding of the electrical and electronic information engineering.

## Contents of class

The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.

The research subject depends on the supervisor and the research group you belong to. Every student will have an individual research subject. For more details, please contact with your supervisor.

## Self Preparation and Review

## **Related subjects**

#### Notes for textbook

Reference and material will be available from the supervisor. Reference and material will be available from the supervisor.

#### Notes for reference

#### Goals to be achieved

To get something new on individual research fields.

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

To develop his/her research skill including the planning and the presentation.

## Evaluation of achievement

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

Examination

試験期間中には何も行わない

None during exam period

**Details of examination** 

Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering[Seminar on Electrical and								
	Electronic Inform	Electronic Information Engineering]							
Schedule number	M42610040	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Required				
Time of starting a course	Year	Day of the	Intensive	Credit(s)	6				
		week,period							
Faculty	Graduate Program for Master's Degree Subject grade 1~2								
Department Offered	Electrical and Elec	Beggining grade	M2						
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu lin-S								
Numbering									

## **Objectives of class**

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

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

## Contents of class

The class provides both of fundamental knowledge on the research work of master thesis and the most advanced results in the related field by reading research papers and monographs. Contents of the class depend on the supervisor. To be announced by individual supervisors.

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. 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.
- 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

 $\label{eq:coursework} Coursework, \ presentation \ and/or \ report.$ 

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

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

Subject name[English]	Methodology of F	1			<b>.</b>	<b>F</b> 1 11
Schedule number	M42630110	Subject are	a	Advanced	Required or	Elective
				Electrical and	elective	
				Electronic		
				Information		
				Engineering		
Time of starting a course	Spring term	Day of	the	Tue.3~3	Credit(s)	2
		week,perio	ł			
Faculty	Graduate Progra	m for Master's	Degre	e	Subject grade	1~2
Department Offered	Electrical and Ele	ectronic Inform	nation	Engineering	Beggining	M1, M2
					grade	
Charge teacher name[Roman	S2系教務委員 2	kei kyomu Iin <sup>.</sup>	-S			
alphabet mark]		-				
Numbering						
_						
Objectives of class						
The class aims to provide a ba	-		odolog	y related to the e	electrical and elect	ronic information
engineering for the research work	of his/her master	thesis.				
The class aims to provide a ba	sic understanding	of R&D meth	iodolog	y related to the e	electrical and elect	ronic information
engineering for the research work	of his/her master	thesis.				
Contents of class						
The class provides some fundam	ental tips to condu	uct R&D work	effect	ively. Contents of	the class depend o	n the supervisor.
To be announced by individual su	pervisors			-		
The class provides some fundam		uct R&D work	effect	ively. Contents of	the class depend o	n the supervisor.
To be announced by individual su	-					
Self Preparation and Review						
Related subjects						
Notes for textbook						
Reference and material will be av	ailable from the su	nervisor				
Reference and material will be av						
Notes for reference						
Goals to be achieved						
To acquire the ability of identif	ying and formulati	ng research	orobler	n, planning and im	plementing specific	research tasks,
troubleshooting and communication	ng outcomes.					
To acquire the ability of identif	ying and formulati	ng research <sub>l</sub>	orobler	n, planning and im	plementing specific	research tasks,
troubleshooting and communicati	ng outcomes.					
Evaluation of achievement						
Coursework and presentation are	evaluated generall	у.				
Coursework and presentation are	avaluated general	v				
Coursework and presentation are	evaluateu generali	у.				
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						
Deletione to etterment attain the						
Relations to attainment objective	is of learning and e	oucation				

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

· · · <b>·</b> · · · · · · · · · · · · · · ·	s for Electronics	1]		
M42630140	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Spring term	Day of the week,period	Wed.2~2	Credit(s)	2
Graduate Program for Master's D	legree		Subject grade	1~2
Electrical and Electronic Informat	tion Engineering		Beggining grade	M1, M2
石山 武, 松田 厚範, 服部 敏 Toshiaki, TAKAGI Hiroyuki	(明,高木 宏幸Ⅰ	SHIYAMA Takeshi,	MATSUDA Ats	unori, HATTORI
	Spring term Graduate Program for Master's D Electrical and Electronic Informat 石山 武, 松田 厚範, 服部 敏	Spring term       Day of the week,period         Graduate Program for Master's Degree         Electrical and Electronic Information Engineering         石山 武,松田 厚範,服部 敏明,高木 宏幸1	Characterized     Electrical and Electronic Information Engineering       Spring term     Day of the week,period       Graduate Program for Master's Degree       Electrical and Electronic Information Engineering       石山 武, 松田 厚範, 服部 敏明, 高木 宏幸 ISHIYAMA Takeshi,	Belocitie     Electrical and Electronic Information     elective       Spring term     Day of the week,period     Wed.2~2     Credit(s)       Graduate Program for Master's Degree     Subject grade     grade       Electrical and Electronic Information Engineering     Beggining grade       Tou 武, 松田 厚範, 服部 敏明, 高木 宏幸 ISHIYAMA Takeshi, MATSUDA Ats

## **Objectives of class**

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

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

## Contents of class

"Physics for Electronics 1" is composed of four topics of functional materials, photonics, electrodics, and spin electronics, which will be delivered for three times for each by four professors whose expertise lie on the individual categories.

The category of "Functional materials" is made to learn preparation, characterization and applications of functional materials for electronics and ionics based on physics and chemistry. The contents are 1) Fundamentals of amorphous and crystal, 2) Structure and property of glasses, 3) New preparation techniques of advanced materials, 4) Functional materials for ionis including Li-ion battery and fuel cell, and 5) Functional materials for optics including coatings, micro-optical components, and photonic devices.

The course of "photonics" is devoted to the understanding of interactions

between photon (light wave) and materials based on the quantum theory and also to industrial applications of photonic devices. 1) Optoelectronic devices, 2) optical processes in semiconductors and exciton, 3) nanomaterial.

The category of "electrodics" is electrochemical reaction on electrode. The contents are 1) fundamentals of thermodynamics in aqueous solution, 2) fundamental of electrical double layer 3) fundamental of adsorption, 4) fundamentals of electrochemical reaction, and 5) applications of chemical sensor.

The category of "spin electronics" covers a wide area from fundamentals to applications of magnetic materials and magnetics. 1) Origin of magnetics, 2) Soft and hard magnetic materials, 3) Major applications of magnetics and magnetic materials, 4) Interaction phenomena among spins and various physical quantities, 5) Micro-magnetic devices and systems, 6) Spintronics and spin photonics

"Physics for Electronics 1" is composed of four topics of functional materials, photonics, electrodics, and spin electronics, which will be delivered for three times for each by four professors whose expertise lie on the individual categories.

The category of "Functional materials" is made to learn preparation, characterization and applications of functional materials for electronics and ionics based on physics and chemistry. The contents are 1) Fundamentals of amorphous and crystal, 2) Structure and property of glasses, 3) New preparation techniques of advanced materials, 4) Functional materials for ionis including Li-ion battery and fuel cell, and 5) Functional materials for optics including coatings, micro-optical components, and photonic devices.

The course of "photonics" is devoted to the understanding of interactions between photon (light wave) and materials based on the quantum theory and also to industrial applications of photonic devices. 1) Optoelectronic devices, 2) optical processes in semiconductors and exciton, 3) nanomaterial. The category of "electrodics" is electrochemical reaction on electrode. The contents are 1) fundamentals of thermodynamics in aqueous solution, 2) fundamental of electrical double layer 3) fundamental of adsorption, 4) fundamentals of electrochemical reaction, and 5) applications of chemical sensor.

The category of "spin electronics" covers a wide area from fundamentals to applications of magnetic materials and magnetics. 1) Origin of magnetics, 2) Soft and hard magnetic materials, 3) Major applications of magnetics and magnetic materials, 4) Interaction phenomena among spins and various physical quantities, 5) Micro-magnetic devices and systems, 6) Spintronics and spin photonics

## Self Preparation and Review

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

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

### **Related subjects**

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

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

Textbook1	Book title	Physical Chemistr	ry	ISBN	0198700725	
	Author	Atkins	Publisher	Oxford	Publish year	2006
				University		
				Press		
Textbook2	Book title	Inorganic Chemist	try		ISBN	0199264635
Textbook2	Book title Author	Inorganic Chemist Shriver	try Publisher	Oxford	ISBN Publish year	0199264635 2006
Textbook2		0	,	Oxford University		

## Notes for textbook

None

None

#### Notes for reference

## Goals to be achieved

(1) To understand fundamental aspects on functional materials, photonics, electrodics and spin electronics.

(2) To get the knowledge on the latest technologies on these physical phenomena.

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

#### **Evaluation of achievement**

The final evaluation will be the sum of four categories (25%); functional materials, photonics, electrodics, spin electronics.

The final evaluation will be the sum of four categories (25%); functional materials, photonics, electrodics, spin electronics.

## Examination

## 試験期間中には何も行わない

## None during exam period

Details of examination

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

## Other information

Photonics; Takeshi Ishiyama: ishiyama@ee.tut.ac.jp

Functional materials; Atsunori Matuda : matsuda@ee.tut.ac.jp

Electrodics; Toshiaki Hattori : thattori@ee.tut.ac.jp

Spin electronics: Hiroyuki Takagi : takagi@ee.tut.ac.jp

Photonics; Takeshi Ishiyama: ishiyama@ee.tut.ac.jp

Functional materials; Atsunori Matuda : matsuda@ee.tut.ac.jp

Electrodics; Toshiaki Hattori : thattori@ee.tut.ac.jp

Spin electronics: Hiroyuki Takagi : takagi@ee.tut.ac.jp

## Reference URL

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

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

Office hours

one hour after every classes one hour after every classes

Relations to attainment objectives of learning and education

## Key words

functional materials, photonics, spin electronics, ionics, micro-optics, electrodics functional materials, photonics, spin electronics, ionics, micro-optics, electrodics

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

Subject name[English]	Electrical Techno	logy and Materials 1	[Electrical Technology	ogy and Materials 1	]
Schedule number	M42630180	Subject area	Advanced	Required or	Elective
			Electrical and	elective	
			Electronic		
			Information		
			Engineering		
Time of starting a course	Spring term	Day of the	Wed.1~1	Credit(s)	2
Faculty	Graduate Program	week,period	20	Subject grade	1~2
Department Offered		ctronic Information		Beggining	M1, M2
			0 0	grade	
Charge teacher name[Roman	須田 善行,稲田	亮史,村上 義信 \$	SUDA Yoshiyuki, INA	ADA Ryoji, MURAK	AMI Yoshinobu
alphabet mark]					
Numbering					
Objectives of class					
This lecture is implemented as a					
disciplines. It is being useful as re		study guide for the I	professional dealing	with this importan	t area. There are
following three sub courses to ch					
This lecture is implemented as a					
disciplines. It is being useful as re		study guide for the	professional dealing	with this importan	t area. There are
following three sub courses to ch	oose from.				
Contents of class					
Sub Course 1(Y. suda)					
1. Fundamental concept of electri	cal energy enginee	ring			
2. Three-phase systems					
3. Power electronics					
Sub Course 2(R. Inada)		<b>_</b> .			
1. Introduction of Electrochemica		n Devices			
2. Lithium-Ion Secondary Batterie					
3. Recent Trend in Electrochemic	al Energy Conversi	on Devices			
Sub Course 3(Yo. murakami)	<b>a</b> .				
1. Introduction of Electric Energy	-				
2. High Voltage Engineering and E					
3. Fundamental Properties of Diel	ectrics and Electric	cal Insulating Materi	als.		
Sub Course 1(Y. suda)					
1. Fundamental concept of electric	cal energy enginee	ring			
2. Three-phase systems					
3. Power electronics Sub Course 2(R. Inada)					
1. Introduction of Electrochemical	Enormy Convorcio	n Daviaga			
		n Devices			
<ol> <li>Lithium-Ion Secondary Batterie</li> <li>Recent Trend in Electrochemic</li> </ol>		on Devices			
Sub Course 3(Yo. murakami)	a Linergy Conversi	UT DEVICES			
1. Introduction of Electric Energy	Systems				
2. High Voltage Engineering and E	-				
3. Fundamental Properties of Diel		cal Insulating Materi	als.		
Self Preparation and Review					
Related subjects					
Basic electrical power engineering	z course is prerequ	isite.			
Basic electrical power engineering					
Notes for textbook	,				
Materials will be prepared by the	lecturer.				
Materials will be prepared by the					
Notes for reference					
Orale to be sublessed					
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

(1) J. Larminie and A. Dicks: Fuel Cell Systems Explained (Wiley)

- (2) M. Yoshio, R.J. Brodd and A. Kozawa: Lithium Ion Batteries: Science and Technologies (Springer-Verlag)
- (3) E. Kuffel, W. Zaengel and J. Kuffel: High Voltage Engineering (Newnes)

(1) J. Larminie and A. Dicks: Fuel Cell Systems Explained (Wiley)

(2) M. Yoshio, R.J. Brodd and A. Kozawa: Lithium Ion Batteries: Science and Technologies (Springer-Verlag)

(3) E. Kuffel, W. Zaengel and J. Kuffel: High Voltage Engineering (Newnes)

Office hours

Relations to attainment objectives of learning and education

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

Schedule number	-	SI Process 1]	[		
	M42630220	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Tue.1~1	Credit(s)	2
Faculty	Graduate Progra	n for Master's Degre	e	Subject grade	1~2
Department Offered	Electrical and Ele	ectronic Information	Beggining grade	M1, M2	
Charge teacher name[Roman alphabet mark]	村上 裕二,澤田	和明 MURAKAMI、	Yuji, SAWADA Kazu		
Numbering					
<b>Objectives of class</b> From the viewpoint of deep unde of latest device will be lectured. From the viewpoint of deep unde of latest device will be lectured.					
Contents of class					
Device processing MEMS/NEMS Latest MOS FETs Gurrent topics in IC/MEMS Integrated circuits Device processing MEMS/NEMS Latest MOS FETs Gurrent topics in IC/MEMS Self Preparation and Review Related subjects The basic knowledge on the quan		ermodynamics, and e	electronics are desir	able.	
	ourse		lectronics are desir	abla	
Semiconductor Physics, Master c The basic knowledge on the quan	tum mechanics, th	ermodynamics, and e		able.	
The basic knowledge on the quan Semiconductor Physics, Master c		ermodynamics, and e			
The basic knowledge on the quan Semiconductor Physics, Master c Notes for textbook	ourse	ermodynamics, and e			
The basic knowledge on the quan Semiconductor Physics, Master c Notes for textbook Physics of Semiconducotr Device S.M.Sze, Willy	eourse	ermoqynamics, and e		aure.	
The basic knowledge on the quan Semiconductor Physics, Master c Notes for textbook Physics of Semiconducotr Device S.M.Sze, Willy Physics of Semiconducotr Device	eourse	ermooynamics, ano e		aure.	
The basic knowledge on the quan Semiconductor Physics, Master c Notes for textbook Physics of Semiconducotr Device	eourse	ermoqynamics, and e		aure.	
The basic knowledge on the quan Semiconductor Physics, Master of Notes for textbook Physics of Semiconducotr Device S.M.Sze, Willy Physics of Semiconducotr Device S.M.Sze, Willy Notes for reference Goals to be achieved (1) To understand fundamental as (2) To get the knowledge on the I (1) To understand fundamental as (2) To get the knowledge on the I	spects on LSI proc atest technologies spects on LSI proc	ess, and semiconduc on LSI process. ess, and semiconduc	tor devices includin	g material design.	
The basic knowledge on the quan Semiconductor Physics, Master of Notes for textbook Physics of Semiconducotr Device S.M.Sze, Willy Physics of Semiconducotr Device S.M.Sze, Willy Notes for reference Goals to be achieved (1) To understand fundamental as (2) To get the knowledge on the I (1) To understand fundamental as	spects on LSI proc atest technologies spects on LSI proc atest technologies	ess, and semiconduc on LSI process. ess, and semiconduc	tor devices includin	g material design.	
The basic knowledge on the quan Semiconductor Physics, Master of Notes for textbook Physics of Semiconducotr Device S.M.Sze, Willy Physics of Semiconducotr Device S.M.Sze, Willy Notes for reference Goals to be achieved (1) To understand fundamental as (2) To get the knowledge on the I (1) To understand fundamental as (2) To get the knowledge on the I Evaluation of achievement Reports (50%) and Final examinati	spects on LSI proc atest technologies spects on LSI proc atest technologies spects on LSI proc atest technologies	ess, and semiconduc on LSI process. ess, and semiconduc	tor devices includin	g material design.	
The basic knowledge on the quan Semiconductor Physics, Master of Notes for textbook Physics of Semiconducotr Device S.M.Sze, Willy Physics of Semiconducotr Device S.M.Sze, Willy Notes for reference Goals to be achieved (1) To understand fundamental as (2) To get the knowledge on the I (1) To understand fundamental as (2) To get the knowledge on the I Evaluation of achievement	spects on LSI proc atest technologies spects on LSI proc atest technologies spects on LSI proc atest technologies	ess, and semiconduc on LSI process. ess, and semiconduc	tor devices includin	g material design.	

Other information
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ymurakami@ee.tut.ac.jp
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

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

Subject name[English]	Information and C 1]	Communication Tec	hnology 1[Informati	on and Communic	ation Technology
Schedule number	M42630240	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Mon.3~3	Credit(s)	2
Faculty	Graduate Program	n for Master's Degre	e	Subject grade	1~2
Department Offered	Electrical and Elec	ctronic Information	Engineering	Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	上原 秀幸,大平	孝 UEHARA Hidey	uki, OHIRA Takashi	·	
Numbering					

## **Objectives of class**

Students select between the following two courses:

The first course is intended for learning how to design microwave circuits needed for advanced wireless communication systems and wireless power transmission systems. The distributed constant element theory is addressed to characterize linear circuits at high frequencies. Based on this technique, students challenge synthesis of a variety of microwave signal and power processing functions.

The second course is intended for learning the mechanism of medium access control and multi-hop communications for ad hoc and sensor networks. Students try to give solutions of the problems which cause performance degradation.

Students select between the following two courses:

The first course is intended for learning how to design microwave circuits needed for advanced wireless communication systems and wireless power transmission systems. The distributed constant element theory is addressed to characterize linear circuits at high frequencies. Based on this technique, students challenge synthesis of a variety of microwave signal and power processing functions.

The second course is intended for learning the mechanism of medium access control and multi-hop communications for ad hoc and sensor networks. Students try to give solutions of the problems which cause performance degradation.

#### **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 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

## 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 1:

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

#### Course 2:

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

## Notes for textbook

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

Course 2: Instruct in 1st class.

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

Course 2: Instruct in 1st class.

## Notes for reference

Goals to be achieved

Course 1:

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

Course 2:

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

Course 1:

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

Course 2:

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

## **Evaluation of achievement**

Course 1: Marks are based on the final test.

Course 2: Marks are based on reports and presentations. Course 1: Marks are based on the final test.

Course 2: Marks are based on reports and presentations.

Examination 定期試験を実施(対面)

Examination(Face to Face)

Details of examination

### Other information

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

## **Reference URL**

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

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

## Office hours

Appoint a time slot via email

Appoint a time slot via email

Relations to attainment objectives of learning and education

## Key words

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

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

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

Subject name[English]	Seminar on Com Engineering I]	Seminar on Computer Science and Engineering I[Seminar on Computer Science Engineering I]							and	
Schedule number	M43610010	Subject	area		Advanced Computer Science Engineering	and	Required elective	or	Required	
Time of starting a course	Year	Day o week.pei		the	Intensive		Credit(s)		4	
Faculty	Graduate Program	for Maste	er's [	Degre	e		Subject gr	ade	1~2	
Department Offered	Computer Science	Computer Science and Engineering				Beggining grade		M1		
Charge teacher name[Roman alphabet mark]	S3系教務委員 3k	S3系教務委員 3kei kyomu Iin-S								
Numbering										

## **Objectives of class**

The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering.

It is also aimed for students to acquire various skills, required in general research work, such as those for oral presentation, and technical discussion and writing.

The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering.

It is also aimed for students to acquire various skills, required in general research work, such as those for oral presentation, and technical discussion and writing.

## Contents of class

While specific contents depend on the research areas students are involved in, it is usually the case for students to read relevant textbooks/research papers and report on them, as well as to present and discuss on the research work of their own. While specific contents depend on the research areas students are involved in, it is usually the case for students to read relevant textbooks/research papers and report on them, as well as to present and discuss on the research work of their own. **Self Preparation and Review** 

#### **Related** subjects

Consult with your advisor.

Consult with your advisor.

Notes for textbook

Consult with your advisor. Consult with your advisor. Notes for reference

Goals to be achieved

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

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

## Evaluation of achievement

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

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

Examination

試験期間中には何も行わない

None during exam period

**Details of examination** 

## Other information

Reference URL

Office hours

Relations to attainment objectives of learning and education

Subject name[English]	Seminar on Co	omputer Science and	d Engineering II[Se	eminar on Compu	ter Scier
	Engineering II]				
Schedule number	M43610020	Subject area	Advanced	Required or	Require
			Computer	elective	
			Science and		
			Engineering		
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	2
Faculty	Graduate Progra	am for Master's Degre	e	Subject grade	2~2
Department Offered	Computer Scien	ce and Engineering		Beggining grade	M2
Charge teacher name[Roman alphabet mark]	S3系教務委員:	3kei kyomu Iin−S		3.000	
Numbering					
Objectives of class					
•					
Contents of class					
Self Preparation and Review					
Related subjects					
Notes for textbook					
Notes for reference					
Goals to be achieved					
Evaluation of achievement					
Examination					
Examination 試験期間中には何も行わない					
試験期間中には何も行わない					
試験期間中には何も行わない None during exam period					
試験期間中には何も行わない					
試験期間中には何も行わない None during exam period					
試験期間中には何も行わない None during exam period <b>Details of examination</b>					
試験期間中には何も行わない None during exam period Details of examination Other information					
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					
試験期間中には何も行わない None during exam period Details of examination Other information Reference URL	s of learning and o	education			
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	es of learning and d	education			
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	s of learning and	education			

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

Subject name[English]	Thesis Research on Computer Science and Engineering[Th							esear	ch on Computer
	Science and Engineering]								
Schedule number	M43610030	Subject area		Advanced Computer Science	and	Required or elective		Required	
					Engineering				
Time of starting a course	2Years	2Years Day of the Intensive			Credit(s)		6		
		week,	period						
Faculty	Graduate Program	for Ma	ster's	Degre	ee		Subject grad	de	1~2
Department Offered	Computer Science	Computer Science and Engineering					Beggining grade		M1, M2
Charge teacher name[Roman alphabet mark]	S3系教務委員 3k	S3系教務委員 3kei kyomu Iin-S							
Numbering									

## **Objectives of class**

The course is intended for students to foster their interests in research problems on computer science and engineering and to acquire ability for independent studies.

It is also aimed for students to acquire, through thesis research, cooperativeness, a sense of responsibility, abilities for problem solving, research planning, decision making, outcome presentation and subject investigation, and to enhance their creativity and persistency, among others.

The course is intended for students to foster their interests in research problems on computer science and engineering and to acquire ability for independent studies.

It is also aimed for students to acquire, through thesis research, cooperativeness, a sense of responsibility, abilities for problem solving, research planning, decision making, outcome presentation and subject investigation, and to enhance their creativity and persistency, among others.

## Contents of class

It is usually the case that thesis research is carried out on individual bases with specific contents differing from one student to another.

Consult with your advisor for any further details.

It is usually the case that thesis research is carried out on individual bases with specific contents differing from one student to another.

Consult with your advisor for any further details.

## Self Preparation and Review

## **Related subjects**

Consult with your advisor for them. Consult with your advisor for them.

#### Notes for textbook

Consult with your advisor for them.

Consult with your advisor for them.

## Notes for reference

## Goals to be achieved

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

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

#### Evaluation of achievement

Three faculty members will be assigned to prepare the evaluation for your thesis research, based on publication records,
master thesis, and oral presentation. It will be then finalized by the faculty meeting.
Three faculty members will be assigned to prepare the evaluation for your thesis research, based on publication records,
master thesis, and oral presentation. It will be then finalized by the faculty meeting.
Examination
Details of examination
Other information
Reference URL
Office hours
Relations to attainment objectives of learning and education
Key words

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

Subject name[English]	Thesis Research	on Computer	Sci	ence and Engineer	ing[Thesis Resear	ch on Computer
	Science and Engi	neering]				
Schedule number	M43610030	Subject area		Advanced	Required or	Required
				Computer	elective	
				Science and		
				Engineering		
Time of starting a course	2Years	Day of	the	Intensive	Credit(s)	6
		week,period				
Faculty	Graduate Program	n for Master's	Degre	e	Subject grade	1~2
Department Offered	Computer Scienc	e and Engineer	ing		Beggining	M1, M2
					grade	
Charge teacher name[Roman	S3系教務委員,3	3系各教員 3ke	i kyoı	mu Iin−S, 3kei kakuł	kyouin	
alphabet mark]						
Numbering						
Objectives of class						
The course is intended for stude	ents to foster their i	nterests in res	earch	problems on comp	uter science and e	ngineering and to
acquire ability for independent st				. p. c. c. c. c. p. c. p.		
It is also aimed for students to a		sis research .co	oner	ativeness a sense (	of responsibility, ab	ilities for problem
solving, research planning, decisi			•			
persistency, among others.	on making, outcome	presentation				ion of outfirity and
percention, among others.						
Contents of class						
It is usually the case that thesis				and a state of the second state	and a set of the set o	and the state of t
another.	research is carried	out on individu	al ba	ses with specific co	ntents differing fro	m one student to
another. Consult with your advisor for an		out on individu	al ba	ses with specific co	ntents differing fro	m one student to

## Self Preparation and Review

## **Related subjects**

Consult with your advisor for them.

## Notes for textbook

Consult with your advisor for them.

## Notes for reference

## Goals to be achieved

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

## **Evaluation of achievement**

Three faculty members will be assigned to prepare the evaluation for your thesis research, based on publication records, master thesis, and oral presentation. It will be then finalized by the faculty meeting.

Examination

その他

## None during exam period

**Details of examination** 

## Other information

Reference URL

**Office hours** 

## Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Thesis Research on Computer Science and Engineering[Thesis Research on Computer								
	Science and Engineering]								
Schedule number	M4361003T						Required elective	or	Required
					Computer Science	and	elective		
					Engineering				
Time of starting a course	Year	Day	of	the	Intensive		Credit(s)		6
		week,	period						
Faculty	Graduate Program	n for Ma	ister's	Degre	e		Subject grad	le	2~2
Department Offered	Computer Science	e and E	nginee	ering			Beggining		M2
		grade							
Charge teacher name[Roman	S3系教務委員 3k	S3系教務委員 3kei kyomu Iin−S							
alphabet mark]									
Numbering									

### **Objectives of class**

The project is intended for students to foster their interests in research problems on computer science and engineering and to acquire ability for independent studies.

It is also aimed for students to acquire design ability for their thesis research such as the purpose, the background knowledge, the research topic, the plan/schedule and to present the progress.

The project is intended for students to foster their interests in research problems on computer science and engineering and to acquire ability for independent studies.

It is also aimed for students to acquire design ability for their thesis research such as the purpose, the background knowledge, the research topic, the plan/schedule and to present the progress.

### Contents of class

It is usually the case that the project is carried out on individual bases with specific contents differing from on student to another.

Consult with your advisor for any further details.

It is usually the case that the project is carried out on individual bases with specific contents differing from on student to another.

Consult with your advisor for any further details.

#### Self Preparation and Review

#### **Related subjects**

Consult with your advisor for them. Consult with your advisor for them.

#### Notes for textbook

Consult with your advisor.

Consult with your advisor.

### Notes for reference

#### Goals to be achieved

To acquire design abilities for doing research and development at technically high level and leading large scale research projects

To acquire design abilities for doing research and development at technically high level and leading large scale research projects

### Evaluation of achievement

Will be evaluated by the poster presentation and report including the research purpose, background knowledge, research topic, plan/scheduling and progress.

Will be evaluated by the poster presentation and report including the research purpose, background knowledge, research topic, plan/scheduling and progress.

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

# (M43630020)System Design Project[System Design Project]

	System Design F	Project[System Desig	gn Project]		
Schedule number	M43630020	Subject area	Required or	Elective	
			Computer	elective	
			Science and		
			Engineering		
Fime of starting a course	Spring term	Day of the	Fri.4 ~ 5,Tue.4 ~4	Credit(s)	2
Faculty	Graduate Progra	week,period m for Master's Degre		Subject grade	1~2
Department Offered	Computer Scien	ce and Engineering		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	S3系教務委員:	3kei kyomu Iin−S			L
Numbering					
Objectives of class					
The project is intended for stude	ents to foster thei	r interests in researd	ch problems on con	nputer science and	engineering a
to acquire ability for independent	studies.				
It is also aimed for students to a	cquire design abilit	y for their thesis res	search such as the	purpose, the backg	round knowledg
the research topic, the plan/sche	edule and to prese	ent the progress.			
The project is intended for stud-	nto to footor that	r interacto in roccorr	h problems on com	puter colonge and	anginacting
The project is intended for stude		mileresis in researc	on problems on con	iputer science and	engineering al
to acquire ability for independent		. for the state of			
It is also aimed for students to a		-	search such as the	purpose, the backg	round knowledg
the research topic, the plan/sche	edule and to prese	ent the progress.			
Contents of class					
It is usually the case that the p	roject is carried o	out on individual bas	es with specific co	ntents differing fro	m on student
another.					
Consult with your advisor for any	further details.				
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<b>T</b> ,					
	roject is carried o	out on individual bas	es with specific co	ntents differing fro	m on student
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Will be evaluated by the poster presentation and report including the research purpose, background knowledge, research topic, plan/scheduling and progress.

A:greater than or equal to 80, B: greater than or equal to 65, C: greater than or equal to 55

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

情報・知能工学専攻 (B)技術者としての正しい倫理観と社会性 技術者としての専門的・倫理的責任を自覚し、社会における技術的課題を設定・解決・評価する能力 (D)広範囲の知識を有機的に連携させた研究開発方法論の体得 広範囲の知識の連携による研究開発に対する方法論を体得し、研究開発の計画立案と、それを実践できる能力 (E)国内外において活躍できる表現力・コミュニケーションカ 論文、ロ頭及び情報メディアを通じて、自分の論点や考えなどを国の内外において効果的に表現し、コミュニケーションする能力 とプレゼンテーションする能力

Key words

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

Subject name[English]	Quantum Biology	1			1
Schedule number	M43630160	Subject area	Advanced	Required or	Elective
			Computer Science	elective	
			Science ar Engineering	ומ	
Time of starting a course	Spring term	Day of the	Engineering Wed.1~1	Credit(s)	2
		week,period	1100.1	5. 5010(6/	-
Faculty	Graduate Program	n for Master's Degre	e	Subject grade	1~2
Department Offered	Computer Scienc	e and Engineering		Beggining	M1, M2
Charge teacher name[Roman	問題 法田 田田	曲力 後藤 仁士。		grade URITA Noriyuki, GOT	0 Hitachi
alphabet mark]	<b>戌封'万</b> 万,木田	兴之,饭膝 1-心。	SENINO HIdeo, K	URITA Noriyuki, GUT	
Numbering					
Objectives of class					
Understanding of theories for mol	ecular science and	simulation technolo	av based upon it		
Understanding of theories for mol					
Contents of class			C. Sperry		
1. Fundamental notion of quantum	mechanics				
i) Philosophical aspect					
ii) Pragmatical aspect					
2. Differential equations for quant	um mechanical pro	blems			
i) Free particle					
ii) Confined particle					
iii) Multidimensional problems					
3. Molecular orbital theory					
i) Representation of physical space					
ii) Spectral representation of space	e/ Basis functions	3			
4. Approximate theory for many e	-				
i) Many particle problem in confin	ed systems				
ii) Rigor and precision					
iii) Computational aspect					
1. Fundamental notion of quantum	n mechanics				
i) Philosophical aspect					
ii) Pragmatical aspect					
2. Differential equations for quant	um mechanical pro	blems			
i) Free particle					
ii) Confined particle					
iii) Multidimensional problems					
3. Molecular orbital theory					
i) Representation of physical space					
ii) Spectral representation of space	e/ Basis functions	3			
4. Approximate theory for many e					
i) Many particle problem in confin	ed systems				
ii) Rigor and precision					
iii) Computational aspect					
Self Preparation and Review					
Preparation is must. Student can	not stay in the clas	s if not prepared for	the class in adv	/ance.	
Preparation is must. Student can	-				
Related subjects					
-					
Notes for textbook					
1)Quantum chemistry					
Eyring/Walter/Kimball					
2)Modern Quantum Chemistry					
Introduction to Advanced Electro					

A.Szabo and N.S.Ostlund
1)Quantum chemistry
Eyring/Walter/Kimball
2)Modern Quantum Chemistry
Introduction to Advanced Electron Structure Theory
A.Szabo and N.S.Ostlund
Notes for reference
Goals to be achieved
To understand quantum mechanics, Molecuar quantum mechanics and its numerical representation on computer.
To understand quantum mechanics, Molecuar quantum mechanics and its numerical representation on computer.
Evaluation of achievement
Presentation in the class and reports, small tests as well as creation of simulation programs.
Presentation in the class and reports, small tests as well as creation of simulation programs.
Examination
その他
Other
Details of examination
In each class, student must show the results of the research project assigned for each.
In each class, student must show the results of the research project assigned for each.
Other information
F-305
0532-44-6880
F-305
0532-44-6880
Reference URL
Wed. 13:00 to 14:30
Wed. 13:00 to 14:30 Relations to attainment objectives of learning and education
Key words
Molecular Orbital Theory Differential Equation
Molecular Orbital Theory Differential Equation

# (M43630210)Advanced Chemoinformatics[Advanced Chemoinformatics]

Subject name[English]	Advanced Chem	oinformatics[Advand	ed Chemoinformatic	s]	
Schedule number	M43630210	Subject area	Advanced	Required or	Elective
			Computer	elective	
			Science and		
			Engineering		
Time of starting a course	Spring term	Day of the week,period	Mon.5~5	Credit(s)	2
Faculty	Graduate Progra	m for Master's Degr	ee	Subject grade	1~2
Department Offered	Computer Scien	ce and Engineering		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	高橋 由雅,加藤	博明 TAKAHASH	l Yoshimasa, KATO I		
Numbering					
Objectives of class					
The purpose of this course is	to introduce and	explain practical an	d applied approache	es to data analysis	(or mining) an
knowledge discovery with illustr				-	-
are interested in not only pursu					
The purpose of this course is	-				(or mining) an
knowledge discovery with illustr				-	-
are interested in not only pursu	•	•		•	
Contents of class					
Topics to be covered:					
1.Structure and information of b	piomacromolecules				
2.Transmission and expression of		nation			
3.Molecular biology database					
4.Sequence allignment by DP m	atching				
5.Homology searching and mult	-				
6.Sequence motif and knowledge					
7.Tertiary structure classification	on and function pred	liction			
8.Exam.					
9.Chemical data space and mult	ivariate data analysi	is			
10.Quantitative structure-activi	ty relationships and	knowledge aquisitio	n		
11.Visualization of higher dimen	sional data of molec	ules			
12.Evaluation of structural simil	arity and its applicat	tion			
13.Fundamentals of machine lea	arning				
14.Artificial neural network and	chemical application	ı			
15.Support vector machine and	chemical application	ו			
16.Exam.					
Topics to be covered:					
1.Structure and information of b					
2.Transmission and expression of	of the genetic inform	nation			
3.Molecular biology database	atabiaa				
4.Sequence allignment by DP m 5.Homology searching and mult	-				
6.Sequence motif and knowledge					
7.Tertiary structure classificatio		liction			
8.Exam.	and function pred				
9.Chemical data space and mult	ivariate data analysi	is			
10.Quantitative structure-activi	-		n		
11.Visualization of higher dimen					
12.Evaluation of structural similar					
12.Evaluation of structural similar 13.Fundamentals of machine lea	• • • • •				
	arning	1			
13.Fundamentals of machine lea	arning chemical application				

### Self Preparation and Review

#### **Related subjects**

Molecular Informatics, Linear Algebra, Elementary Analytics Molecular Informatics, Linear Algebra, Elementary Analytics

#### Notes for textbook

Material will be made available in the form of hard copies or on the class website (to be announced).

Material will be made available in the form of hard copies or on the class website (to be announced).

#### Notes for reference

Goals to be achieved

First half term (by Kato)

/They understand structure and information of biomacromolecules.

/They learn the basic concept of molecular biology database and acquire the abilities of database retrieval.

/They understand knowledge discovery techniques from databases such as sequence alignment and motif searching.

Second half term (by Takahashi)

/They understand regression analysis technique based on linear least squares method and the application to chemical data fitting.

/They learn fundamentals of quantitative structure-activity relationships (QSAR)

/They learn mathematical basis of principal component analysis and visualization of multivariate chemical data space.

/They understanad usefulness and importance of structural similarity in intelligent molecular information processing.

/They learn mathematical basis of machine learning.

/Artificial neural network (ANN) and applicaton in chemistry.

/Support vector machine (SVM) and application in drug design and development.

They acquire the abilities how they can apply the methods to chemical data analysis, data classification and prediction.

First half term (by Kato)

/They understand structure and information of biomacromolecules.

/They learn the basic concept of molecular biology database and acquire the abilities of database retrieval.

/They understand knowledge discovery techniques from databases such as sequence alignment and motif searching.

Second half term (by Takahashi)

/They understand regression analysis technique based on linear least squares method and the application to chemical data fitting.

/They learn fundamentals of quantitative structure-activity relationships (QSAR)

/They learn mathematical basis of principal component analysis and visualization of multivariate chemical data space.

/They understanad usefulness and importance of structural similarity in intelligent molecular information processing.

/They learn mathematical basis of machine learning.

/Artificial neural network (ANN) and applicaton in chemistry.

/Support vector machine (SVM) and application in drug design and development.

They acquire the abilities how they can apply the methods to chemical data analysis, data classification and prediction.

Evaluation of achievement		
Reports and classroom per	formance	20%
Written examination	80%	
Reports and classroom perf	formance	20%
Written examination	80%	
Examination		
定期試験を実施(対面)		
Examination(Face to Face)		
Details of examination		

Other information

Office: F-304 (Ext. 6879) Email: kato@cs.tut.ac.jp (Kato) Office: F-303 (Ext. 6878) Email: taka@cs.tut.ac.jp (Takahashi)

Office: F-304 (Ext. 6879) Email: kato@cs.tut.ac.jp (Kato) Office: F-303 (Ext. 6878) Email: taka@cs.tut.ac.jp (Takahashi)

### **Reference URL**

http://www.mbi.cs.tut.ac.jp/~kato/lecture/ (Kato) http://www.mis.cs.tut.ac.jp/ (Takahashi)

http://www.mbi.cs.tut.ac.jp/~kato/lecture/ (Kato) http://www.mis.cs.tut.ac.jp/ (Takahashi)

### Office hours

Friday 15:00-16:30 (Kato) Friday 13:00-14:30 (Takahashi) Friday 15:00-16:30 (Kato) Friday 13:00-14:30 (Takahashi) **Relations to attainment objectives of learning and education** 

### Key words

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

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

(M43630220)Speech and Langua	ge Processing, A	Advanced Speech	and Language	Processing, Advanced]

Schedule number	Speech and Language Proc	essing, Advanced[Speed	h and Language Pro	cessing, Advand	ced]
	M43630220	Subject area	Advanced Computer Science and 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 Mast			Subject	1~2
Department Offered	Computer Science and Eng	ineering		grade Beggining	M1, M2
Charge teacher name[Roman alphabet mark]	秋葉 友良, 山本 一公 AKI	IBA Tomoyoshi, YAMAM	OTO Kazumasa	grade	
Numbering					
	ge processing / Basic of spe ge model, parsing and decoder			speech recogr	nition / Hic
	trieval / Basic of natural lar ntences and documents / Au			matching and t	ext indexir
(Yamamoto) Basic of spoken languag	re processing / Basic of spe	ech recognition / Algo	rithm for continuous	sneech recom	nition / Hic
Basic of spoken languag Markov Model / Languag (Akiba) Basic of information ret	ge processing / Basic of spe ge model, parsing and decoder trieval / Basic of natural lar intences and documents / Au	r/ Spoken dialog system nguage processing / Al	s/ gorithms for string		
Basic of spoken languag Markov Model / Languag (Akiba) Basic of information ret	e model, parsing and decoder trieval / Basic of natural lar ntences and documents / Au	r/ Spoken dialog system nguage processing / Al	s/ gorithms for string		
Basic of spoken languag Markov Model / Languag (Akiba) Basic of information ret Modeling methods for se Self Preparation and Ret Related subjects Information theory, Form	e model, parsing and decoder trieval / Basic of natural lar ntences and documents / Au <b>view</b> nal language theory	r/ Spoken dialog system nguage processing / Al	s/ gorithms for string		
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Basic of spoken languag Markov Model / Languag (Akiba) Basic of information ret Modeling methods for se Self Preparation and Ret Related subjects Information theory, Form Notes for textbook Resumes will be provided •M.Gales & S.Young	e model, parsing and decoder trieval / Basic of natural lar ntences and documents / Au <b>view</b> nal language theory nal language theory	r/ Spoken dialog system nguage processing / Al utomatic machine transla	s/ gorithms for string		
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Basic of spoken languag Markov Model / Languag (Akiba) Basic of information ret Modeling methods for se Self Preparation and Ret Related subjects Information theory, Form Information theory, Form Notes for textbook Resumes will be provided •M.Gales & S.Young The application of hidder World Scientific •L.R. Rabiner, R.W. Scha Introduction to Digital Sp	e model, parsing and decoder trieval / Basic of natural lar intences and documents / Au view hal language theory hal language theory d, which are based on: n Markov models in speech re fer beech Processing Berthier Bibeiro-Neto	r/ Spoken dialog system nguage processing / Al utomatic machine transla	s/ gorithms for string		

### Resumes will be provided, which are based on:

•M.Gales & S.Young The application of hidden Markov models in speech recognition, World Scientific

•L.R. Rabiner, R.W. Schafer Introduction to Digital Speech Processing World Scientific

• Richado Baeza-Yates, Berthier Bibeiro-Neto Modern Information Retrieval Addison Wesley

•Kevin Knight A Statistical MT Tutorial Workbook

Reference1	Book title	The application or recognition	ISBN			
	Author	M.Gales & S.Young	Publisher	World Scientific	Publish year	
Reference2	Book title	Introduction to Dig	gital Speech Proc	essing	ISBN	
	Author	L.R. Rabiner, R.W. Schafer	Publisher	World Scientific	Publish year	
Reference3	Book title	Modern Informatio	n Retrieval		ISBN	
	Author	Richado Baeza- Yates, Berthier Bibeiro-Neto	Publisher	Addison Wesley	Publish year	
Reference4	Book title	A Statistical MT T	ISBN			
	Author	Kevin Knight	Publisher		Publish year	

# Notes for reference

### Goals to be achieved

Basics: Understand the role of spoken language as an human interface / Understand hierarchical structure of spoken language / Understand the basic speech analysing methods. / Understand the basic concepts of information retrieval and natural language processing

 $\label{eq:speech} Speech \ Recognition: Understand \ the \ relation \ between \ speech \ recognition \ and \ information \ theory \ / \ Understand \ the \ algorithm \ for \ speech \ recognition \ using \ DP \ matching \ / \ Understand \ the \ Hidden \ Markov \ Model.$ 

Natural Language Processing: Understand the role of language model / Understand the parser for context free language. / Understand the character encoding scheme for the world wide letters. / Understand the string matching methods and text indexing methods. / Understand the computational models for sentences, documents, and cross-language relations.

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

Basics: Understand the role of spoken language as an human interface / Understand hierarchical structure of spoken language / Understand the basic speech analysing methods. / Understand the basic concepts of information retrieval and natural language processing

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

Natural Language Processing: Understand the role of language model / Understand the parser for context free language. / Understand the character encoding scheme for the world wide letters. / Understand the string matching methods and text indexing methods. / Understand the computational models for sentences, documents, and cross-language relations.

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

Evaluation of achievement

Marks are based on reports (100%).

### Marks are based on reports (100%).

### Examination

# レポートで実施

### By Report Details of examination

# Other information

Tomoyosi Akiba: C-505, 44-6758, akiba@cs.tut.ac.jp Kazumasa Yamamoto: C-506, 44-6767, yamamoto@cs.tut.ac.jp

Tomoyosi Akiba: C-505, 44-6758, akiba@cs.tut.ac.jp Kazumasa Yamamoto: C-506, 44-6767, yamamoto@cs.tut.ac.jp

### **Reference URL**

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

Office hours

16:25-17:40, Tuesday and Wednesday 16:25-17:40, Tuesday and Wednesday

Relations to attainment objectives of learning and education

# Key words

spoken language processing, natural language processing, human language technology spoken language processing, natural language processing, human language technology

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

Subject name[English]	Web Data Engineering 1[Web Dat	ta Engineering 1]			
Schedule number	M43630280	Subject area	Advanced Computer	Required or elective	Elective
			Science and Engineering		
Time of starting a	Spring1 term	Day of the	Thu.1~1	Credit(s)	1
course Faculty	Graduate Program for Master's D	<b>week,period</b> Degree		Subject	1~2
Department Offered	Computer Science and Engineeri	ng		grade Beggining	M1, M2
		0		grade	
Charge teacher name[Roman alphabet mark]	青野 雅樹 AONO Masaki				
Numbering					
Objectives of class					
Data engineering techno	ologies for the data (primarily on the	e Web) will be discu	ussed.		
Main emphasis is on the	information retrieval and data min	ing technologies.			
Data Mining technologie	s include principal component anal	ysis, supervised lea	arning such as class	fication, unsupe	ervised learnin
	Web mining technologies.				
Multimedia data process	sing will also be dsicussed.				
	ologies for the data (primarily on the	e Web) will be discu	ussed.		
	information retrieval and data min				
-	s include principal component analy		arning such as classi	fication, unsupe	ervised learnir
	Web mining technologies.				
	sing will also be dsicussed.				
Contents of class					
Classes will be held (the	coretically) 7.5 times. The last time	will be kept for the	e exam.		
1. Information Retrieval					
	s to construct a search system,	-	ouild indices, how t	o tokenize text	s, and how t
extract features from te	exts and images, will be considered.				
2. Data and Web Mining					
Fundamental methods for	or data mining as well as Web minin	ng are discussed.			
We plan to do one or tw	o assignments for data mining tech	nniques inside.			
	lecture is held at the same time wit coretically) 7.5 times. The last time		-	be in Japanese.	
1. Information Retrieval					
•	s to construct a search system,	0	ouild indices, how t	o tokenize text	s, and how t
extract teatures from te	exts and images, will be considered.				
2. Data and Web Mining					
Fundamental methods fo	or data mining as well as Web minin	ng are discussed.			
We plan to do one or tw	o assignments for data mining tech	nniques inside.			
	lecture is held at the same time wit	th Japanese cours	e, the lecture might	be in Japanese.	
component analysis, an computer, because some It is desirable to self-st	view tudy as well as review fundamenta d regression. It is recommended e of the lecture materials are writt tudy as well as review fundamenta d regression. It is recommended	installing R/Python en in R/Python lan al data mining tech	n (also sometimes guage. (R is favorat miques such as clus	Java/C++) lang ble for simple vis stering, classific	uage into you sualization.) ation, princip

component analysis, and regression. It is recommended installing R/Python (also sometimes Java/C++) language into your

computer, because some of the lecture materials are written in R/Python language. (R is favorable for simple visualization.) **Related subjects** 

### Notes for textbook

Materials will be prepared by lecturers

References:

(1) C. D. Manning et al, Introduction to Information Retrieval, Cambridge Univ. Press

(2) J. Han and M. Kamber, Data Mining: Concepts and Techniques, 2nd ed, Morgan Kaufmann

Materials will be prepared by lecturers

References:

(1) C. D. Manning et al, Introduction to Information Retrieval, Cambridge Univ. Press

(2) J. Han and M. Kamber, Data Mining: Concepts and Techniques, 2nd ed, Morgan Kaufmann

Reference1	Book title	Information Retrie	g and Evaluating	ISBN	978-0-262-	
		Search Engines				02651-2
	Author	Stefan Buttcher,	Publisher	MIT Press	Publish year	2010
		Charles L.A.				
		Clarke, Gordon V.				
		Cormack				
Reference2	Book title	Data Mining: Conce	Data Mining: Concepts and Techniques, Third Edition			
						81479-1
	Author	Jiawei Han,	Publisher	Morgan	Publish year	2011
		Micheline		Kaufmann		
		Kamber, and Jian				
		Pei				
Reference3	Book title	Data Mining Pract	ical Machine Le	arning Tools and	ISBN	978-0-12-
		Techniques, Third E	Edition			374856-0
	Author	Ian H. Witten,	Publisher	Morgan	Publish year	2011
		Eibe Frank, and		Kaufmann		
		Mark A. Hall				

# Notes for reference

Reference #4

Title: Modern Information Retrieval, the concepts and technology behind search, Second Edition J

Authors:Ricardo Baeza-Yates, Bertier Ribeiro-Neto

Publisher: Addison Wesley

ISBN:978-0-321-41691-9

Year:2011

Reference #5

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

Reference #4

Title: 「Modern Information Retrieval, the concepts and technology behind search, Second Edition」 Authors: Ricardo Baeza-Yates, Bertier Ribeiro-Neto Publisher: Addison Wesley ISBN : 978-0-321-41691-9 Year: 2011 Reference #5 Title: 「Google's PageRank and Beyond」 Authors: Amy N. Langville, Carl D. Meyer Publisher: Princeton University Press ISBN : 978-0-691-12202-1

Goals to be achieved

Year: 2006

To acquire the following knowledge that can make you 1. Implement fundamental data mining technologies. 2. Understand advanced technologies for information retrieval, including dimensional reduction.

3. Design, analyze, and evaluate the information retrieval and data mining technologies.

To acquire the following knowledge that can make you

1. Implement fundamental data mining technologies.

2. Understand advanced technologies for information retrieval, including dimensional reduction.

3. Design, analyze, and evaluate the information retrieval and data mining technologies.

Evaluation of achievement

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

A: (>=80), B: (>=65), C: (>= 55) Exercise (20%) and Final exam (80%)

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

Examination

定期試験を実施(対面) Examination(Face to Face)

Details of examination

Other information

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

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

### **Reference URL**

 $\label{eq:http://www.kde.cs.tut.ac.jp/~aono/myLecture.html http://www.kde.cs.tut.ac.jp/~aono/myLecture.html \label{eq:http://www.kde.cs.tut.ac.jp/~aono/myLecture.html \label{eq:html}}$ 

### Office hours

Anytime, but a priori email appointment is definitely preferable.

Anytime, but a priori email appointment is definitely preferable.

Relations to attainment objectives of learning and education

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

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

Key words

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

<u> </u>		ironmental and Life S	1	1	1
Schedule number	M44610010	Subject area	Advanced Environmental and Life Sciences	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	3
Faculty	Graduate Progra	am for Master's Degr	ee	Subject grade	1~2
Department Offered	Environmental a	nd Life Sciences		Beggining grade	M1
Charge teacher name[Roman alphabet mark] Numbering	S4系教務委員	4kei kyomu Iin−S		Brado	
Objectives of class					
This course will provide the stu sciences by reading textbooks a students is to learn knowledge ar understanding of environmental a This course will provide the stu sciences by reading textbooks a students is to learn knowledge ar understanding of environmental a	nd scientific pape nd presentation sl nd life sciences. Jdents with oppo nd scientific pape nd presentation sl	ers under the guidand kills required for his/h rtunities to study of ers under the guidand	ce of his/her superv ner research in the s n his/her research ce of his/her superv	visor. The aim of the eminar as well as the subjects on enviro visor. The aim of the	ne lessen for th o deepen his/he onmental and lif ne lessen for th
Contents of class					
are suggested by his/her supervi The students will be required to are suggested by his/her supervi Self Preparation and Review Related subjects Seminar on Environmental and Li Thesis Research on Environment All other relevant subjects in Adv Seminar on Environmental and Li Thesis Research on Environment All other relevant subjects in Adv Notes for textbook Supervisor will recommend textbo Supervisor will recommend textbo Notes for reference	read textbooks and sor, and to report fe Science II al and Life Science vanced Environme fe Science II al and Life Science vanced Environme cooks, papers, and	nd papers written by and discuss deeply of the intal and Life Science research materials to	other language than on his/her research ss ss o students.	Japanese, especia	Illy English, whic
Gaala to be ashieved					
Goals to be achieved To acquire basic knowledge on er	nvironmental and	life sciences			
To understand the contents of so To be able to make oral and post To acquire basic knowledge on en To understand the contents of so	cientific papers in er presentations nvironmental and cientific papers in	a given field of envir relevant to papers he life sciences a given field of envir	/she has read. onmental and life sci		
To be able to make oral and post Evaluation of achievement	er presentations	relevant to papers he	she has read.		
The evaluation is based on the	His/her supervise	or evaluates the score	es.		
his/her research in the seminar. The evaluation is based on the his/her research in the seminar.					presentations (
his/her research in the seminar. The evaluation is based on the					presentations

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

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

Environmental and Life         elective           Time of starting a course         Year         Day of the week,period         Intensive         Credit(s)         3           Faculty         Graduate Program for Master's Degree         Subject grade         2~2           Department Offered         Environmental and Life Sciences         Beggining grade         M2           Charge teacher name[Roman alphabet mark]         S4系教務委員.後藤 尚弘 4kei kyomu lin~S, GOTOH Naohiro         Boggining grade         M2           Objectives of class         Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in the seminar.         Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance 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 learn the knowledge and the presentation skills required for his/her research in the seminar.           Contents of class         The students will learn the knowledge and the presentation skills required for his/her research in the seminar.           Contents of class	Subject name[English] Schedule number	M44610020	Subject area	Science IILSeminar or Advanced	Required or	Required
Time of starting a course         Year         Day of the veckpariod         Intensive         Credit(s)         3           Faculty         Graduate Program for Master's Degree         Subject grade         2~2           Department Offered         Environmental and Life Sciences         Begring, M2           giphabet man1         S4泰教務委員, 後藤 尚弘 4kei kyomu lin-S, GOTOH Naohiro         Begring, M2           giphabet man2         S4泰教務委員, 後藤 尚弘 4kei kyomu lin-S, GOTOH Naohiro         Begring, M2           Subject grade         S4泰教務委員, 後藤 尚弘 4kei kyomu lin-S, GOTOH Naohiro         Begring, M2           Subject of class         Based on the Saminar on Environmental and Life Science I, this course will further provide the students with the opportur         to study on his/her research subject in environmental and the sciences by reading textbooks and papers under the guidance           Based on the Saminar on Environmental and Life Science I, this course will further provide the students with the opportur         Contents of class           Based on the Saminar on Environmental and Life Science I, this course sull for the subject in his/her research subject in notwornmental and the sciences by reading textbooks and papers under the guidance           Based on the Saminar on Environmental and Life Science I         The students will be required to read textbooks and papers written by other language than Japanese, especially English, wh are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in thowendary           The s	Schedule humber	M44010020		Environmental and Life	-	Required
Faculty         Graduate Program for Master's Degree         Subject grade         2~2           Department Offered         Environmental and Life Sciences         Begining grade         M2           Charge teacher name[Roman ajchabet mark]         S4乘教務委員、後藤 尚弘 4kei kyomu lin-S, GOTOH Naohiro         M2           Objectives of class         Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance seminar.           Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and Life sciences by reading textbooks and papers under the guidance bis/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in 1 seminar.           Contents of class         The students will be required to read textbooks and papers written by other language than Japanese, especially English, wh are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.           The students will be required to read textbooks and papers written by other language than Japanese, especially English, wh are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.           Sef Properation and Review         Selecta subject         Selecta subject in the seminar.	Time of starting a course	Year	•		Credit(s)	3
Department Offered         Environmental and Life Sciences         Beggning grade         M2           Charge tascher name[Roman alphabet mark]         S4乘教務委員,後藤 尚弘 4kei kyomu lin-S, GOTOH Naohiro alphabet mark]         S4乘教務委員,後藤 尚弘 4kei kyomu lin-S, GOTOH Naohiro           Objectives of class         Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in t seminar.           Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in t seminar.           Contract of olase         The students will be required to read textbooks and papers written by other language than Japanese, especially English, wh are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.           Self Preparation and Review         Thesis Research on Environmental and Life Science I Thesis Research on Environmental and Life Science I I thesis research on Environmental and Life Sciences           Supervisor will recommend textbooks, papers, and research materials to students. Notes	Faculty	Graduate Progr		ree	Subject grade	2~2
Charge teacher name[Roman alphabet mark]         S4系教務委員.後藤 岗弘 4kei kyomu lin-S, GOTOH Naohiro alphabet mark]           Numbering         Chijectives of class           Based on the Seminar on Environmental and Life Science I, this course will further provide the students with the opportur to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research is/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research is/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in 1 seminar.           Contents of class         Contents of class           The students will be required to read textbooks and papers written by other language than Japanese, especially English, wh 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           Related subjects         Seminar on Environmental and Life Science I Thesis Research on Environmental and Life Science I Thesis Research on Environmental and Life Science I           Thesis Research on Envir	•	_	=		Beggining	M2
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Seminar on Environmental and Life Science I Thesis Research on Environmental and Life Science All other relevant subjects in Advanced Environmental and Life Sciences Seminar on Environmental and Life Science I Thesis Research on Environmental and Life Science 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 basic knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of 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 his/her research in the seminar. His/her supervisor evaluates the scores. Examination Bits®All Evaluation Bits®All Ev	Self Preparation and Review					
Thesis Research on Environmental and Life Science All other relevant subjects in Advanced Environmental and Life Sciences Seminar on Environmental and Life Science I Thesis Research on Environmental and Life Science All other relevant subjects in Advanced Environmental and Life Sciences <b>Notes for textbook</b> Supervisor will recommend textbooks, papers, and research materials to students. Supervisor will recommend textbooks, papers, and research materials to students. Supervisor will recommend textbooks, papers, and research materials to students. <b>Notes for reference</b> <b>Goals to be achieved</b> To acquire basic knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To be able to make oral and poster presentations relevant to papers he/she has read. To acquire basic knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To be able to make oral and poster presentations relevant to papers he/she has read. <b>Evaluation of achievement</b> The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations his/her research in the seminar. His/her supervisor evaluates the scores. The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations his/her research in the seminar. His/her supervisor evaluates the scores. <b>Examination</b> Itigs期間中には何も行わない	Related subjects					
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Seminar on Environmental and Life Science I Thesis Research on Environmental and Life Science All other relevant subjects in Advanced Environmental and Life Sciences Notes for textbook Supervisor will recommend textbooks, papers, and research materials to students. Supervisor will recommend textbooks, papers, and research materials to students. Notes for reference Goals to be achieved To acquire basic knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To acquire basic knowledge on environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of environmental and life sciences To understand the contents of scientific papers in a given field of 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 his/her research in the seminar. His/her supervisor evaluates the scores. The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations his/her research in the seminar. His/her supervisor evaluates the scores. Examination The signific papers in the seminar. His/her supervisor evaluates the scores. Examination						
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試験期間中には何も行わない						
		·				
	Examination					
	試験期間中には何も行わない					

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

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

Subject name[English]	Thesis Research on Environmental and Life Science[Thesis Research on Environmental an Life Science]						
Schedule number	M44610030	Subject area	Advanced Environmental and Life Sciences	Required or elective	Required		
Time of starting a course	2Years	Day of the week.period	Intensive	Credit(s)	6		
Faculty	Graduate Progran	n for Master's Deg	Subject grade	1~2			
Department Offered	Environmental and	d Life Sciences	Beggining grade	M1, M2			
Charge teacher name[Roman alphabet mark]	S4系教務委員 4	kei kyomu Iin−S					
Numbering							

#### **Objectives of class**

In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.

In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.

#### Contents of class

The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense. The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research subject stills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense. **Self Preparation and Review** 

#### **Related subjects**

Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II

#### Notes for textbook

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

Notes for reference

#### Goals to be achieved

To acquire basic knowledge on environmental and life sciences

To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research

To be able to make safety control in experimental work

To acquire basic knowledge on environmental and life sciences

To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research

To be able to make safety control in experimental work

#### Evaluation of achievement

The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).

The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).

#### Examination

### Details of examination

#### Other information

Supervisor

# Supervisor

Reference URL

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

### Office hours

Students are encouraged visiting by appointment.

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

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

Subject name[English]	Thesis Research on Environmental and Life Science[Thesis Research on Environmental an Life Science]						
Schedule number	M44610030	Subject are	a	Advanced Environmental and Life Sciences	Required or elective	Required	
Time of starting a course	2Years	Day of	the	Intensive	Credit(s)	6	
		week,period					
Faculty	Graduate Program	n for Master's	Degre	e	Subject grade	1~2	
Department Offered	Environmental and	d Life Science	es		Beggining	M1, M2	
					grade		
Charge teacher name[Roman	S4系教務委員, 4	1系各教員 4k	ei kyo	mu Iin−S, 4kei kakuk	youin	·	
alphabet mark]							
Numbering							

### **Objectives of class**

In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.

#### **Contents of class**

The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense. **Self Preparation and Review** 

#### Related subjects

Seminar on Environmental and Life Science I

Seminar on Environmental and Life Science II

Notes for textbook

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

Notes for reference

### Goals to be achieved

To acquire basic knowledge on environmental and life sciences

To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research

To be able to make safety control in experimental work

### Evaluation of achievement

The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation

#### etc). Examination

その他

None during exam period

#### Details of examination

Other information

Supervisor

Reference URL

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

Office hours

Students are encouraged visiting by appointment.

Relations to attainment objectives of learning and education

# Key words

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

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

Subject name[English]	Thesis Research on Environmental and Life Science[Thesis Research on Environmental and Life Science]							
Schedule number	M4461003T	Subje	ct are	a	Advanced Environmer and Sciences	ntal Life	Required or elective	Required
Time of starting a course	Year	Day	of	the .	Intensive		Credit(s)	6
		week,	period	1	L			
Faculty	Graduate Program	Graduate Program for Master's Degree						2~2
Department Offered	Environmental and	Environmental and Life Sciences					Beggining grade	M2
Charge teacher name[Roman alphabet mark]	S4系教務委員 4	keikyon	าน Iin-	-S				
Numbering								

#### **Objectives of class**

In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.

In the course, the students will perform advanced researches on the environmental and life science under the direction of his/her supervisor in the laboratory. The aims of this lessen are to acquire the knowledge and experimental and analytical skills required for his/her research subject, to learn the scientific and social importance of his/her subject by researching for related studies by others, and to write a Master's Thesis. The students will acquire the skills and capacities of presentation by discussing in the final review of his/her Master's Thesis.

#### Contents of class

The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense. The students are required to have his/her research subject under the direction of his/her supervisor and perform his/her research by acquiring the experimental and analytical skills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research subject stills in the laboratory. The students will be expected to learn the scientific and social background of his/her research subject by collecting and reading the references relating to his/her research. The results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research must be described as a Master's Thesis. The students must also present the results from his/her research, discuss, and answer the questions with the reviewers in the final master's dissertation defense. **Self Preparation and Review** 

#### **Related** subjects

Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II Seminar on Environmental and Life Science I Seminar on Environmental and Life Science II

#### Notes for textbook

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

Notes for reference

#### Goals to be achieved

To acquire basic knowledge on environmental and life sciences

To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research

To be able to make safety control in experimental work

To acquire basic knowledge on environmental and life sciences

To master experimental techniques and analytical skills required for research on a given field of environmental and life sciences To be able to present and discuss on the results of his/her research

To be able to make safety control in experimental work

#### Evaluation of achievement

The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).

The score of the course is based on his/her Master's Thesis and the presentation in the final review of his/her Master's Thesis (the quality of his/her research, presentation skills, discussions and answering the questions on his/her presentation etc).

# 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) Supervisor(s)

# Reference URL

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

#### Office hours

Students are encouraged visiting by appointment.

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

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

Subject name[English]	Seminar on Environmental and Life Science[Seminar on Environmental and Life Science]								
Schedule number	M44610040	Subje	ct are	a	Advanced		Required	or	Required
					Environmer	ntal	elective		
					and	Life			
					Sciences				
Time of starting a course	Year	Day	of	the	Intensive		Credit(s)		6
		week,	period	I					
Faculty	Graduate Program	Graduate Program for Master's Degree					Subject gra	de	2~2
Department Offered	Environmental and	d Life S	cience	es			Beggining		M2
							grade		
Charge teacher name[Roman	S4系教務委員 4kei kyomu Iin-S								
alphabet mark]									
Numbering									

#### Objectives of class

This course will provide the students with the opportunity to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance of his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in the seminar.

This course will provide the students with the opportunity to study on his/her research subject in environmental and life sciences by reading textbooks and papers under the guidance of his/her supervisor. The students will learn the knowledge and the presentation skills required for his/her research in the seminar.

#### **Contents of class**

The students will be expected to read textbooks and papers written by foreign language that are indicated by his/her supervisor, and report and discuss deeply on his/her research subject in the seminar.

The students will be expected to read textbooks and papers written by foreign language that are indicated by his/her supervisor, and report and discuss deeply on his/her research subject in the seminar.

#### Self Preparation and Review

### **Related subjects**

Thesis Research on Environmental and Life Science

All other relevant subjects in Advanced Environmental and Life Sciences

Thesis Research on Environmental and Life Science

All other relevant subjects in Advanced Environmental and Life Sciences

### Notes for textbook

Supervisor will recommend textbooks and papers to students.

Supervisor will recommend textbooks and papers to students.

### Notes for reference

### Goals to be achieved

To acquire basic knowledge on environmental and life sciences

To understand the contents of scientific papers in a given field of environmental and life sciences

To be able to make oral and poster presentations relevant to papers he/she has read.

To acquire basic knowledge on environmental and life sciences

To understand the contents of scientific papers in a given field of environmental and life sciences

To be able to make oral and poster presentations relevant to papers he/she has read.

#### **Evaluation of achievement**

The evaluation is based on the scores of reading papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores.

The evaluation is based on the scores of reading papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores.

Examination

試験期間中には何も行わない

None during exam period

Details of examination

Other information

Supervisor

 Supervisor

 Reference URL

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

 Office hours

 Students are encouraged visiting by appointment.

 Students are encouraged visiting by appointment.

 Relations to attainment objectives of learning and education

 Key words

## (M44630050)Applied Physical Chemistry I[Applied Physical Chemistry I]

(M44630050)Applied Physical Ch				-7	
Subject name[English]		Chemistry I[Applied			
Schedule number	M44630050	Subject area	Advanced Environmental	Required or elective	Elective
			and Life Sciences		
Time of starting a course	Spring1 term	Day of the week,period	Tue.4~4	Credit(s)	1
Faculty	Graduate Progra	m for Master's Degre	e	Subject grade	1~2
Department Offered	Environmental ar	nd Life Sciences		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	松本 明彦 MATS	SUMOTO Akihiko			
Numbering					
Objectives of class					
Intermolecular interaction plays adsorption and separation feature materials and basic principle of th based on the molecular interaction Intermolecular interaction plays adsorption and separation feature materials and basic principle of th	es of molecules by ne intermolecular in on. a key role in inter es of molecules by ne intermolecular in	porous solids. This nteraction. The adso facial characteristics porous solids. This	course deals with fu orption and separations such as a mechani- course deals with fu	indamental aspect on phenomena are cal property of con indamental aspect	of the composite also implemented nposite materials of the composite
based on the molecular interaction	on.				
<ul> <li>[5] 3-3 Induced interaction 3-4 E</li> <li>[6] 4.Adsorption and related pher</li> <li>[7] Control of interface interaction</li> <li>[8] Examination</li> <li>[1] 1.Composite materials overvies</li> <li>[2] (Continued)</li> <li>[3] 2.Formation of interface and i</li> <li>[4] 3.Molecular interaction 3-1 El</li> </ul>	nomena n by regulation of w nterfacial free ene	the chemical structu rgy			
[5] 3-3 Induced interaction 3-4 [	-	on			
<ul><li>[6] 4.Adsorption and related pher</li><li>[7] Control of interface interactic</li><li>[8] Examination</li></ul>		the chemical structu	ire of the interface		
Self Preparation and Review					
<b>Related subjects</b> Basic understanding on physical of	chemistry is desira	ble			
Basic understanding on physical of Basic understanding on physical of	-				
Notes for textbook		· · · · · · · · · · · · · · · · · · ·			
Reference handouts will be provid	ded in the class.				
(Reference books) [For molecular interaction] 1. Intermolecular and Surface For 2. Interface chemistry: D. H. Ever 3. Physical Chemistry of Surface:	ett, Basic Principle	es of Colloid Science	, Royal Society of C	-	
[For adsorption] 1. F. Rouquerol, J. Rouquerol and Reference handouts will be provid	-	rption by Powders a	nd Porous solids, Ac	ademic Press (199	9)

#### (Reference books)

[For molecular interaction]

- 1. Intermolecular and Surface Forces, 3rd Ed.: J. N. Israelachivili, Academic Press (2011).
- 2. Interface chemistry: D. H. Everett, Basic Principles of Colloid Science, Royal Society of Chemistry(1988).
- 3. Physical Chemistry of Surfaces, 7th Ed.: A. Adamson, Wiley-Intercience (1997), or its old edition.

[For adsorption]

1. F. Rouquerol, J. Rouquerol and K.S.W. Sing, Adsorption by Powders and Porous solids, Academic Press (1999)

#### Notes for reference

#### Goals to be achieved

1) Understanding of basic structure and properties of composit materials

- 2) Understanding of molecular interaction
- 1) Understanding of basic structure and properties of composit materials
- 2) Understanding of molecular interaction

### **Evaluation of achievement**

30 % Homework report and/or Quiz, 70 % Final examination or report 30 % Homework report and/or Quiz, 70 % Final examination or report

#### Examination

定期試験を実施(対面)

Examination(Face to Face)

Details of examination

#### Other information

A. Matsumoto: room # B-505, E-mail: aki\*at\*ens.tut.ac.jp (Please replace "\*at\*" to "@" when e-mailing) A. Matsumoto: room # B-505, E-mail: aki\*at\*ens.tut.ac.jp (Please replace "\*at\*" to "@" when e-mailing)

Reference URL

Office hours

Relations to attainment objectives of learning and education

Key words

## (M44630060)Applied Physical Chemistry II[Applied Physical Chemistry II]

Schedule number		Chemistry II[Applied		II	1
	M44630060	Subject area	Advanced Environmental	Required or elective	Elective
			and Life Sciences		
Time of starting a course	Spring2 term	Day of the week,period	Tue.4~4	Credit(s)	1
Faculty	Graduate Progra	m for Master's Degre	e	Subject grade	1~2
Department Offered	Environmental ar	nd Life Sciences		Beggining	M1, M2
Charge teacher name[Roman alphabet mark]	松本 明彦 MAT	SUMOTO Akihiko		grade	
Numbering					
Objectives of class Adsorption is important in varie fundamental aspect of adsorption Adsorption is important in varie fundamental aspect of adsorption Contents of class 1.Introduction 2.Porous materials 3.Adsorption measurements 4.Characterization of porous solid 5.Characterization of porous solid 6.Characterization of porous solid 7.Adsorption control of gases by 1 8.Examination	especially gas ad ety of fields such especially gas ad the by adsorption (N the by adsorption (N the by adsorption (N	sorption on porous s as materials separa sorption on porous s Non-porous and mac Microporous material Mesoporous material	olids. ition, purification an olids. roporous materials) s)	-	
1.Introduction					
2.Porous materials 3.Adsorption measurements 4.Characterization of porous solid 5.Characterization of porous solid 6.Characterization of porous solid 7.Adsorption control of gases by 1 8.Examination	ls by adsorption (N Is by adsorption (N	Microporous material Mesoporous material	s)		
3.Adsorption measurements 4.Characterization of porous solid 5.Characterization of porous solid 6.Characterization of porous solid 7.Adsorption control of gases by	ls by adsorption (N Is by adsorption (N	Microporous material Mesoporous material	s)		
<ul> <li>3.Adsorption measurements</li> <li>4.Characterization of porous solid</li> <li>5.Characterization of porous solid</li> <li>6.Characterization of porous solid</li> <li>7.Adsorption control of gases by r</li> <li>8.Examination</li> </ul> Self Preparation and Review Related subjects	Is by adsorption (N Is by adsorption (N regulation of pore	Nicroporous material Mesoporous materials surface	s)		
<ul> <li>3.Adsorption measurements</li> <li>4.Characterization of porous solid</li> <li>5.Characterization of porous solid</li> <li>6.Characterization of porous solid</li> <li>7.Adsorption control of gases by n</li> <li>8.Examination</li> </ul> Self Preparation and Review Related subjects Basic understanding on physical of	Is by adsorption (N Is by adsorption (N regulation of pore	Microporous material Mesoporous material surface	s)		
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<ul> <li>3.Adsorption measurements</li> <li>4.Characterization of porous solid</li> <li>5.Characterization of porous solid</li> <li>6.Characterization of porous solid</li> <li>7.Adsorption control of gases by a</li> <li>8.Examination</li> </ul> Self Preparation and Review Related subjects Basic understanding on physical of Basic understanding on physical of Notes for textbook	Is by adsorption (N Is by adsorption (N regulation of pore chemistry is desira chemistry is desira ded in the class.	Microporous material Mesoporous materials surface able. able.	s) s)	ademic Press (199	9)
<ul> <li>3.Adsorption measurements</li> <li>4.Characterization of porous solid</li> <li>5.Characterization of porous solid</li> <li>6.Characterization of porous solid</li> <li>7.Adsorption control of gases by a</li> <li>8.Examination</li> </ul> Self Preparation and Review Related subjects Basic understanding on physical of Notes for textbook Reference handouts will be provided	Is by adsorption (N Is by adsorption (N regulation of pore chemistry is desira chemistry is desira ded in the class. K.S.W. Sing, Adso	Microporous material Mesoporous materials surface able. able. able.	s) s) nd Porous solids, Ac.	ademic Press (199	9)

1. F. Rouquerol, J. Rouquerol and K.S.W. Sing, Adsorption by Powders and Porous solids, Academic Press (1999)
2. S. Lowell et al., Characterization of Porous Solids and Powders, Kluwer (2004)
and other books related adsorption science.
Notes for reference
Goals to be achieved
Evaluation of achievement
30 % Homework report and/or Quiz, 70 % Final examination or report
30 % Homework report and/or Quiz, 70 % Final examination or report
Examination
定期試験を実施(対面)
Examination(Face to Face)
Details of examination
Other information
A. Matsumoto: room # B-505, E-mail: aki@ens.tut.ac.jp
A. Matsumoto: room # B-505, E-mail: aki@ens.tut.ac.jp
Reference URL
Office hours
Relations to attainment objectives of learning and education
Key words

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

Schedule number         M44630100         Subject area         Advanced Environmental and Life         Required or elective         Elective           Time of starting a course         Spring1 term         Day of the weekparted         Ture 5-5         Credit(a)         1           Faculty         Craduate Program for Master's Degree         Subject grade         1~2           Department Offered         Environmental and Life Sciences         Beggining grade         M1. M2           Objectives of class         Dopartment offered         Environmental atynabe and/1         M1. M2           Numboring         Diversities of class         Degetines         Degetines           To provide you with a working knowledge of advanced synthesis of molecular materials.         Contents of class         Department offered           To provide you with a working knowledge of advanced synthesis of molecular materials.         Output         Sciences         Degetines           1. Total synthesis of bioactive organic compounds. (lwasa)         3.         Asknoed modern synthetic organic synthesis and asymmetric catalytics. (lwasa)         3.         Basic concept of Lewis acid catalyst and granocatalyst. (hibatomi)         4. Synthetic applications of asymmetric synthesis. (Shibatomi)         6. dycanced Lewis acid catalyst and granocatalyst. (hibatomi)         7. Advanced Congranic cancopocatalyst. (hibatomi)         7. Advanced catalysis. organometallic the total synthesis of houter and to	Subject name[English]	Special Topics in	Applied Organic Ch	emistry[Special Topi	ics in Applied Orga	nic Chemistry]
Image: Spring 1 term         Day of the Sciences         Credit(a)         1           Fieudity         Graduate Program for Master's Dagree         Subject grade         1~2           Department Offered         Environmental and Life Sciences         Bregining grade         M1, M2 grade           Orage teacher name[Roman alphabet mat()         MEE 株二、柴富 一孝 IWASA Seiji, SHIBATOMI Kazutaka         M1, M2 grade           Digetives of class         To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.           Contrast of class         This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of noisective organic compounds. (Iwasa)           1. Total synthesis of bioactive organic compounds. (Iwasa)         Sasic concept of Lewis acid catalysts in organic synthesis. (Shibatomi)           2. Advanced modern synthetic organic reactions using transition metals. (Iwasa)         Sasic concept of Lewis acid catalysts in organic synthesis. (Shibatomi)           3. Advanced usis acid catalysts in organic synthesis. (Shibatomi)         Advanced usis acid catalysts in organic synthesis. (Shibatomi)           4. Advanced usis acid catalysts in organic synthesis. (Shibatomi)         Advanced usis acid catalysts in organic synthesis. (Shibatomi)           7. Advanced usis acid catalysts in organic synthesis. (Shibatomi)         Advanced usis acid catalysts in orgranic synth	Schedule number	M44630100	Subject area	Advanced	Required or	Elective
Sciences         Sciences         Sciences           Time of starting a course         Spring I term         Day of the vest,period         Tue.5~5         Credit(a)         1           Faculty         Graduate Program for Master's Degree         Subject grade         1~2           Department Offered         Environmental and Life Sciences         Beggining grade         1~2           Charge tascher name[Roman alphabet mark]         どは 第二、東宮 一季 IWASA Seji, SHIBATOMI Kazutaka         MI, M2 grade           Objectives of class         To provide you with a working knowledge of advanced synthesis of molecular materials.         Contents of class           To provide you with a working knowledge of advanced synthesis of molecular materials.         Contents of class         Contents of class           To scourse includes the detail of the most recent progress in modern synthetic analysis.         2         Advanced marking and reductive elimination in catalytic cycles. (Iwasa)           3. Basic concept of foxidative addition and reductive elimination in catalytic cycles. (Iwasa)         3. Basic concept of Lavis acid catalyst and organocatalyst. (Shibatomi)           6. Advanced davis acid catalyst and organocatalyst. (Shibatomi)         3. Advanced marking and the site of sprinter catylist. (Iwasa)           8. Advanced modern synthetic organic synthesis. (Shibatomi)         3. Advanced modern synthetic organic synthesis. (Shibatomi)           7. Advanced organocatalysis in organic synthesis. (Shi				Environmental	elective	
Time of starting a course         Spring1 term         Day of the weakpoind         Tue.5~5         Credit(a)         1           Faculty         Graduate Program for Master's Degree         Subject grade         1~2           Department Offered         Environmental and Life Sciences         Begging         M1, M2           grade         Environmental and Life Sciences         Begging         M1, M2           grade         To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.           To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.           To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of natural products on the basis of retrosynthetic analysis.           1. Total synthesis of bioactive organic compounds. (Iwasa)         3. Basic concept of Lewis acid catalyst and organocatalyst. (Shibatomi)           7. Advanced organocatalysis in organic synthesis. (Shibatomi)         3. Organofluorine chemistry. (Shibatomi)<				and Life		
Weekperiod         Weekperiod         Subject grade         1~2           Faculty         Oraduate Program for Master's Dagree         Subject grade         1~2           Department Offered         Environmental and Life Sciences         Beggining grade         1~2           Charge teacher name[Roman alphabot mark]         世徒 精二, 業賞 一孝 IWASA Sejii, SHIBATOMI Kazutaka         MI, M2           Diportives of class         To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of bioactive organic compounds. (Iwasa)         2. Advanced modern synthetic organic reactions using transition metals. (Iwasa)           2. Advanced modern synthetic organic exprime synthesis and asymmetric catalysts. (Iwasa)         3. Basic concept of avidative addition and reductive elimination in catalytic cycles. (Iwasa)           3. Basic concept of Lewis acid catalysts in organic synthesis. (Shibatomi)         7. Advanced Dargenocatalysts. (Ishibatomi)           6. Advanced Lewis acid catalysts in organic synthesis. (Shibatomi)         7. Advanced organocatalysts. (Ishibatomi)           7. Advanced organocatalysts. In organic synthesis. (Shibatomi)         8. Organofluorine chemistry. (Shibatomi)           8. Advanced Modern Synthetic organic reactions using transition metals. (Iwasa)				Sciences		
Faculty         Graduate Program for Master's Degree         Subject grade         1~2           Department Offered         Environmental and Life Sciences         Beggining grade         M1, M2 grade           Charge teacher name[Roman         岩佐 精二, 柴富 一孝 IWASA Seji, SHIBATOMI Kazutaka         M1, M2 grade         M1, M2           Objectives of class         To provide you with a working knowledge of advanced synthesis of molecular materials.         To provide you with a working knowledge of advanced synthesis of molecular materials.           Orberts of class         To provide you with a working knowledge of advanced synthesis of molecular materials.         Ontents of class           This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of bioactive organic reactions using transition metals. (Iwasa)         3. Advanced modern synthetic organic reactions using transition metals. (Iwasa)           3. Basic concept of oxidative addition and reductive elimination in catalytic cycles. (Iwasa)         5. Basic concept of Lewis acid catalyst and organocatalyst. (Shibatomi)           7. Advanced newis the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of bioactive organic compounds. (Iwasa)         3. Advanced Lewis acid catalyst and organocatalyst. (Shibatomi)           7. Advanced modern synthetic organic reactions using transition metals. (Iwasa)         3. Basic concept of xidative addition and reductive elimination in catalytic cycles. (Iwasa) <t< td=""><td>Time of starting a course</td><th>Spring1 term</th><th>Day of the</th><td>Tue.5~5</td><td>Credit(s)</td><td>1</td></t<>	Time of starting a course	Spring1 term	Day of the	Tue.5~5	Credit(s)	1
Department Offered         Environmental and Life Sciences         Beggining grade         M1, M2           Charge teacher name[Roman alphabet mark]         岩佐 精二, 柴富 一孝 IWASA Seiji, SHIBATOMI Kazutaka         Numbering         Numasaid asalysis in organic synthesis of natural products on the b			week,period			
grade           Charge teacher name[Roman ghabets mark]            Numbering            Objectives of class            To provide you with a working knowledge of advanced synthesis of molecular materials. To provide you with a working knowledge of advanced synthesis of molecular materials.            Contrast of class             This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of bioactive organic compounds. (Iwasa)            2. Advanced modern synthetic organic reactions using transition metals. (Wasa)             3. Basic concept of oxidative addition and reductive elimination in catalytic cycles. (Iwasa)             3. Basic concept of synthesis in organic synthesis. (Shibatomi)              7. Advanced modern synthetic sign organic synthesis. (Shibatomi)               8. Organofluorine chemistry. (Shibatomi)                1. Total synthesis of bioactive organic compounds. (Iwasa)                7. Advanced organocatalysis in organic synthesis. (Shibatomi)	Faculty	Graduate Progra	m for Master's Degr	ee	Subject grade	1~2
Charge teacher name[Roman]         岩佐 精二, 柴宮 一孝 IWASA Seiji, SHIBATOMI Kazutaka           alphabet mark]         Numbering           Objectives of class         To provide you with a working knowledge of advanced synthesis of molecular materials. To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         To avoide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class         To provide you with a working knowledge of advanced synthesis of molecular materials.           2. Advanced modern synthetic organic captotation (wasa)         2.           3. Basic concept of Ewis acid catalyst and organocatalyst. (Shibatomi)         5.           6. Advanced Lewis acid catalyst and organocatalyst. (Shibatomi)         8.           7. Advanced modern synthetic organic reactions using transition metals. (Iwasa)         8.           8. Basic concept of Lewis acid catalyst and organic synthesis. (Shibatomi)         8.           7. Advanced Demistry (Shibatomi)         8.           8. Organofluorine chemistry (Shibatomi and reductive elimination in catalyt	Department Offered	Environmental ar	nd Life Sciences		Beggining	M1, M2
alphabet mark         Intervention of the second synthesis of molecular materials.           Objectives of class         To provide you with a working knowledge of advanced synthesis of molecular materials.           To provide you with a working knowledge of advanced synthesis of molecular materials.         Cortents of class           This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of bioactive organic compounds. (lwasa)         3.           1. Total synthesis of bioactive organic reactions using transition metals. (lwasa)         3.           2. Advanced modern synthetic organic reactions using transition metals. (lwasa)         3.           3. Basic concept of oxiditive addition and reductive elimination in catalytic cycles. (lwasa)         4.           5. Basic concept of Lewis acid catalysts and organocatalyst. (Shibatomi)         6.           7. Advanced organocatalysis in organic synthesis. (Shibatomi)         8.           8. Organofluorine chemistry. (Shibatomi)         7.           7. Advanced modern synthetic organic compounds. (lwasa)         2.           8. Sonthetic application of catalysis, organometallic the total synthesis of holactive organic compounds. (lwasa)         3.           9. Advanced modern synthetic organic reactions using transition metals. (lwasa)         3.           1. Total synthesis of bioactive organic compounds. (lwasa)         3.           2. Advanced modern synthetic synthesis a						
Numbering           Objectives of class           To provide you with a working knowledge of advanced synthesis of molecular materials.           To provide you with a working knowledge of advanced synthesis of molecular materials.           Contents of class           This course includes the detail of the most recent progress in modern synthetic application of catalysis, organometallic the total synthesis of bioactive organic compounds. (Iwasa)           2. Advanced modern synthetic organic reactions using transition metals. (Iwasa)           3. Basic concept of oxidative addition and reductive elimination in catalytic cycles. (Iwasa)           5. Basic concept of Lewis acid catalyst and organocatalyst. (Shibatomi)           6. Advanced Lewis acid catalysis in organic synthesis. (Shibatomi)           7. Advanced organocatalysis in organic synthesis. (Shibatomi)           7. Advanced organocatalysis in organic synthesis. (Shibatomi)           8. Organofluorine chemistry. (Shibatomi)           7. Advanced organocatalysis in organic reactions using transition metals. (Iwasa)           8. Basic concept of oxidative addition and reductive elimination in catalytic cycles. (Iwasa)           8. Organofluorine chemistry. (Shibatomi)           7. Advanced ondern synthetic organic reactions using transition metals. (Iwasa)           8. Basic concept of oxidative addition and reductive elimination in catalytic. (Iwasa)           4. Synthetic applications of asymmetric synthesis and asymmetric catalysts. (Iwasa)	Charge teacher name[Roman	岩佐 精二,柴富	了一孝 IWASA Seiji,	SHIBATOMI Kazutak	ka	
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A firm understanding on catalyst, stereochemistry, reaction mechanism, and their application for the synthesis of molecula
naterials is achieved.
Evaluation of achievement
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A design of novel organic molecular material.
The report on papers from scientific journals such as J.A.C.S and Angew. Chem. will be imposed.
A design of novel organic molecular material.
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By Report
Details of examination
Dther information
for more information:
Seiji Iwasa: room (B-506), e-mail (iwasa@ens.tut.ac.jp)
Kazutaka Shibatomi: room (B-507), e-mail (shiba@ens.tut.ac.jp)
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Kazutaka Shibatomi: room (B-507), e-mail (shiba@ens.tut.ac.jp)
http://material.tutms.tut.ac.jp/STAFF/IWASA/index.htmlja
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Office hours
Relations to attainment objectives of learning and education
Key words
no ecular catalyst total synthesis natural product asymmetric synthesis transition metal

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

# (M44630110)Developmental Neuroscience[Developmental Neuroscience]

Schedule number Time of starting a course Faculty	M44630110	Subject area	Advanced Environmental	Required or elective	Elective
-			and Life Sciences	0.000170	
<sup>-</sup> aculty	Spring2 term	Day of the	Thu.2~2	Credit(s)	1
	Graduate Progra	week,period m for Master's Degr	ee	Subject grade	1~2
Department Offered	Environmental and Life Sciences			Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	吉田 祥子, 沼野 利佳 YOSHIDA Sachiko, NUMANO Rika				
Numbering					
Objectives of class					
Dbjective of class is to develop	a new technolog	v for detection of u	neuronal function in	vour brain. We de	al with neuron
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S Yoshida,					
1)Properties of neuronal cells					
2)Electrical function and ion tran					
3)Chemical information transpor					
4)Development of neuronal circu					
5)Detection of chemical information	tion				
6)Detection of electrical informa					
7)Detection of cortical developm	ient				
R Numano,					
8)Neural inducer in vertebrates					
9)Notch and Delta genes					
10)Polarity and Segmentation					
11)Hox gene function in the ner	ous system				
12)Genesis and Migration					
13)Cerebral cortex histogenesis					
14)Topic1					
15)Topic2 & Discussion					
S Yoshida,					
1)Properties of neuronal cells					
2)Electrical function and ion trar	isport				
3)Chemical information transpor	t				
4)Development of neuronal circu	iit				
5)Detection of chemical information	tion				
6)Detection of electrical informa	tion				
7)Detection of cortical developm	nent				
R Numano,					
8)Neural inducer in vertebrates					
9)Notch and Delta genes					
10)Polarity and Segmentation					
(11)Hox gene function in the nerv	ous system				
12)Genesis and Migration					
13)Cerebral cortex histogenesis					
14)Topic1					
15)Topic2 & Discussion					
Self Preparation and Review					

	undamental biochemistry and thermodynamics will be necessary.
Notes for textbook	
Web-based text will be o	stributed.
(Reference)	
From Neuron To Brain 4	n Ed, Nicholls et. al. (Sinauer, 2001)
Web-based text will be o	
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From Neuron To Brain 4	n Ed, Nicholls et. al. (Sinauer, 2001)
Notes for reference	
Goals to be achieved	
Goals to be achieved	
Evaluation of achieveme	
Short reports on Web; 4	ώ, Term report; 60%
Term report; 100%	
Short reports on Web; 4	6, Term report; 60%
Term report: 100%	
Examination	
レポートで実施	
By Report	
Details of examination	
Other information	
S Yoshida	
Room: B-406, E-mail:syd	hida@ens.tut.ac.jp
R Numano	
Room: G-304, E-mail:nu	ano@tut.jp
S Yoshida	
Room: B-406, E-mail:syd	hida@ens.tut.ac.jp
R Numano	
Room: G-304, E-mail:nu	ano@tut.jp
Reference URL	
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Relations to attainment	Djectives of learning and education
Key words	

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

Subject name[English]	Advanced Elect	rical and Electror	nic Technology for	Ecological Engir	eering[Advance
	Electrical and Ele	ctronic Technology	for Ecological Engin	eering]	
Schedule number	M44630140	Subject area	Advanced Environmental and Life Sciences	Required or elective	Elective
Time of starting a course	Spring1 term	Day of the week,period	Fri.4~4	Credit(s)	1
Faculty	Graduate Program	n for Master's Degr	ee	Subject grade	1~2
Department Offered	Environmental an	d Life Sciences		Beggining grade	M1, M2
Charge teacher name[Roman	高島 和則,田中	三郎,水野 彰 TA	KASHIMA Kazunori,	-	MIZUNO Akira
alphabet mark]					
Numbering					
<b>Objectives of class</b> 静電気力やレーザを用いる DNA ウイルスの制御は感染予防、さら 気工学の基礎に加え細胞や分子 Bio-manipulation of cells and ge produced by plasma reduces infe	には医療への応用 の取り扱いなどのst nes is an importa	lが期待されている。 知識が必要であり、 nt tool for life scie	このような学際的な それらをこの講 義を nces. Control of r	領域での技術開身 通じて学ぶ。 nicrobes and virus	きを進めるには電 es using radical
developments, knowledge of cells studied in this lecture. 静電気力やレーザを用いる DNA ウイルスの制御は感染予防、さら 気工学の基礎に加え細胞や分子 Bio-manipulation of cells and ge produced by plasma reduces infe developments, knowledge of cells studied in this lecture.	s and genes is req . 分子や細胞の計: には医療への応用 の取り扱いなどの nes is an importar ction of diseases a	uired in addition to 測、操作が生命現象 が期待されている。 印識が必要であり、 nt tool for life scie and will possibly be	the basics of electr このような学際的な それらをこの講義を nces. Control of r applied in medical tr	ical engineering. 没であり、またラジァ 領域での技術開多 通じて学ぶ。 nicrobes and virus eatment. For these	These points ar カルを使う細胞4 をを進めるには電 es using radica a interdisciplinar
Contents of class					
<ol> <li>1.1 バイオ制御の目的 (Aim of Bi 電気工学が細胞・遺伝子操作や engineering and its application in ・健康な環境の維持 (To maintain ・静電気力とプラズマによる微生 ・新しい計測技術の開発 (Novel a ・ポストゲノム時代の遺伝子等の)</li> <li>1.2 電気を使う細胞や生体高分子 たまたまたま。細胞、小ス長体</li> </ol>	計測にどのような役 bio-manipulation s healthy environme 勿制御 (Bio-molecu nalytical method) 解析の重要性 (Imp -制御の概要紹介 (	と割を果たしているた should be understo ent) ule manipulation by portance of gene- se Electrostatic metho	ood through several e electrostatic force a equencing in Post-G od for manipulation o	examples.) nd plasma) enome Era.) f cells and molecul	es)
静電気力を使う細胞・分子操作 through several examples) ・電気泳動によるDNA配列解析( ・静電微粒化によるセルソータ(E ・レーザと電界による・細胞・DNA ・低温プラズマによる細胞・ウイル	〔Electrophoresis〕 lectro−spray and c ふ一分子操作 (Mani	ell sorter) pulation of individua	l cells and DNA mole	ecules)	
2. 復習:静電気工学の基礎 (Bas 微小物体ならびに液体に働く静電 により力の方向が変わることなど application in bio-manipulation sh	気力と、それによる 、グレーディエント	る運動 に関する理論 力の性質の理解を	深める。(Importanc		
2.1 静電気による力学現象 (Elect ・クーロンカ、影像カ、グレーデ comparison with gravity, drag, ma	ィエントカ 重カ、	粘性力、磁気力と	の比較(Coulomb t	force, image force	, gradient forc

2.2 電気流体力学 (Electro Fluid dynamics) ・電気ひずみ力、誘電泳動力、電気泳動力 (Electrophoresis, Electro-Osmosis, Dielectro-phoresis) ・マイクロ流路の流れの制御 (Flow control for micro- fluidics)

2.3 帯電液滴の発生と制御 (Generation and control of charged droplets)

3. 細胞操作と計測 (Manipulation of cells for analysis)

個々の細胞に対し、静電気力により運動制御を行うための 実際的な方法を理解する。また集光したレーザによる微小 粒子や 細胞の捕捉に関し、その原理と実際の適用方法を知 る。あわせて細胞の融合や遺伝子導入の基礎として、細胞 の性質の概 要、取り扱い方法の知識を得る。また細胞操作 の具体例として、細胞の分極、膜に加わる電界強度とそれによる膜破壊に関す る知識を得る。(Obtain the knowledge for manipulation of individual cells by electrostatic force and laser. Electrical characteristics of cells should be studied, including polarization and membrane breakdown by pulsed high electric field. Lasertweezers and their practical applications should also be understood.)

3.1 細胞の観察 (Observation of cells)

3.2 細胞の電気的性質と静電気力による細胞操作 (Electrical characteristics of cells and manipulation by electrostatic force) ・電気泳動、誘電泳動、回転操作と生死判別 (Electrophoresis, Dielectro-phoresis, Cell rotation and detection of viability)

3.3 高電界の利用 (Application of High electric field)
 ・電気的細胞融合、細胞膜破壊 (Cell fusion, Punctuation of cell membrane)

3.4 レーザトラッピングによる細胞・分子操作 (Laser-tweezers for manipulation of cells and bio-molecules)

4. 生体高分子の操作技術 (Manipulation of single DNA molecules)

DNAの構造と性質、DNA複製、制限酵素の働きなど、DNA情報をもとに生体が作られる際の基本的事項に関し、理解を深める。また、この章ではDNA一分子を取り扱う方法に関する知識を得る。(Fundamentals of genes should be understood, which includes: Construction and nature of DNA, replication, activity of enzymes. Basic technique for manipulation of single DNA molecules should also be studied.)

4.1DNAの複製と相転移 (Phase-change and replication)

4.2DNA分子の可視化 (Visualization of DNA molecules)

4.3 染色体 DNA の取り出し、選別操作 (Extraction of DNA from single cell)

4.4DNA分子の伸張固定 (Fix in stretched shape)

4.5 制限酵素との反応と制限地図 (Restriction enzyme)

4.6DNA分子の切断加工ならびに PCR 増幅 (Cutting and PCR amplification of DNA)

4.7 マイクロ流路での反応・制御 (Micro fluidic system)

5. 復習:気体放電現象 (Review of ionized gas)

気体放電に関する基礎知識を整理し、大気圧低温プラズマの発生方法、環境技術への応用に関する理解を深める。 (Fundamentals of ionized gases are reviewed. Generation of non-thermal plasma, and application in environmental remediation are studied.)

5.1 気体分子運動と電子衝突による電離、電子付着 (Ionization and electron attachment)

5.2 暗流と火花放電 (Dark current and spark discharge) ・タウンゼントの理論、パッシェンの法則、ストリーマ (Theory of gaseous breakdown: Townsend's theory, Paschen's law of flashover streamer formation)

5.3 大気中の各種放電 (Gas discharge in atmospheric air) ・コロナ放電、バリア放電、沿面放電 (Corona, Barrier, Surface discharge)

5.4 電離によるラジカル生成と反応 (Generation of Radicals)
 ・酸化によるガス状汚染物質の浄化、微生物の殺菌 (Oxidation by radicals for cleaning of gaseous pollutants and sterilization)

5.5 安全に高電圧を取扱うために (Safety for High voltages)

6. 放電プラズマによる環境中微生物、ウイルスの制御(Control of microbes and viruses by non-thermal plasma) 細胞やウイルスがプラズマにより受ける影響を知り、そのメカニズムを調べるための方法論に関する知識を得る。(Effect of non-thermal plasma on cells and viruses is to be studied.)

6.1 プラズマ殺菌 (Sterilization by plasma)

6.2 ウイルスの破壊メカニズムの解明に向けて (Mechanism of the virus inactivation)

6.3 生体とプラズマとの相互作用の計測 (Interaction between plasma and bioparticles)

6.4 一分子DNAの切断頻度計測によるプラズマ暴露液 体などの安全性評価 (Evaluation of radical activity through the cutting rate of DNA molecules)

7. 展望 (Perspective)

7.1 DNA解析の高速化、一分子反応装置 (High speed sequencing and single molecule reactions)

7.2 バイオ制御と環境 (Bio-manipulation for reducing infection)

1. 序論 (Introduction)

1.1 バイオ制御の目的 (Aim of Bio-molecule manipulation)

電気工学が細胞・遺伝子操作や計測にどのような役割を果たしているかを具体例をもとに理解する。 (Importance of electrical engineering and its application in bio-manipulation should be understood through several examples.)

・健康な環境の維持 (To maintain healthy environment)

・静電気力とプラズマによる微生物制御 (Bio-molecule manipulation by electrostatic force and plasma)

・新しい計測技術の開発 (Novel analytical method)

・ポストゲノム時代の遺伝子等の解析の重要性 (Importance of gene- sequencing in Post-Genome Era.)

1.2 電気を使う細胞や生体高分子制御の概要紹介 (Electrostatic method for manipulation of cells and molecules) 静電気力を使う細胞・分子操作の実例を学ぶ。(Electrostatic manipulation of cells and molecules should be understood through several examples)

・電気泳動によるDNA配列解析(Electrophoresis)

・静電微粒化によるセルソータ(Electro-spray and cell sorter)

・レーザと電界による・細胞・DNAー分子操作 (Manipulation of individual cells and DNA molecules)

・低温プラズマによる細胞・ウイルスの除去と破壊 (Destruction of microbes and viruses by non-thermal plasma)

2. 復習:静電気工学の基礎 (Basic of Electrostatics) 微小物体ならびに液体に働く静電気力と、それによる運動 に関する理論の理解を深める。特に制御対象物体の誘電分 極特性 により力の方向が変わることなど、グレーディエントカの性質の理解を深める。 (Importance of electrical engineering and its application in bio-manipulation should be understood through several examples.)

2.1 静電気による力学現象 (Electrostatic force)

・クーロンカ、影像カ、グレーディエントカ 重力、粘性力、磁気力との比較(Coulomb force, image force, gradient force, comparison with gravity, drag, magnetic force)

2.2 電気流体力学 (Electro Fluid dynamics)

・電気ひずみ力、誘電泳動力、電気泳動力 (Electrophoresis, Electro-Osmosis, Dielectro-phoresis)

·マイクロ流路の流れの制御 (Flow control for micro- fluidics)

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 ・電気的細胞融合、細胞膜破壊 (Cell fusion, Punctuation of cell membrane)

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DNAの構造と性質、DNA複製、制限酵素の働きなど、DNA情報をもとに生体が作られる際の基本的事項に関し、理解を深める。また、この章ではDNA一分子を取り扱う方法に関する知識を得る。(Fundamentals of genes should be understood, which includes: Construction and nature of DNA, replication, activity of enzymes. Basic technique for manipulation of single DNA molecules should also be studied.)

4.1DNAの複製と相転移 (Phase-change and replication)

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4.5 制限酵素との反応と制限地図(Restriction enzyme)

4.6DNA分子の切断加工ならびに PCR 増幅 (Cutting and PCR amplification of DNA)

4.7 マイクロ流路での反応・制御 (Micro fluidic system)

5. 復習:気体放電現象 (Review of ionized gas) 気体放電に関する基礎知識を整理し、大気圧低温プラズマ の発生方法、環境技術への応用に関する理解を深める。 (Fundamentals of ionized gases are reviewed. Generation of non-thermal plasma, and application in environmental remediation are studied.) 5.1 気体分子運動と電子衝突による電離、電子付着 (Ionization and electron attachment)

5.2 暗流と火花放電 (Dark current and spark discharge) ・タウンゼントの理論、パッシェンの法則、ストリーマ (Theory of gaseous breakdown: Townsend's theory, Paschen's law of flashover streamer formation)

5.3 大気中の各種放電 (Gas discharge in atmospheric air) ・コロナ放電、バリア放電、沿面放電 (Corona, Barrier, Surface discharge)

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 ・酸化によるガス状汚染物質の浄化、微生物の殺菌 (Oxidation by radicals for cleaning of gaseous pollutants and sterilization)

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6.1 プラズマ殺菌 (Sterilization by plasma)

6.2 ウイルスの破壊メカニズムの解明に向けて (Mechanism of the virus inactivation)

6.3 生体とプラズマとの相互作用の計測 (Interaction between plasma and bioparticles)

6.4 一分子DNAの切断頻度計測によるプラズマ暴露液 体などの安全性評価 (Evaluation of radical activity through the cutting rate of DNA molecules)

7. 展望 (Perspective)

7.1 DNA解析の高速化、一分子反応装置 (High speed sequencing and single molecule reactions)

7.2 バイオ制御と環境 (Bio-manipulation for reducing infection)

## Self Preparation and Review

Related subjects

Notes for textbook 必要な文献等を配布する。 References will be distributed. 必要な文献等を配布する。 References will be distributed. Notes for reference

Goals to be achieved

## Evaluation of achievement

レポートにより評価する

Evaluated by reports.
レポートにより評価する
Evaluated by reports.
Examination
レポートで実施
By Report
Details of examination
Other information
連絡先:
水野彰 Email: mizuno@ens.tut.ac.jp, G 棟 607 号室, 内線 6904
田中三郎 Email: tanakas@ens.tut.ac.jp, G 棟 605 号室, 内線 6916
高島和則 Email: takashima@ens.tut.ac.jp, G 棟 310 号室, 内線 6921
連絡先:
水野彰 Email: mizuno@ens.tut.ac.jp, G 棟 607 号室, 内線 6904
田中三郎 Email: tanakas@ens.tut.ac.ip. G 棟 605 号室, 内線 6916
高島和則 Email: takashima@ens.tut.ac.jp, G 棟 310 号室, 内線 6921
Reference URL
http://ens.tut.ac.jp/electrostatics/
http://ens.tut.ac.jp/electrostatics/
Office hours
Relations to attainment objectives of learning and education
Key words

# (M44630180)Advanced Reaction Engineering[Advanced Reaction Engineering]

Subject name[English]			anced Reaction Engin		Election
Schedule number	M44630180 Subject area		Advanced	Required or	Elective
			Environmental	elective	
			and Life		
Time of starting a course	Spring1 term	Day of the	Sciences Tue.2~2	Credit(s)	1
Time of starting a course	Springi term	week,period	Tue.2. • 2	Great(s)	1
Faculty	Graduate Progra	im for Master's Degr	ee	Subject grade	1~2
Department Offered	Environmental ar			Beggining	M1, M2
				grade	
Charge teacher name[Roman	小口 達夫 OGU	ICHI Tatsuo			
alphabet mark]					
Numbering					
Objectives of class					
This course will provide student	ts with the opport	tunity to understan	d the basic reaction	kinetics and dyna	amics. Especial
experimental and theoretical trea	atment of reaction	n rate constants will	be given. Some read	ction mechanisms	in combustion
atmosphere will be also discusse	d.				
This course will provide student	s with the opport	tunity to understan	d the basic reaction	kinetics and dyna	amics. Especial
experimental and theoretical trea	atment of reaction	n rate constants will	be given. Some read	ction mechanisms	in combustion
atmosphere will be also discusse	d.				
Contents of class					
1. Introduction.					
2. Chemical reaction and rate the	ory.				
3. Reaction mechanism.					
4. Thermodynamics of reaction.					
5. Reaction rate theory. (1)					
6. Reaction rate theory. (2)					
7. Summary					
1. Introduction.					
2. Chemical reaction and rate the	ory.				
3. Reaction mechanism.					
4. Thermodynamics of reaction.					
5. Reaction rate theory. (1)					
6. Reaction rate theory. (2)					
7. Summary					
Self Preparation and Review					
Related subjects					
Notes for textbook					
(Reference book)					
Paul L. Houston, "Chemical Kinet	cics and Reaction I	Dynamics″, McGraw	Hill.		
(A study-aid book)					
Steingfeld, Francisco, and Hase, '	Chemical Kinetics	s and Dynamics", Pr	entice-hall, 1989.		
(Reference book)					
Paul L. Houston, "Chemical Kinet	cics and Reaction I	Dynamics″, McGraw	Hill.		
(A study-aid book)					
Steingfeld, Francisco, and Hase, '	Chemical Kinetics	s and Dynamics″, Pr	entice-hall, 1989.		
otempreiu, i rancisco, anu riase,					
Notes for reference					
Notes for reference	ry, reaction mecha	anisms.			

# Evaluation of achievement

Grades for the course will be based on the reports. Grades for the course will be based on the reports.

Examination

レポートで実施 By Report

Details of examination

#### Other information

Tatsuo Oguchi, Phone:6930 Tatsuo Oguchi, Phone:6930

Reference URL

# Office hours

Any time, but e-mail is required in advance. Any time, but e-mail is required in advance.

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

Physical chemistry and thermodynamics.

Physical chemistry and thermodynamics.

#### Key words

Reaction, Rate Theory, Transition State Theory, Lindemann Mechanism. Reaction, Rate Theory, Transition State Theory, Lindemann Mechanism.

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

Subject name[English]	Advanced Susta	inable Coordinator[A	dvanced Sustainable	Coordinator]	
Schedule number	M44630190	Subject area	Advanced Environmental and Life Sciences	Required or elective	Elective
Time of starting a course	Spring2 term	Day of the week,period	Fri.4~4	Credit(s)	1
Faculty	Graduate Progra	m for Master's Degre	e	Subject grade	1~2
Department Offered	Environmental a	nd Life Sciences		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	後藤 尚弘,東海	存林 孝幸 GOTOH Na	aohiro, TOKAIRIN Ta		
Numbering					
<b>Objectives of class</b> Goto To establish a "Sustainable Soc comprehensive and they comprise 1 to comprehend notion of "Sust 2 to learn human dimensional disc 3 to know planning method to est	e not only enginee ainable Society" ciplines for "Susta	ring but also several inable Society"	disciplines. The obje		
Tokairin The objectives of this class are 1 to know air pollution situation 2 to understand the evaluation m 3 to understand the characteristi Goto To establish a "Sustainable Soc comprehensive and they compris 1 to comprehend notion of "Sust 2 to learn human dimensional disc 3 to know planning method to est	cs of planetary bo iety" is one of m e not only enginee ainable Society" ciplines for "Susta	undary layer najor fields for susta ring but also several inable Society"	disciplines. The obje		
Tokairin The objectives of this class are 1 to know air pollution situation 2 to understand the evaluation m 3 to understand the characteristi <b>Contents of class</b> Goto 1 Concept of Sustainable develop 2 Material (Substance) flow analy	cs of planetary bo oment	undary layer			
3 Japanese environmental law an	-	Assessment			
Tokairin 1 Atmospheric environment and a 2 Atmospheric diffusion modeling 3 Meteorology of planetary bound	-				
Goto 1 Concept of Sustainable develop 2 Material (Substance) flow analy 3 Japanese environmental law an	sis and Life Cycle	Assessment			
Tokairin 1 Atmospheric environment and a	air pollution				

2 Atmospheric diffusion modeling3 Meteorology of planetary boundary layer

# Self Preparation and Review

# Related subjects

# Notes for textbook

I will distribute copies of document.

## Tokairin

Goto

 $\ensuremath{I}$  will distribute copies of document.

# Goto

 $\ensuremath{I}$  will distribute copies of document.

Tokairin I will distribute copies of document.

# Notes for reference

#### Goals to be achieved

Goto to understant how to establish sustainable society

#### Tokairin

to understand basics on atmospheric environment and its evaluation method.

# Goto

to understant how to establish sustainable society

Tokairin

to understand basics on atmospheric environment and its evaluation method.

# Evaluation of achievement

Every week and Term end report (100%)

Every week and Term end report (100%)

#### Examination

レポートで実施 By Repor<u>t</u>

# Details of examination

#### Other information

Naohiro Goto (G603) goto@ens.tut.ac.jp Takayuki Tokairin (G405) tokairin@ens.tut.ac.jp

Naohiro Goto (G603) goto@ens.tut.ac.jp Takayuki Tokairin (G405) tokairin@ens.tut.ac.jp

## **Reference URL**

Office hours

Any time by E-mail Any time by E-mail

Relations to attainment objectives of learning and education

Key words

Sustainablity, MFA, LCA, Air pollution, planetary boundary layer, Atmospheric diffusion Sustainablity, MFA, LCA, Air pollution, planetary boundary layer, Atmospheric diffusion

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

Subject name[English]		rcritical Fluid Enginee			_
Schedule number	M44630200	Subject area	Advanced Environmental and Life Sciences	Required or elective	Elective
Time of starting a course	Spring2 term	Day of the week,period	Fri.2~2	Credit(s)	1
Faculty	Graduate Progra	am for Master's Degre	e	Subject grade	1~2
Department Offered	Environmental a	nd Life Sciences		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark] Numbering	大門 裕之 DAIM	大門 裕之 DAIMON Hiroyuki			L
Objectives of class					
Based on Supercritical Fluid leadership of engineer are impre Environmental issue is widely dis Based on Supercritical Fluid leadership of engineer are impre Environmental issue is widely dis <b>Contents of class</b>	oved during this co scussed to obtain t Engineering and B oved during this co	ourse. The topics ar the knowledge and or; Environmental Chem ourse. The topics ar	e mainly waste man ganizing skill of comp ical Engineering, p e mainly waste man	agement and utiliz prehensive process ractical philosophy agement and utiliz	ation of biomass or society. r, creativity an ation of biomass
1st Summary					
2nd History 3rd Physical property 1 4th Physical property 2 5th Instrumentation and process 6th Application of Supercritical 1 7th Application of Supercritical 1 8th Application of Supercritical 1 9th Application of Supercritical 1 10th Application of Supercritical 12th Application of Supercritical 13th Application of Supercritical 13th Application of Supercritical 14th Application of Supercritical 15th Examination 1st Summary 2nd History 3rd Physical property 1	Water Technologies Water Technologies Water Technologies Water Technologies I Water Technologies I Carbon dioxide Te I Carbon dioxide Te I Carbon dioxide Te	s 2 s 3 s 4 es 5 echnologies 1 echnologies 2 echnologies 3			
4th Physical property 2					
5th Instrumentation and process 6th Application of Supercritical 7th Application of Supercritical 8th Application of Supercritical 9th Application of Supercritical	Water Technologies Water Technologies Water Technologies	s 2 s 3			
10th Application of Supercritical 11th Application of Supercritical 12th Application of Supercritical 13th Application of Supercritical 14th Application of Supercritical	l Carbon dioxide Te l Carbon dioxide Te l Carbon dioxide Te	echnologies 1 echnologies 2 echnologies 3			
15th Examination Self Preparation and Review					
Related subjects					
Advanced Analytical Separation					
Advanced Analytical Separation Notes for textbook	Griemistry, Advanc	eu industrial Ecology	,		
1. Analytical Supercritical Fluid	Chromatography an	nd Extraction			

Chromatography Conference, Inc.
2. Hyphenated Techniques in Supercritical Fluid Chromatography and Extraction
edited by K. Jinno, 1992
Elsevier
1. Analytical Supercritical Fluid Chromatography and Extraction
edited by M. L. Lee and K. E. Markides, 1990
Chromatography Conference, Inc.
2. Hyphenated Techniques in Supercritical Fluid Chromatography and Extraction
edited by K. Jinno, 1992
Elsevier
Notes for reference
Goals to be achieved
1. To understand Supercritical Fluid Technology
2. To improve engineering skill
3. To obtain the knowledge about Environmental problem especially for waste management
1. To understand Supercritical Fluid Technology
2. To improve engineering skill
3. To obtain the knowledge about Environmental problem especially for waste management
Evaluation of achievement
Based on Presentation and Interview during class
More than
80% ; A
65% ; B
55% ; C
Based on Presentation and Interview during class
More than
80% ; A
65% ; B
55% ; C
Examination
レポートで実施
By Report
Details of examination
Other information
Office:Builing G, Floor 6th, Room 602
Tel:0532-44-6905
Email:daimon@ens.tut.ac.jp
Office : Builing G, Floor 6th, Room 602
Tel:0532-44-6905
Email:daimon@ens.tut.ac.jp
Reference URL
http://water.eco.tut.ac.jp/class.html (English version under construction)
http://water.eco.tut.ac.jp/class.html (English version under construction)
Office hours
After the class or anytime when you make an appointment through Email
After the class or anytime when you make an appointment through Email
Relations to attainment objectives of learning and education
(D)
(D)
Key words
Supercritical Fluids, Resource Recovery, Material and Energy Balance, Process Engineering
Supercritical Fluids, Resource Recovery, Material and Energy Balance, Process Engineering

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

				fe Science and Bio	
Schedule number	M44630220	Subject area	Advanced	Required or	Elective
			Environmental	elective	
			and Life		
<b></b>			Sciences	<b>a m</b> ()	
Time of starting a course	Spring term	Day of the	Intensive	Credit(s)	2
<b>F</b>	Que durate Due en	week,period		Outlinet musels	1 0
Faculty	-	am for Master's Degre	e	Subject grade	1~2
Department Offered	Environmental a	nd Life Sciences		Beggining grade	M1, M2
Charge teacher name[Roman	S4系数務委員	4kei kyomu Iin-S		grauo	
alphabet mark]	0-xxmyg				
Numbering					
-					
Objectives of class					с. н. — — — — — — — — — — — — — — — — — —
This course will provide the stu	-		-		
life science and biotechnology bar This course will provide the stu		-			
life science and biotechnology ba	-		-		
Contents of class		Suge of the course of	Auvanueu Lite SCIE	nee and Diotecrifio	logy I.
The classes will be given by his/	her supervisor Th	e type and contents	of this course deper	id on his/her super	visor
The classes will be given by his/		••	•		
Self Preparation and Review		is type and contents		a on mo, ner ouper	
Related subjects					
Advanced Life Science and Biot	a a b na l a m / I				
Advanced Life Science and Biot					
Notes for textbook	echnology I				
Notes for reference					
Goals to be achieved					
Evaluation of achievement					
<b>Evaluation of achievement</b> The evaluation is based on the s	cores of reports, (	presentations, and exa	amination.		
The evaluation is based on the s					
The evaluation is based on the s The evaluation is based on the s					
The evaluation is based on the s The evaluation is based on the s <b>Examination</b>					
The evaluation is based on the s The evaluation is based on the s <b>Examination</b> 試験期間中には何も行わない					
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The evaluation is based on the set Statement of the set	g by appointment. g by appointment. g by appointment.	education	amination.		

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

Subject name[English]	Advanced Enviro	onmental Technology	II[Advanced Enviror	mental Technology	/ II]
Schedule number	M44630240	Subject area	Advanced Environmental and Life Sciences	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Intensive	Credit(s)	2
Faculty	Graduate Progra	m for Master's Degr	ee	Subject grade	1~2
Department Offered	Environmental a	nd Life Sciences		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu lin-S				
Numbering					
<b>Objectives of class</b> This course will provide the stude environmental technology based This course will provide the stude environmental technology based <b>Contents of class</b> The classes will be given by his/ The classes will be given by his/	on the knowledge dents with the opp on the knowledge her supervisor. The	of the course of Adv portunity to study or of the course of Adv e type and contents	anced Environmenta the selected subject anced Environmenta of this course depen	I Technology I. ct in the realm of I Technology I. d on his/her super	further advanced
The classes will be given by his/ Self Preparation and Review	ner supervisor. The	e type and contents	of this course depen	a on his/her super	visor.
Advanced Environmental Techno Notes for textbook Notes for reference Goals to be achieved	logy I				
Evaluation of achievement	<u> </u>				
The evaluation is based on the set The evaluation is based on the set					
Examination 試験期間中には何も行わない None during exam period	<u></u>	<u>,</u>			
Details of examination					
Other information Supervisor Supervisor Reference URL					
Office hours	. h				
Students are encouraged visiting Students are encouraged visiting Relations to attainment objective	by appointment.	education			
Key words					

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

Subject name[English]	Advanced Envir Systems II]	ronmental and Ecolo	gical Systems II[Adva	anced Environment	al and Ecologic
Schedule number	M44630260	Subject area	Advanced Environmental and Life Sciences	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Intensive	Credit(s)	2
Faculty Department Offered	_	am for Master's Deg and Life Sciences	ee	Subject grade Beggining grade	1~2 M1, M2
Charge teacher name[Roman alphabet mark] Numbering	S4系教務委員 4kei kyomu lin−S				
Objectives of class					
Systems I. This course will provide the stud environmental and ecological sy Systems I. Contents of class The classes will be given by his/I The classes will be given by his/I Self Preparation and Review Related subjects Advanced Environmental and Eco Advanced Environmental and Eco	vstems based on ner supervisor. Th ner supervisor. Th plogical Systems 1	the knowledge of ne type and contents ne type and contents	the course of Advan	nced Environmenta	al and Ecologic
Notes for reference Goals to be achieved					
<b>Evaluation of achievement</b> The evaluation is based on the se	area of reports	procentations and a	romination		
The evaluation is based on the se	•				
Examination	,	,			
試験期間中には何も行わない					
None during exam period Details of examination					
Other information					
Supervisor Supervisor					
Reference URL					
Office hours					
Students are encouraged visiting	• • • •				
Students are encouraged visiting Relations to attainment objective		education			
	55 OF IGATINING ANO				

Key words

# (M44630280)X-ray Spectroscopy for Catalytic Engineering[X-ray Spectroscopy for Catalytic Engineering]

Subject name[English]		opy for Catalytic En	gineering[X-ray Spe		
Schedule number	M44630280 Subject area Advanced			Required o	r Elective
			Environmental	elective	
			and Life		
			Sciences		
Time of starting a course	Spring2 term	Day of the	Tue.3~3	Credit(s)	1
		week,period			
Faculty	Graduate Progra	m for Master's Degre	e	Subject grade	1~2
Department Offered	Environmental an	ld Life Sciences		Beggining	M1, M2
				grade	
Charge teacher name[Roman	水嶋 生智 MIZU	SHIMA Takanori			
alphabet mark]					
Numbering					
Objectives of class					
To gain knowledge of X-ray spe	stroscopic techniqu	ues including X-ray	diffraction X-ray ab	sorption fine str	ucture (XAES) and
fluorescent X-ray spectroscopy				sorption nile su	
To gain knowledge of X-ray spe			diffraction V-roy ob	corntion find atr	unturn (VAES) on
			antraction, A-ray ab	sorption line str	ucture (AAFS), an
fluorescent X-ray spectroscopy Contents of class	as analytical tools i	I OF SOUL CATALYSTS.			
(1) Fundamentals of X-ray and it					
(2) Principle, measurement techr		ion of X-ray diffract	on		
(3) Principle and analysis of XAF					
(4) Measurement of XAFS using	synchrotron radiati	on			
(5) Measurement of XAFS by lab	oratory system				
(6) Application of XAFS to cataly	st characterization	1			
(7) Advanced XAFS techniques a	and their application	ıs			
(8) Principle, measurement techr	iques, and applicat	ion of fluorescent X-	-ray spectroscopy		
(1) Fundamentals of X-ray and it	s spectroscopy				
(2) Principle, measurement techr		ion of X-ray diffract	on		
(3) Principle and analysis of XAF		·····, ·····			
(4) Measurement of XAFS using		on			
(5) Measurement of XAFS by lab	-				
(6) Application of XAFS to cataly					
(7) Advanced XAFS techniques a					
(8) Principle, measurement techr	ilques, and applicat	ion of huorescent A	ray spectroscopy		
<u> </u>					
Self Preparation and Review					
Related subjects					
-	wedge of physical a	nd inorgania abarria	tn		
It is advisable to have basic know		-	-		
It is advisable to have basic know It is advisable to have basic know		-	-		
It is advisable to have basic know It is advisable to have basic know Notes for textbook	vledge of physical a	and inorganic chemis	-		
It is advisable to have basic know It is advisable to have basic know Notes for textbook	vledge of physical a	and inorganic chemis	-		
It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe	vledge of physical a	and inorganic chemis	-		
It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe (Reference)	vledge of physical a	and inorganic chemis lass will be given.	try.		
It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe (Reference)	vledge of physical a	and inorganic chemis lass will be given.	try.	fic	
It is advisable to have basic know It is advisable to have basic know Notes for textbook No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti	vledge of physical a d synopsis of the c on fine structure fo	and inorganic chemis lass will be given. or catalysts and surf	try.	fic	
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It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti No textbook is required. A printe (Reference)	vledge of physical a d synopsis of the c on fine structure fo d synopsis of the c	and inorganic chemis lass will be given. or catalysts and surf lass will be given.	try. aces", World Scienti		
Related subjects It is advisable to have basic know It is advisable to have basic know Notes for textbook No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti Notes for reference	vledge of physical a d synopsis of the c on fine structure fo d synopsis of the c	and inorganic chemis lass will be given. or catalysts and surf lass will be given.	try. aces", World Scienti		
It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti No textbook is required. A printe (Reference)	vledge of physical a d synopsis of the c on fine structure fo d synopsis of the c	and inorganic chemis lass will be given. or catalysts and surf lass will be given.	try. aces", World Scienti		
It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti <b>Notes for reference</b>	vledge of physical a d synopsis of the c on fine structure fo d synopsis of the c	and inorganic chemis lass will be given. or catalysts and surf lass will be given.	try. aces", World Scienti		
It is advisable to have basic know It is advisable to have basic know Notes for textbook No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti Notes for reference Goals to be achieved	vledge of physical a d synopsis of the c on fine structure fo d synopsis of the c <u>on fine structure fo</u>	and inorganic chemis lass will be given. or catalysts and surf lass will be given.	try. aces", World Scienti		
It is advisable to have basic know It is advisable to have basic know <b>Notes for textbook</b> No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti No textbook is required. A printe (Reference) Y.Iwasawa et al., "X-ray absorpti <b>Notes for reference</b>	vledge of physical a d synopsis of the c on fine structure fo d synopsis of the c on fine structure fo -ray spectroscopy	and inorganic chemis lass will be given. or catalysts and surf lass will be given. or catalysts and surf	try. aces", World Scienti aces", World Scienti	fic	

# (1) Understanding of basics of X-ray spectroscopy

(2) Understanding of X-ray diffraction, XAFS, and fluorescent X-ray spectroscopy as analytical tools for solid catalysts.

# Evaluation of achievement

Reports 100%

Reports 100%

**Examination** レポートで実施

By Report

# Details of examination

#### Other information

Takanori Mizushima, room : B-303, e-mail: mizushima@ens.tut.ac.jp Takanori Mizushima, room : B-303, e-mail: mizushima@ens.tut.ac.jp **Reference URL** 

Office hours

Anytime

Anytime

Relations to attainment objectives of learning and education

# Key words

X-ray spectroscopy, X-ray diffraction, XAFS, Fluorescent X-ray spectroscopy, Solid catalysts X-ray spectroscopy, X-ray diffraction, XAFS, Fluorescent X-ray spectroscopy, Solid catalysts

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

Subject name[English]	Advanced Biomaterials E	ngineering[Advanced Bio	materials Engineering	<u>[</u> ]	
Schedule number	M44630290	Subject area	Advanced Environmental and Life Sciences	Required or elective	Elective
Time of starting a course	Spring2 term	Day of the week,period	Fri.5~5	Credit(s)	1
Faculty	Graduate Program for Master's Degree			Subject grade	1~2
Department Offered	Environmental and Life Sciences			Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	手老 龍吾, 辻 秀人 TEF	RO Ryugo, TSUJI Hideto			
Numbering					

#### **Objectives of class**

Biomaterials have been developed and studied in terms of various applications including biomedical, pharmaceutical and environmental applications. This course covers the fundamentals and applications of biomaterials and related experimental techniques.

Biomaterials have been developed and studied in terms of various applications including biomedical, pharmaceutical and environmental applications. This course covers the fundamentals and applications of biomaterials and related experimental techniques.

#### **Contents of class**

This course deals with all aspects of biobased and biodegradable polymers for biomedical, pharmaceutical, and environmental applications, and of devices and techniques for sensing biomolecules. The detailed course schedule is shown below. The detailed course schedule is shown below.

#### Biobased and biodegradable polymers (Hideto Tsuji):

(1) introduction, synthesis, and structures, (2) molding, crystallization, and physical properties, (3) hydrolytic degradation and biodegradation, and (4) applications.

Biodevice and biosensing (Ryugo Tero):

(5) introduction of biomaterials and biodevices, (6) detection of cell membrane functions, (7) surface patterning and microarray, and (8) imaging techniques for biomolecules.

This course deals with all aspects of biobased and biodegradable polymers for biomedical, pharmaceutical, and environmental applications, and of devices and techniques for sensing biomolecules. The detailed course schedule is shown below. The detailed course schedule is shown below.

Biobased and biodegradable polymers (Hideto Tsuji):

(1) introduction, synthesis, and structures, (2) molding, crystallization, and physical properties, (3) hydrolytic degradation and biodegradation, and (4) applications.

Biodevice and biosensing (Ryugo Tero):

(5) introduction of biomaterials and biodevices, (6) detection of cell membrane functions, (7) surface patterning and microarray, and (8) imaging techniques for biomolecules.

#### Self Preparation and Review

If possible, read the reference book chapters which are shown below and you can find them in the university library (Hideto Tsuji).

Read the appropriate chapter(s) of the reference book (#3) shown below. You can access it in the university network. (Ryugo Tero)

If possible, read the reference book chapters which are shown below and you can find them in the university library (Hideto Tsuii).

Read the appropriate chapter(s) of the reference book (#3) shown below. You can access it in the university network. (Ryugo Tero)

#### **Related subjects**

#### Notes for textbook

Printed materials will be distributed (Hideto Tsuji).

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

Reference 1	Book title	Degradation of F	Poly (Lactide)-	Based Biodegrada	ble ISBN	1604565020
	Author	Hideto Tsuji	Publisher	Nova Scier Pub Inc	nce <b>Publish</b> year	2008
Reference2	Book title	Chapter 21 in	•	acid): Synthe	sis, <b>ISBN</b>	0470293667
	A 11			ng, and Applications		0010
	Author	Hideto Tsuji	Publisher	Wiley	Publish year	2010
Reference3	Book title	Nanoscience: Nan	obiotechnology	and Nanobiology	ISBN	978-3-540- 88633-4
	Author	Patrick Boisseau & Marcel Lahmani	Publisher	Springer	Publish year	2009
Notes for reference						
Reference book 3 (Ry http://link.springer.co Reference book 3 (Ry http://link.springer.co	om/book/10.100 yugo Tero):					
Goals to be achieved	l					
To understand the fu To understand the fu To understand the fu To understand the fu	ndamentals and ndamentals and	applications of biode applications of bioba	evice, biosensir ased and biode	g and related meth gradable polymers (	ods (Ryugo Tero) Hideto Tsuji).	
Evaluation of achieve	ement					
Presentation (100%) r	regarding the bio	based and biodegrad	lable polymers	(Hideto Tsuji)		
Reporting assignment Presentation (100%) r		-				
Reporting assignment	t (100%) which w	ill be given in each c	lass (Ryugo Te	ero)		
Examination						
レポートで実施						
By Report						
Details of examinatio						
Presentation (Hideto						
Reporting assignment						
Presentation (Hideto						
Reporting assignment Other information	t (Ryugo Tero)					
Room (G-606), e-mai	il (tauii@ana.t.t.t	a in) phone: 6022 (L	didata Tauii)			
Room (G-606), e-mai Room (B-405), e-mai						
Room (G-606), e-mai						
Room (B-405), e-mai	-		-			
Reference URL						
Office hours						
Immediately after the	e class (Hideto T	suji)				
After the class, or as						
Immediately after the	e class (Hideto T	suji)				
	needed in my o	ffice (Ryugo Tero)				
After the class, or as	ant abiaativaa a	f learning and educat	tion			
After the class, or as <b>Relations to attainme</b>						
	ant objectives of					

I

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

Subject name[English]	Seminar on Architecture and Civil Engineering I[Seminar on Architecture and					
	Engineering I]			-		
Schedule number	M45610010 Subject area Advanced		Required or	Required		
	Arch		Architecture	elective		
			and Civil			
Time of starting a course	Year	Day of t	Engineering Intensive	Credit(s)	3	
Time of starting a course	Tear	week,period	ie incensive	Credic(s)	5	
Faculty	Graduate Progra		egree	Subject grade	1~2	
Department Offered	Architecture and			Beggining	M1	
				grade		
Charge teacher name[Roman	S5系教務委員 5	ökei kyomu Iin−S				
alphabet mark]						
Numbering	I					
Objectives of class						
All the students are required to						
subjects related to the current re		the laboratory. I	he scheduled program	of the seminars is	announced by the	
supervisor at the guidance of the All the students are required to		inare which is a	rranged by the labora	tony supervisor for	the special study	
subjects related to the current re					-	
supervisor at the guidance of the		· • • • • • • • • • • • • • • •				
Contents of class						
Self Preparation and Review						
Polotod aubianto						
Related subjects						
Notes for textbook						
Notes for reference						
Goals to be achieved						
Evaluation of achievement						
Report						
Report Examination						
レポートで実施						
By Report						
Details of examination						
Other information						
Reference URL						
Office hours						
Relations to attainment objective	s of learning and 4	aducation				
Key words						

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

Subject name[English]	Seminar on Architecture and Civil Engineering II[Seminar on Architecture and C				
Schedule number	Engineering II] M45610020 <b>Subject area</b> Advanced			Required or	Poquirod
Schedule number	M43010020	Subject area	Advanced Architecture	Required or elective	Required
		and Ci		01000440	
			Engineering		
Time of starting a course	Year	Day of the	Intensive	Credit(s)	3
Faculty	Graduate Program	week,period n for Master's Degr		Subject grade	2~2
Department Offered	Architecture and	-		Beggining	M2
				grade	
Charge teacher name[Roman	S5系教務委員5	kei kyomu Iin-S			L
alphabet mark]					
Numbering					
Objectives of class					
All the students are required to	attend all the sem	inars, which is arra	nged by the laborate	ory supervisor for	the special study
subjects related to the current re	esearch activity of	the laboratory. The	scheduled program	of the seminars is a	announced by the
supervisor at the guidance of the					
All the students are required to					
subjects related to the current re	-	the laboratory. The	scheduled program	of the seminars is a	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					
Report					
Examination					
レポートで実施					
By Report					
Details of examination					
Other information					
Reference URL					
Office hours					
Relations to attainment objective	es of learning and e	ducation			
Key words					

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

Subject name[English]	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]						
Schedule number	M45610030	30 Subject area		Advanced Architecture and Civil Engineering	Required or elective	Required	
Time of starting a course	2Years	Day week,	of period	the	Intensive	Credit(s)	6
Faculty	Graduate Program	for Ma	ster's	Degre	e	Subject grade	1~2
Department Offered	Architecture and	Architecture and Civil Engineering					M1, M2
Charge teacher name[Roman alphabet mark]	S5系教務委員 5k	S5系教務委員 5kei kyomu Iin-S					
Numbering							

# **Objectives of class**

This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).

This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).

# **Contents of class**

The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).

The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).

# Self Preparation and Review

#### Related subjects

TBD by the laboratory

# TBD by the laboratory

**Notes for textbook** TBD by the laboratory TBD by the laboratory

# Notes for reference

# Goals to be achieved

#### Evaluation of achievement

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

#### **Details of examination**

#### Other information

Refer to administration office. Refer to administration office.

#### **Reference URL**

Refer to the URL of each laboratory Refer to the URL of each laboratory

# Office hours

Refer to administration office.

Refer to administration office.

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

Key words

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

Subject name[English]         Thesis Research on Architecture and Civil Engineering[Thesis Research o           Civil Engineering]         Civil Engineering]					
Schedule number	M45610030	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Required
Time of starting a course	2Years	Day of the week,period	Intensive	Credit(s)	6
Faculty	Graduate Progr	am for Master's Degr	e	Subject grade	1~2
Department Offered		d Civil Engineering		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	S5系教務委員	,5系各教員 5kei kyo	mu Iin−S, 5kei kakuk	youin	
Numbering					
<b>Objectives of class</b> Research on architecture and ci	vil engineering				
Contents of class					
It depends on the laboratory. Al the thesis, as a requirement for the guidance of the supervisor.					
Self Preparation and Review					
Related subjects					
It depends on the laboratory					
Notes for textbook					
Notes for reference					
Goals to be achieved					
Evaluation of achievement					
Evaluation is based on report.					
Examination					
その他					
By Report					
Details of examination					
Other information					
Reference URL					
Office hours					
Relations to attainment objectiv	es of learning and	education			
Key words					

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

Subject name[English]	Thesis Research on Architecture and Civil Engineering[Thesis Research on Architecture and Civil Engineering]						
Schedule number	M4561003T	Subje	ct are	a	Advanced Architecture and Civil Engineering	Required or elective	Required
Time of starting a course	Year	Day week,	of period	the I	Intensive	Credit(s)	6
Faculty	Graduate Program	for Ma	ister's	Degre	e	Subject grade	2~2
Department Offered	Architecture and	Architecture and Civil Engineering					M2
Charge teacher name[Roman alphabet mark]	S5系教務委員 5kei kyomu Iin−S						
Numbering							

# **Objectives of class**

This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).

This thesis research on architecture and civil engineering is designated to deepen the knowledge and enhance the skills of the students in their research fields through the self-oriented endeavour with the instruction of his/her supervisor(s).

# **Contents of class**

The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).

The subjects and the contents of the thesis vary depending on the laboratory. All students must present their thesis at the end of the course and take a final examination on the thesis, as a requirement for the graduation of the master course. The study for the thesis is planned and conducted under the guidance of the supervisor(s).

# Self Preparation and Review

Related subjects

Notes for textbook

#### Notes for reference

Goals to be achieved

#### Evaluation of achievement

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

Examination

レポートで実施 By Report

Details of examination

#### Other information

Refer to administration office. Refer to administration office.

# Reference URL

Refer to the URL of each laboratory Refer to the URL of each laboratory

# Office hours

Refer to administration office.

Refer to administration office.

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

Key words

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

Subject name[English]	Seminar on Architecture and Civil Engineering[Seminar on Architecture and Civil Engineering]						
Schedule number	M45610040	Subject area	Advanced	Required or	Required		
			Architecture	elective			
			and Civil				
Time of starting a course	Year	Day of the	Engineering Intensive	Credit(s)	6		
	1 cui	week,period	Inconsive	Of Oalt(S)	Ũ		
Faculty	Graduate Progran	n for Master's Degre	e	Subject grade	2~2		
Department Offered	Architecture and	Civil Engineering		Beggining	M2		
Ohanna taadhar araa Damaa	05. 云 粉 改 禾 吕 日	in the second line C		grade			
Charge teacher name[Roman alphabet mark]	S5系教務委員 5	kei kyömu iin-3					
Numbering							
Objectives of class							
All the students are required to	attend all the semi	inars. which is arrar	nged by the laborato	orv supervisor for	the special study		
subjects related to the current re							
supervisor at the guidance of the	seminar.						
All the students are required to	attend all the semi	nars, which is arran	nged by the laborate	ory supervisor for	the special study		
subjects related to the current re		the laboratory. The	scheduled program o	of the seminars is a	announced by the		
supervisor at the guidance of the <b>Contents of class</b>	seminar.						
In each seminar, students purs	sue coveral recear	ob topics and/or	undertake projects	collectively and	cololy under the		
instruction of the faculty member		-		collectively and	solely under the		
In each seminar, students purs				collectively and	solely under the		
instruction of the faculty member				2	,		
Self Preparation and Review							
Related subjects							
Notes for textbook							
Notes for reference							
Goals to be achieved							
Evaluation of achievement							
Report							
Report <b>Examination</b>							
レポートで実施							
By Report							
Details of examination							
Other information							
Reference URL							
Office hours							
Relations to attainment objective	es of learning and e	ducation					

Key words

# (M45630110)Computer Applications in Urban Planning[Computer Applications in Urban Planning]

Subject name[English]         Computer Applications in Urban Planning[Computer Applications in Urban Planning]					
Schedule number	M45630110	Subject area	Advanced Architecture and Civil	Required or elective	Elective
Time of starting a course	Spring term	Day of the	Engineering Tue.2~2	Credit(s)	2
		week,period			
Faculty	_	m for Master's Degre	e	Subject grade	1~2
Department Offered	Architecture and	I Civil Engineering		Beggining grade	M1, M2
Charge teacher name[Roman alphabet mark]	浅野 純一郎 AS	SANO Junichiro		8.440	
Numbering					
<ol> <li>To gain the fundamental know</li> <li>To learn the advanced method</li> <li>To gain the fundamental know</li> <li>To learn the advanced method</li> <li>Contents of class</li> </ol>	Is using computer t ledge of computer	technology for urbar applications in urban	and regional planni and regional plannir	ing. ng.	
The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy	graphic Information s using computer to a (CA) model to ur o land use planning	Systems); its function echnology in the field ban growth simulation g and environmental	l of urban planning n modelling zoning		
Design" and "Computers, Enviro The major topics that will be ado 1.Introduction: What is GIS (Geo	nment and Urban s ressed in this class graphic Information	ystems" will be used s are the followings. Systems); its functio	for reading papers. on and applications		g B: Planning an
The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur o land use planninn stem for urban dev	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental relopment in developi	for reading papers. on and applications I of urban planning n modelling zoning ng countries		
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn stem for urban dev on computer appli	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developion cations: Internationa	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr	nent and Plannin;	
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn stem for urban dev on computer appli	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developion cations: Internationa	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr	nent and Plannin;	
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developion cations: Internationa	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr	nent and Plannin;	
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developion cations: Internationa	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr	nent and Plannin;	
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban planning	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developion cations: Internationa	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr	nent and Plannin;	
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system tr 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s ng is desirable. Ig is desirable.	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning and
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s ng is desirable. Ig is desirable.	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning and
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system tr 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of No textbook is required for this of	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s ng is desirable. Ig is desirable.	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning and
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo, 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of Notes for reference	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur b land use planninn; stem for urban dev on computer appli- nment and Urban s ng is desirable. Ig is desirable.	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning an
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of Notes for reference Goals to be achieved Evaluation of achievement The report on selected papers w	nment and Urban s ressed in this class graphic Information s using computer to a (CA) model to ur o land use planninn, stem for urban dev on computer appli- nment and Urban s ng is desirable. Ing is desirable. class. Some recent class. Some recent	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning and
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of Notes for reference Goals to be achieved Evaluation of achievement The report on selected papers w Oral presentation: 40%, Written re	nment and Urban s ressed in this class graphic Information is using computer to a (CA) model to ur o land use planninn stem for urban dev on computer appli nment and Urban s ng is desirable. Ing is desirable. class. Some recent class. Some recent class. Some recent	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning and
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of Notes for reference Goals to be achieved Evaluation of achievement The report on selected papers w Oral presentation: 40%, Written re	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur o land use planninn, stem for urban dev on computer appli nment and Urban s ng is desirable. Ing is desirable. class. Some recent class. Some r	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning an
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo, 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of Notes for reference Goals to be achieved Evaluation of achievement The report on selected papers w Oral presentation: 40%, Written re	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur o land use planninn, stem for urban dev on computer appli nment and Urban s ng is desirable. Ing is desirable. class. Some recent class. Some r	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning an
Design" and "Computers, Enviro The major topics that will be add 1.Introduction: What is GIS (Geo, 2.Overview of Advanced method 3.Application of Cellular Automat 4.Application of Expert system to 5.GIS-based planning support sy Reporting some recent papers Design" and "Computers, Enviro Self Preparation and Review Related subjects Basic knowledge of urban plannin Basic knowledge of urban plannin Notes for textbook No textbook is required for this of Notes for reference Goals to be achieved Evaluation of achievement The report on selected papers w Oral presentation: 40%, Written re	nment and Urban s ressed in this class graphic Information s using computer te a (CA) model to ur o land use planninn, stem for urban dev on computer appli nment and Urban s ng is desirable. Ing is desirable. class. Some recent class. Some r	ystems" will be used s are the followings. Systems); its function echnology in the field ban growth simulation g and environmental elopment in developi cations: Internationa ystems" will be used	for reading papers. on and applications I of urban planning n modelling zoning ng countries I Journal "Environr for reading papers. applications to urba	nent and Planning	g B: Planning an

# Other information

# Reference URL

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

# Office hours

Relations to attainment objectives of learning and education

Key words

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

Subject name[English]	Advanced Study on Housing System and Housing Policy[Advanced Study on Housing							
	System and Housing Policy]							
Schedule number	M45630130	Subject a	rea	Advanced Architecture and Civil Engineering	Required or elective	Elective		
Time of starting a course	Spring term	Day of week,peri	the od	Tue.3~3	Credit(s)	2		
Faculty	Graduate Program	n for Master	's Degr	e	Subject grade	1~2		
Department Offered	Architecture and	Civil Engine		Beggining grade	M1, M2			
Charge teacher name[Roman alphabet mark]	松島 史朗 MATS	SUSHIMA SP	iro		·			
Numbering								

# **Objectives of class**

To understand emerging architecture of humanity such as post-disaster temporary housing, refugee camp, and illegal residence. With increasing number of population moving into the urban area from suburbs, there emerge risks with which we have to cope, especially supply of housing and related facility has to be taken into account.

For the final projet, students are expected to conduct research to write a case study on such risks of their countries and examine necessary counter measures.

To understand emerging architecture of humanity such as post-disaster temporary housing, refugee camp, and illegal residence. With increasing number of population moving into the urban area from suburbs, there emerge risks with which we have to cope, especially supply of housing and related facility has to be taken into account.

For the final projet, students are expected to conduct research to write a case study on such risks of their countries and examine necessary counter measures.

#### Contents of class

This course takes several topics about the issues stated above. Two classes are allocated to each topic in principle; in the first class a lecture is given by the instructor and in the second class, the presentation is given by the student who is assigned to each topic.

It may adopt case method with which students are expected to read cases on various topics regarding emerging risks related to architectural

and housing planning, design, and urban development. Students read cases prior to the class and, at the class, they will exchange their ideas

face to face in order to develop their original idas to knowledge. It is also expected to develop skills of debating. Instructor will provide

appropriate instruction in timely manner for the class discussion along with giving lecture at the class.

1. Introduction

2/3. Architecture after 3.11

4/5. Lecture on Architectural and Housing Development of the World

6/7. Revitalising the City and Empowering. Community Tie by the Community (Re) Development in Toyokawa Inari Shrine Mid-term paper due: proposal of the final project

8/9. Yebisu Garden Place

10. Final Project Interim Presentation and collective review

11/12. Rainbow Town Tokyo Waterfront Development

13. Independent Desk Crit

14/15. Final presentation by students.

16. Editing and compiling the final projects to make a booklet.

For the final project, students will write their own cases based on their research and give presentation at the last class. Final project may be either independent work or group project.

Because this is a small class and students have different backgrounds and interests, the contents of the class and schedule are subject to

change according to her/his disciplines.

This course takes several topics about the issues stated above. Two classes are allocated to each topic in principle; in the first class a lecture is given by the instructor and in the second class, the presentation is given by the student who is assigned to each topic.

It may adopt case method with which students are expected to read cases on various topics regarding emerging risks related to architectural

and housing planning, design, and urban development. Students read cases prior to the class and, at the class, they will

exchange their ideas

face to face in order to develop their original idas to knowledge. It is also expected to develop skills of debating. Instructor will provide

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1. Introduction

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Mid-term paper due: proposal of the final project

8/9. Yebisu Garden Place

10. Final Project Interim Presentation and collective review

 $11/12. \ Rainbow \ Town \ Tokyo \ Waterfront \ Development$ 

13. Independent Desk Crit

14/15. Final presentation by students.

16. Editing and compiling the final projects to make a booklet.

For the final project, students will write their own cases based on their research and give presentation at the last class. Final project may be either independent work or group project.

Because this is a small class and students have different backgrounds and interests, the contents of the class and schedule are subject to

change according to her/his disciplines.

## Self Preparation and Review

Read a case and prepare for the answers to each question on the case.

Develop your own ideas in order to exchange them w/ your class mates to have more diverse views

From the review of your project, you may revise and develop your argument for the future. Reflecting yourself by listening to others is the most important aspect to become a good practitioner.

Read a case and prepare for the answers to each question on the case.

Develop your own ideas in order to exchange them w/ your class mates to have more diverse views From the review of your project, you may revise and develop your argument for the future. Reflecting yourself by listening to others is the most important aspect to become a good practitioner.

#### **Related subjects**

Architectural/Civil Engineering practice experience preferred but not required.

Architectural/Civil Engineering practice experience preferred but not required.

# Notes for textbook

Cases shown above. Cases are subject to change.

(Reference)

TBA

Cases shown above. Cases are subject to change.

#### (Reference)

тва

#### Notes for reference

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

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

#### Goals to be achieved

To understand the needs or structure for humanity that involves various issues including design, procurement, and distribution systems of architecture from international point of view and from local standpoint.

To develop your own ideas and your ability of discussion based on the comparative research of your country and Japan about the problems discussed here.

To understand the needs or structure for humanity that involves various issues including design, procurement, and distribution systems of architecture from international point of view and from local standpoint.

To develop your own ideas and your ability of discussion based on the comparative research of your country and Japan about

the problems discussed here.
Evaluation of achievement
Class participation (30%), final project of case writing (40%), presentation by the students (30%), and contributiron to make the
booklet that features the final projects (10%)
Class participation (30%), final project of case writing (40%), presentation by the students (30%), and contributiron to make the
booklet that features the final projects (10%)
Examination
その他
Other
Details of examination
Other information
D-707, Phone: 44-6835, Email: shirom@ace.tut.ac.jp
D-707, Phone: 44-6835, Email: shirom@ace.tut.ac.jp
Reference URL
http://mlab.ace.tut.ac.jp/
http://mlab.ace.tut.ac.jp/
Office hours
Every Tuesday 12:30 to 14:30 on sign-up basis
or by appointment via email
Every Tuesday 12:30 to 14:30 on sign-up basis
or by appointment via email
Relations to attainment objectives of learning and education
Key words

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

Subject name[English]	Advanced Structural System Planning and Design II[Advanced Structural System Planning					System Planning	
	and Design II]	anan oyoto		.8 ana 200.8. <u>n</u> p.a			
Schedule number	M45630200	Subject	area	Advanced	Required or	Elective	
				Architecture	elective		
				and Civil			
				Engineering			
Time of starting a course	Spring term	Day o	of the	Intensive	Credit(s)	2	
		week,pe					
Faculty	Graduate Program			e	Subject grade	1~2	
Department Offered	Architecture and	Civil Engin	leering		Beggining	M1, M2	
	○□乙卦改禾号□		r 0		grade		
Charge teacher name[Roman	S5系教務委員 5	кеі куоти	lin-5				
alphabet mark] Numbering	<u> </u>						
Numbering	L						
Objectives of class							
It depends on the laboratory. T	he resistered stud	dents are	required	to attend all the s	eminars, which is	arranged by the	
laboratory supervisor for the spe					ty of the laborator	y. The scheduled	
program of the seminars is annou			-				
It depends on the laboratory. T							
laboratory supervisor for the spe					ty of the laborator	y. The scheduled	
program of the seminars is annou	nced by the superv	lisor at the	e guidance	e of the seminar.			
Contents of class							
Self Preparation and Review							
Related subjects							
Notes for textbook							
Notes for reference							
Goals to be achieved							
Goals to be achieved							
Evaluation of achievement							
Examination							
レポートで実施							
By Report							
Details of examination							
Other information							
Reference URL							
Office hours							
Relations to attainment objective	e of learning and a	ducation					
	o or loarning and 6	Juvauon					
Key words							
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# (M45630220)Advanced Environmental System Planning and Design II[Advanced Environmental System Planning and Design II]

Subject name[English]	Advanced Environmental System Planning and Design II[Advanced Environmental System				
	Planning and Des	Ē.	1	1	1
Schedule number	M45630220	Subject area	Advanced	Required or	Elective
			Architecture	elective	
			and Civil Engineering		
Time of starting a course	Spring term	Day of the	Intensive	Credit(s)	2
	opinig torm	week,period	Inconditio		-
Faculty	Graduate Program	n for Master's Degr	ee	Subject grade	1~2
Department Offered	Architecture and	Civil Engineering		Beggining	M1, M2
				grade	
Charge teacher name[Roman -	S5系教務委員 5	kei kyomu Iin−S			
alphabet mark]					
Numbering					
Objectives of class					
It depends on the laboratory. T	he resistered stud	dents are required	to attend all the s	eminars, which is	arranged by the
laboratory supervisor for the spe				ty of the laborator	y. The scheduled
program of the seminars is annou		-			
It depends on the laboratory. T laboratory supervisor for the spe					
program of the seminars is annou				ty of the laborator	y. The scheduled
Contents of class					
Self Preparation and Review					
Related subjects					
Notes for textbook					
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Goals to be achieved					
Evaluation of achievement					
Examination					
レポートで実施 By Report					
Details of examination					
Other information					
Reference URL					
Office hours					
Office nours					
Deletione to etteinment altistic		ducation			
Relations to attainment objective	is of learning and e	ducation			
Key words					

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

Subject name[English]	Advanced Regional System Planning and Design II[Advanced Regional System Planning and					
	Design II]	iceu Regional Sys	terri Flanning anu			
Sahadula number			A duama c -l	De autre d	Elective	
Schedule number	M45630240	Subject area		Required or	Elective	
			Architecture	elective		
			and Civil			
			Engineering			
Time of starting a course	Spring term	Day of the	Intensive	Credit(s)	2	
		week,period				
Faculty	Graduate Program	n for Master's Degre	ee	Subject grade	1~2	
Department Offered	Architecture and	Civil Engineering		Beggining	M1, M2	
				grade		
Charge teacher name[Roman	S5系教務委員5	kei kvomu Iin-S		-		
alphabet mark]						
Numbering						
Objectives of class						
It depends on the laboratory. T	he resistered stud	dents are required	to attend all the s	eminars, which is	arranged by the	
laboratory supervisor for the spe	cial study subjects	s related to the cur	rent research activi	ty of the laborator	y. The scheduled	
program of the seminars is annou				•	•	
It depends on the laboratory. T		-		eminars, which is	arranged by the	
laboratory supervisor for the spe						
					y. The solieduleu	
program of the seminars is annou Contents of class	nceu by the superv	visor at the guidance	e or the seminar.			
Contents of class						
Self Preparation and Review						
Delated and to de						
Related subjects						
Notes for textbook						
Notes for reference						
Notes for reference						
Goals to be achieved						
Evaluation of achievement						
Evaluation of achievement						
Examination						
レポートで実施						
By Report						
Details of examination						
Other information						
Reference URL						
Office hours						
Relations to attainment objective	s of learning and e	ducation				
Key words						
1						

(M45630260)Building and Urban Thermal Environment[Building and Urban Thermal Environment]

Subject name[English]	Building and Urba	n Thermal Environm	ent[Building and Ur	ban Thermal Enviro	nment]
Schedule number	M45630260	Subject area	Advanced	Required or	Elective
			Architecture	elective	
			and Civil		
			Engineering		
Time of starting a course	Spring term	Day of the		Credit(s)	2
		week,period			
Faculty		n for Master's Degre	e	Subject grade	1~2
Department Offered	Architecture and	Civil Engineering		Beggining	M1, M2
Charge teacher name[Roman	S5系教務委員 5	kai kuamu Jin-S		grade	
alphabet mark]	30 宋 秋 伤 女 貝 り	kei kyönnu ini-3			
Numbering					
-					
Objectives of class				с с.,	
Understanding Building/Urban Er	ivironmental Engine	ering to ensure peo	ople live and work i	n a sate, comfortat	ple, efficient, and
healthy environmental space. Understanding Building/Urban Er	vironmontal Engine	oring to oncure no	and live and work i	n a cafa comfartak	ala afficiant and
	ivironinentai Engine	ering to ensure per	opie live and work i	n a sale, connortal	bie, efficient, and
healthy environmental space.					
1 Introduction to Course					
2 Energy and Buildings					
3 Green Buildings					
4 Smart Growth					
5 Indoor Environments					
6 Sustainable City Projects	Dt				
7 Mid-term Project Researching					
8 District Energy Supply Systems	5				
9 Building Facility Management					
10 Building and Urban Risk Mana 11 Urban Heat Island	gement				
12 Building and Urban Greenery	nd Wind Environmen	. <b>t</b>			
13 Urban Thermal Environment a		il.			
14 Building and Urban Environme	ntal Infrastructure				
15 Individual Presentation Work 16 FINAL EXAM					
TO FINAL EXAM					
1 Introduction to Course					
2 Energy and Buildings					
3 Green Buildings					
4 Smart Growth					
5 Indoor Environments					
6 Sustainable City Projects					
7 Mid-term Project Researching					
8 District Energy Supply Systems	6				
9 Building Facility Management					
10 Building and Urban Risk Manag	gement				
11 Urban Heat Island					
12 Building and Urban Greenery					
13 Urban Thermal Environment a		nt			
14 Building and Urban Environme	ntal Infrastructure				
15 Individual Presentation Work					
16 FINAL EXAM					
Self Preparation and Review					
-					
Related subjects					
-					

Notes for reference
Goals to be achieved
Evaluation of achievement
Report
Report
Examination
レポートで実施
By Report
Details of examination
Other information
D-711
D-711
Reference URL
Office hours
Thursday
Thursday
Relations to attainment objectives of learning and education
Key words
Energy and Buildings, Sustainable City, Green Buildings, Thermal Environment

Energy and Buildings, Sustainable City, Green Buildings, Thermal Environment Energy and Buildings, Sustainable City, Green Buildings, Thermal Environment

# (M45630280)Advanced Architectural Planning[Advanced Architectual Planning]

Subject name[English]	Advanced Archi	tectural Planning[Adv	anced Architectual	Planning	1
Schedule number	M45630280	Subject area	Advanced	Required or	Elective
			Architecture	elective	
			and Civil		
			Engineering		
Time of starting a course	Spring term	Day of the	Mon.3~3	Credit(s)	2
		week,period			
Faculty	Graduate Program for Master's Degree			Subject grade	1~2
Department Offered	Architecture and Civil Engineering			Beggining	M1, M2
				grade	
Charge teacher name[Roman	垣野 義典 KAK	(INO Yoshinori			
alphabet mark]					
Numbering					
Objectives of class					
Architectural planning is a basic	theory for design	ning huildings Fundan	nentally. The field fo	ocused on the fund	tionality and t
	and a set of a solight		-		and a
	tivities and snaces	s without an architect	s decign sense		
relationship between people's act Some countries have something					0

社会基盤コースでは、社会基盤施設を計画する場合に、計画するという事は、何を、どのように考えて計画する事なのかを学ぶ。

Architectural planning is a basic theory for designing buildings. Fundamentally, The field focused on the functionality and the relationship between people's activities and spaces without an architect's design sense.

Some countries have something like this field (For example, Japanese, America, Sweden, Netherlands, and UK).

# 社会基盤コースでは、社会基盤施設を計画する場合に、計画するという事は、何を、どのように考えて計画する事なのかを学ぶ。

#### Contents of class

1	Guidance, "What is Architectural Planning?"				
2	How do we live together ? - Housing, Collective Housing1				
З	How do we live together? - Housing, Collective Housing2				
4	What is school architecture? - Toward Church to Educational institute				
5	What is school architecture? Movement of Japan and Europe				
6	Nursery and Kindergarten + New cases in Finland				
7	What can we do in a library? + New cases in Finland and Netherlands				
8	The development of Hospital				
9	Why do we need nursery ?				
10	Office - Can architecture support the work style?				
11	Theater - The development of theaters				
12	What can we do in a museum?				
13	3 The relationship between Human scale and a body				
14	What public place do we use in a city?				
15	Summary of Architectural Planning in Jppan				
1	Guidance, "What is Architectural Planning?"				
2	How do we live together ? - Housing, Collective Housing1				
3	How do we live together ? - Housing, Collective Housing2				
4	What is school architecture? - Toward Church to Educational institute				
5	What is school architecture? Movement of Japan and Europe				
6	Nursery and Kindergarten + New cases in Finland				
7	What can we do in a library? + New cases in Finland and Netherlands				
8	The development of Hospital				
9	Why do we need nursery ?				
10	Office - Can architecture support the work style?				
11	Theater - The development of theaters				
12	What can we do in a museum?				
13	The relationship between Human scale and a body				

14 What public place do we use in a city?

15 Summary of Architectural Planning in Jppan

# Self Preparation and Review

# **Related subjects**

計画序論 建築設計演習 I からVI 建築設計演習基礎

計画序論 建築設計演習ⅠからⅦ 建築設計演習基礎

#### Notes for textbook

Please refer them (sorry, Japanese only).

建築設計資料集成・総合編・日本建築学会編(丸善、2001年) 建築設計資料集成・拡張編・集会・市民サービス・日本建築学会編(丸善、2002年)

Please refer them (sorry, Japanese only).

建築設計資料集成・総合編・日本建築学会編(丸善、2001年) 建築設計資料集成・拡張編・集会・市民サービス・日本建築学会編(丸善、2002年)

# Notes for reference

#### Goals to be achieved

Master the basic theory for designing planning of public buildings. Master the basic theory for designing planning of public buildings.

Evaluation of achievement Evaluation of performance : some reports Evaluation of performance : some reports

Examination レポートで実施

By Report

Details of examination

#### Other information

e-mail:y-kakino@ace.tut.ac.jp Room No. : D-709 e-mail:y-kakino@ace.tut.ac.jp Room No. : D-709 **Reference URL** http://one.world.coocan.jp/

http://one.world.coocan.jp/

Office hours

Relations to attainment objectives of learning and education

# Key words

Architectural Planning, space composition, Human life, Culture, Behavior and Activities, function Architectural Planning, space composition, Human life, Culture, Behavior and Activities, function

# (M45630320)Water Environment Engineering II[Water Environment Engineering II]

Subject name[English]	Water Environme		ater Environment En	gineering II]	
Schedule number	M45630320	Subject area	Advanced	Required or	Elective
	MI TO OCCUEU		Architecture	elective	LIUULIVU
			and Civil	01000110	
			Engineering		
Time of starting a course	Spring term	Day of the		Credit(s)	2
		week,period			
Faculty	Graduate Program	n for Master's Deg	ree	Subject grade	1~2
Department Offered	Architecture and	Civil Engineering		Beggining	M1, M2
				grade	
Charge teacher name[Roman	井上 隆信 INOUI	E Takanobu			
alphabet mark]					
Numbering					
Objectives of class					
To know and understand the wat	er quality change in	environment and	treatment system.		
To know and understand drinking	water treatment ar	nd waste water tre	atment.		
To know and understand the wat	er quality change in	environment and	treatment system		
To know and understand drinking					
To know and and orotand annung					
Contents of class					
Water pollutants in water environ	mont				
1) nutrients, Organic matter	linent				
2) chemicals in water environmer	*				
2) chemicals in water environmen					
and a second second second second second	<b>. .</b>				
water quality change in environm		system.			
1) fundamental equation of the m	lass balance				
<ol> <li>2) piston flow model</li> <li>2) complete mixing model</li> </ol>					
<ul><li>3) complete mixing model</li><li>4) reaction rate</li></ul>					
4) reaction rate					
drinking water treatment and was	ste water treatment				
<ol> <li>rapid sand filtration process</li> <li>activated sludge treatment pro</li> </ol>					
2) activated sludge treatment pro	00000				
Water pollutants in water environ	ment				
1) nutrients, Organic matter					
2) chemicals in water environmer	nt				
water quality change in environm	ent and treatment s	system.			
1) fundamental equation of the m	lass balance				
2) piston flow model					
3) complete mixing model					
4) reaction rate					
drinking water treatment and was	ste water treatment	:			
1) rapid sand filtration process					
2) activated sludge treatment pro	ocess				
Salf Dranavation and Daviant					
Self Preparation and Review					
Related subjects					

#### Notes for textbook

No textbook is required for this class. No textbook is required for this class. **Notes for reference** 

# Goals to be achieved

To understand the water pollution and environmental quality standard.

To understand the water pollution and environmental quality standard. **Evaluation of achievement** 

# Reports

Reports

# Examination

レポートで実施 By Report

# Details of examination

# Other information

Room : D-811 Tel. : 6852 e-mail : inoue@ace.tut.ac.jp

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# **Reference URL**

**Office hours** Wednesday 12:00- 13:00 Wednesday 12:00- 13:00

Relations to attainment objectives of learning and education

Key words