

Syllabus

**International Doctoral Degree
Program
(2020-Spring Term)**

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

Subject name[English]	Advanced Seminar on Mechanical Engineering 1[Advanced Seminar on Mechanical Engineering 1]				
Schedule number	D51010010	Subject area	Advanced Mechanical Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	4
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Mechanical Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_DOC71015				
Objectives of class	Knowledge from fundamental to advanced levels are acquired in each research field of mechanical engineering. Abilities for problem-solving, problem-questing, and judgement, and presentation skill are polished up at seminar of this class.				
Contents of class	Content of this class will be set in each laboratory.				
Self Preparation and Review	Preparation for next class and a review after each class are carried out.				
Related subjects	Inquire this of your supervisor.				
Notes for textbook	Inquire this of your supervisor.				
Notes for reference	N/A				
Goals to be achieved	(1) Knowledge from fundamental to advanced levels is acquired in each research field of mechanical engineering.to perform research. (2) Contents of literature are understood and presented accurately and briefly. (3) Problem-setting is found by developing content of literature.				
Evaluation of achievement	The achivement is evaluated based on the results of paper introduction, understanding of papers, answers to questions, and on the contribution to discussion. Grade levels are C(60% - less than 70%), B(70- less than 80%), A(80% - less than 90 %) and S(90% or over).				
Examination	試験期間中には何も行わない None during exam period				
Details of examination	None during exam period				
Other information	Inquire this of your supervisor.				
Reference URL	N/A				
Office hours	Contact your supervisor.				
Relations to attainment objectives of learning and education	<p>(C)高度な知識を統合的・発展的に活用できる実践力・創造力 機械工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、 課題解決のための独創的な技術を創造し、実践できる能力を身につけている。</p> <p>(C) Practical and creative skills to utilize advanced knowledge in an integrated and progressive manner Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner.</p> <p>(C) Practical and creative skills to utilize advanced knowledge in an integrated and progressive manner</p>				

Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner

Key words

Mechanical engineering, Mechanical system design, Materials and manufacturing, System control and robotics, Environment and energy

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

Subject name[English]	Advanced Seminar on Mechanical Engineering 2[Advanced Seminar on Mechanical Engineering 2]				
Schedule number	D51010020	Subject area	Advanced Mechanical Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	2~
Department Offered	Mechanical Engineering			Beggining grade	D2
Charge teacher name[Roman alphabet mark]	S1系教務委員 1kei kyomu Iin-S				
Numbering	MEC_DOC71015				
Objectives of class	Knowledge from fundamental to advanced levels are acquired in each research field of mechanical engineering. Abilities for problem-solving, problem-questing, and judgement, and presentation skill are polished up at seminar of this class.				
Contents of class	Content of this class will be set in each laboratory.				
Self Preparation and Review	Preparation for next class and a review after each class are carried out.				
Related subjects	Inquire this of your supervisor.				
Notes for textbook	Inquire this of your supervisor.				
Notes for reference	N/A				
Goals to be achieved	(1) Knowledge from fundamental to advanced levels is acquired in each research field of mechanical engineering.to perform research. (2) Contents of literature are understood and presented accurately and briefly. (3) Problem-setting is found by developing content of literature.				
Evaluation of achievement	The achivement is evaluated based on the results of paper introduction, understanding of papers, answers to questions, and on the contribution to discussion. Grade levels are C(60% - less than 70%), B(70- less than 80%), A(80% - less than 90 %) and S(90% or over).				
Examination	試験期間中には何も行わない None during exam period				
Details of examination	None during exam period				
Other information	Inquire this of your supervisor.				
Reference URL	N/A				
Office hours	Contact your supervisor.				
Relations to attainment objectives of learning and education	<p>(C) 高度な知識を統合的・発展的に活用できる実践力・創造力 機械工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、 課題解決のための独創的な技術を創造し、実践できる能力を身につけている。</p> <p>(C) Practical and creative skills to utilize advanced knowledge in an integrated and progressive manner Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner.</p>				

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

Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner

Key words

Mechanical engineering, Mechanical system design, Materials and manufacturing, System control and robotics, Environment and energy

(D51030010)Advanced Mechanical Systems[Advanced Mechanical Systems]

Subject name[English]	Advanced Mechanical Systems[Advanced Mechanical Systems]				
Schedule number	D51030010	Subject area	Advanced Mechanical Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Mon.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Mechanical Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	河村 庄造, 足立 忠晴, 竹市 嘉紀 KAWAMURA Shozo, ADACHI Tadaharu, TAKEICHI Yoshinori				
Numbering	MEC_DOC73025				
Objectives of class					
The class aims to give advanced knowledge on solid mechanics, vibration engineering or tribology.					
Contents of class					
Prof. S. Kawamura From 1st to 5th weeks Vibration engineering of machines and structures is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the vibration engineering, and must present them. Practical modeling and simulation of structural vibration are understood through discussion based on the presentations. Topics: Vibration engineering, Modeling and simulation of dynamic phenomena and so on.					
Prof. T. Adachi From 6th to 10th weeks Mechanics of solids and structures including materials science is lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the mechanics, and must present them. Practical mechanics and design of engineering materials and mechanical structures are understood through discussion based on the presentations. Topics: Mechanics of solids and structures, Mechanical properties of materials, Design of mechanical components and so on.					
Associate Prof. Y. Takeichi From 11th to 15th weeks Fundamentals of tribology including materials science are lectured with current topics. Each student is assigned some examinations, and/or reviewing current papers related to the tribology, and must present them. Practical lubrication engineering and design of sliding mechanical components are understood through discussion based on the presentations. Topics: Tribology, Lubrication engineering, Surface properties, Wear of materials, Tribological coatings and so on.					
Self Preparation and Review					
Review each lecture and prepare for the next class with reference to the textbook.					
Related subjects					
Fundamental knowledge on solid mechanics, vibration engineering or tribology.					
Notes for textbook					
Handouts will be prepared					
Notes for reference					
N/A					
Goals to be achieved					
get advanced knowledge on solid mechanics, vibration engineering or tribology.					
Evaluation of achievement					
A comprehensive report(70%) and discussion(30%) S: Achieved all goals and obtained total points of reports, 90 or higher (out of 100 points). A: Achieved 80% of goals and obtained total points of reports, 80 or higher (out of 100 points). B: Achieved 70% of goals and obtained total points of reports, 70 or higher (out of 100 points). C: Achieved 60% of goals and obtained total points of reports, 60 or higher (out of 100 points).					
Examination					
レポートで実施 By Report					
Details of examination					
N/A					

Other information

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

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

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

Reference URL

N/A

Office hours

Ask us by E-Mail

Relations to attainment objectives of learning and education

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

機械工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

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

Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner

Key words

solid mechanics, vibration engineering, tribology

(D51030030)Advanced Manufacturing Processes[Advanced Manufacturing Processes]

Subject name[English]	Advanced Manufacturing Processes[Advanced Manufacturing Processes]				
Schedule number	D51030030	Subject area	Advanced Mechanical Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Tue.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Mechanical Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	伊崎 昌伸, 横山 誠二, 安井 利明 IZAKI Masanobu, YOKOYAMA Seiji, YASUI Toshiaki				
Numbering	MEC_DOC74025				
Objectives of class					
1. 材料の作製と機能(伊崎) 本授業は固体物理学および化学熱力学に立脚して材料ならびにその薄膜の形成技術を取り扱うとともに、材料の組織・構造・エネルギー状態と材料の物理・化学的性質の関係を掘り下げ、機能向上のための技術と科学を学ぶ。					
2. 接合プロセス 最先端の接合プロセス、および表面改質プロセスの原理および実用技術を学ぶ。本授業は、力学、固体物理学、化学熱力学および移動現象論を網羅している。					
1. Manufacturing and function of materials(izaki) This subject deals with the manufacturing process of materials and the thin films based on solid state physics and chemical thermodynamics, and the science and technology for enhancing the performance of materials and the thin films are learned by understanding the fundamental aspects of the characteristics.					
2. Joining process Students will learn principle and practical technology of advanced joining process and surface modification process. This subject incorporates the mechanics, solid state physics, chemical thermodynamics, and transport phenomena.					
Contents of class					
(オンデマンド) 第1週: 材料の製造と加工1ー無機固体生産に関わる化学熱力学(伊崎)					
(オンデマンド) 第2週: 材料の製造と加工2ー化学熱力学を用いた生産プロセス設計(伊崎)					
(対面) 第3週: 材料の製造と加工3ー無機固体の固体物理学(電子論)(伊崎)					
(オンデマンド) 第4週: 材料の製造と加工4ー無機固体の固体物理学(結晶学)(伊崎)					
(オンデマンド) 第5週: 材料の製造と加工5ー無機固体の溶液プロセスによる製造と応用(結晶学)(伊崎)					
(対面) 第6週: 材料の製造と加工6ー高温度における物理化学(横山)					
(オンデマンド) 第7週: 材料の製造と加工7ー冶金反応における平衡(横山)					
(オンデマンド) 第8週: 材料の製造と加工8ー冶金反応における反応速度(横山)					
(対面) 第9週: 材料の製造と加工9ー鉄鋼製錬プロセス(横山)					
(対面) 第10週: 材料の製造と加工10ー資源とリサイクル(横山)					
(オンデマンド) 第11週: 接合加工と表面処理プロセス1ー序論(安井)					
(オンデマンド) 第12週: 接合加工プロセス2ーパルク接合プロセス(安井)					
(対面) 第13週: 接合加工プロセス3ー粒子積層プロセス(安井)					
(対面) 第14週: 接合加工プロセス4ー気相蒸着プロセス(安井)					
(On demand) 1st week: Production and manufacturing of materials 1 – Chemical thermodynamics in manufacturing.(Izaki)					
(On demand) 2nd week: Production and manufacturing of materials 2 – Process design based on thermodynamic (izaki)					
(Face-to-face) 3rd week: Production and manufacturing of materials 3 – Solid state physics of inorganic solid (energy state).(Izaki)					
(On demand) 4th week: Production and manufacturing of materials 4 – Solid state physics of inorganic solid (crystal).(Izaki)					
(On demand) 5th week: Production and manufacturing of materials 5 – Preparation and application of inorganic solid.(Izaki)					
(Face-to-face) 6th week: Production and manufacturing of materials 6 – Physical chemistry at high temperature.(Yokoyama)					
(On demand) 7th week: Production and manufacturing of materials 7 – Equilibrium of metallurgical reaction.(Yokoyama)					
(On demand) 8th week: Production and manufacturing of materials 8 – Reaction rate of metallurgical reaction.(Yokoyama)					
(Face-to-face) 9th week: Production and manufacturing of materials 9 – Process of iron- and steel-making.(Yokoyama)					
(Face-to-face) 10th week: Production and manufacturing of materials 10 – Resource and recycling.(Yokoyama)					
(On demand) 11th week: Joining process 1 – Introduction of joining process. (Yasui)					

(On demand) 12th week: Joining process 2 – Bulk joining process. (Yasui)
 (Face-to-face) 13th week: Joining process 3 – Particle deposition process. (Yasui)
 (Face-to-face) 14th week: Joining process 4 – Vapor deposition process. (Yasui)

Self Preparation and Review

授業後の復習、授業前の予習が重要。
 Review after every class, and read the text before next class.

Related subjects

接合加工プロセス、表面加工学、材料科学、材料物理化学、材料解析
 Joining process, surface process engineering, materials science, Physical chemistry of material, material analysis

Notes for textbook

資料を配布する。
 Text will be distributed.

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

Notes for reference

N/A

Goals to be achieved

- 1) 結晶構造と電子状態を理解していること。
 - 2) 蒸気圧、活量、pH、電位を理解していること。
 - 3) 反応の平衡と速度論を理解していること。
 - 4) 都市鉱山、リサイクルを理解していること。
 - 5) 金属とセラミックスの接合に関する原理と力学を理解していること。
 - 6) 薄膜および厚膜の製造プロセスの原理、力学、特性を理解していること。
 - 7) 真空技術や平均自由行程の概念を理解していること。
 - 8) プラズマの発生とその応用を理解していること。
- 1) To understand crystal structure and electron state.
 - 2) To understand evaporation pressure, activity, pH, electron potential.
 - 3) To comprehend equilibrium and kinetics of reaction.
 - 4) To comprehend urban mine and recycling.
 - 5) To understand principles and mechanics on joining of metals and ceramics.
 - 6) To understand principles, mechanics and characteristics of preparation process of thin and thick coating.
 - 7) To understand vacuum technology and concept of mean free path.
 - 8) To understand plasma generation and its application.

Evaluation of achievement

S: 達成目標をすべて達成しており、かつレポートの合計点(100点満点)が90点以上
 A: 達成目標を○%達成しており、かつレポートの合計点(100点満点)が80点以上
 B: 達成目標を○%達成しており、かつレポートの合計点(100点満点)が70点以上
 C: 達成目標を○%達成しており、かつレポートの合計点(100点満点)が60点以上
 ※ただし、過年度生が履修した場合には、従来(A~C)の評価基準が適用される。
 Each instructor will give students assignments. Average score is used for evaluation.

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

- S: Achieved all goals and obtained total points of reports, 90 or higher (out of 100 points).
 A: Achieved all goals and obtained total points of reports, 80 or higher (out of 100 points).
 B: Achieved 80 % of goals and obtained total points of reports, 70 or higher (out of 100 points).
 C: Achieved 60 % of goals and obtained total points of reports, 60 or higher (out of 100 points).
 (The conventional evaluation standard of (A – C) is applied for a past fiscal year student.)

Examination

レポートで実施

By Report
Details of examination N/A
Other information 伊崎昌伸 (部屋 D-505,内線 6694,e-mail:m-izaki@me.tut.ac.jp) 横山誠二 (部屋 D-507,内線 6696,e-mail:yokoyama@me.tut.ac.jp) 安井利明 (部屋 D-601,内線 6703,e-mail:yasui@tut.jp) Masanobu Izaki (D-505,ext.6694, e-mail:m-izaki@me.tut.ac.jp) Seiji Yokoyama (D-507, ext.6696, e-mail:yokoyama@me.tut.ac.jp) Toshiaki Yasui (D-601, ext.6703,e-mail:yasui@tut.jp)
Reference URL N/A
Office hours いつでも可。ただし、事前にメールで連絡すること。 Any time, but inform us your visit by e-mail before your visit.
Relations to attainment objectives of learning and education 材料と加工法の技術開発する広範囲な実践力と能力を養う。 機械工学専攻 (E)最新の技術や社会環境の変化に対する探究心と持続的学習力 社会、環境、技術等の変化の本質を探求し、生涯にわたって自発的に計画し学習する能力を身につけている。 A broad range of expertise and the ability to carry out technological development in materials and manufacturing. Graduate Program of Mechanical Engineering for Doctoral Degree (E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment Have the skills to investigate the nature of change in society, environment and technology, andvoluntarily make plans and learn throughout one's life
Key words 薄膜、コーティング、蒸発、活量、スプレイ加工、移動現象論、熱力学 thin solid film, coating, evaporation, activity, spray forming, transport phenomena, thermodynamics

(D51030070)Advanced Energy Engineering[Advanced Energy Engineering]

Subject name[English]	Advanced Energy Engineering[Advanced Energy Engineering]				
Schedule number	D51030070	Subject area	Advanced Mechanical Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Fri.4~4	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Mechanical Engineering			Begging grade	D1
Charge teacher name[Roman alphabet mark]	鈴木 孝司, 中村 祐二, 松岡 常吉, 未定 SUZUKI Takashi, NAKAMURA Yuji, MATSUOKA Tsuneyoshi, To be assigned				
Numbering	MEC_DOC76025				
Objectives of class					
The aim of the present lecture is to understand the basic equation governed by the reactive thermo-fluid system (known as "complex" physics), and how to simplify to predict the phenomena.					
Contents of class					
*Introduction : (2 weeks) Classification of reactive thermo-fluid system Analytical concept for multi-phase fluid system Introduction of basic equation *Fundamental theory for Non-reacting, multi-phase flow system (4 week) Physics on surface boundary Instability analysis Optical method for visualization Dynamic behavior of droplets (break up, merging etc) *Chemical reaction -reactive system without transport effect- (2 weeks) Overview of fundamental idea of chemical reaction equilibrium state reaction rate expression, reaction model (simplified) *Ignition theory -chemical system with simplified transport effect- (1 weeks) Frank-Kamenetskii's theory *Premixed flame theory -chemical system with transport effect (1); chemical-controlled- (2 weeks) Rankine-Hugoniot equation Premixed flame structure (asymptotic analysis) *Diffusion flame theory -chemical system with transport effect (2); transport-controlled- (2 weeks) Mixture fraction analysis Burke-Schumann flame theory *Combustion modeling : (2 weeks) Prediction of regression rate of solid propellant Fire modeling *Final Exam (1 week)					
Self Preparation and Review					
Students MUST be pre-studied the related area, especially for applied mathematics, fluid dynamics and thermodynamics (advance level is strongly preferred).					
Related subjects					
Applied mathematics, fluid dynamics, thermodynamics for advanced level. Basic combustion (preferred)					
Notes for textbook					
Instructors will provide the materials, if necessary.					
Reference1	Book title	The Molecular Theory of Gases and Liquids		ISBN	
	Author	J.O. Hirschfelder, C.F. Curtiss, R.B. Bird	Publisher	John Wiley and Sons	Publish year 1954
Reference2	Book title	Combustion Physics		ISBN	
	Author	C.K. Law	Publisher	Cambridge University	Publish year 2006

				Press		
Reference3	Book title	Combustion Theory			ISBN	
	Author	F.A. Williams	Publisher	Addison-Wesley	Publish year	1985
Notes for reference						
[additional references]						
<ul style="list-style-type: none"> - Fundamentals of Fire Phenomena/J.G. Quintiere: John Wiley and Sons, 2009 - Fundamental Aspects of Combustion/A. Linan & F.A. Williams: Oxford Univ. Press, 1993 - Combustion Analysis (in Japanese)/T. Niioka: Tohoku Univ. Press, 2003 - any textbook for applied math book dealing with asymptotic analysis (perturbation theory) is good to have in your hand 						
Goals to be achieved						
The goal is to understand the combustion theory; learn one of effective ways to simplify the complex (multi-scale, multi-physics) problem.						
Evaluation of achievement						
50%: assignments (several assignments are requested during the term), 50%: final exam.						
[Evaluation basis]						
Students who attend all classes will be evaluated as follows:						
S: Achieved all goals and obtained total points of exam and reports, 90 or higher (out of 100 points).						
A: Achieved 80 % goals and obtained total points of exam and reports, 80 or higher (out of 100 points).						
B: Achieved 70 % of goals and obtained total points of exam and reports, 70 or higher (out of 100 points).						
C: Achieved 60 % of goals and obtained total points of exam and reports, 60 or higher (out of 100 points).						
Examination						
定期試験を実施(対面)						
Examination(Face to Face)						
Details of examination						
Final exam will be interview style (oral examination): it could be replaced to the written exam based on the judgement by instructor (mainly number of students are key to this judge)						
Student can bring any printed items during the examination.						
Detail will be announced in the class.						
Other information						
N/A						
Reference URL						
N/A						
Office hours						
Anytime when instructor is available: send mail to instructor to book your time for personal meeting						
Relations to attainment objectives of learning and education						
(C) 高度な知識を統合的・発展的に活用できる実践力・創造力						
機械工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。						
N/A						
(C) Practical and creative skills to utilize advanced knowledge in an integrated and progressive manner						
Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner						
Key words						
Reactive thermo-fluid analysis, Multi-scale and multi-physics problem						

(D51030110)Advanced Mechatronics[Advanced Mechatronics]

Subject name[English]	Advanced Mechatronics[Advanced Mechatronics]				
Schedule number	D51030110	Subject area	Advanced Mechanical Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Thu.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Mechanical Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	佐藤 海二, 佐野 滋則, 高木 賢太郎 SATO Kajji, SANO Shigenori, TAKAGI Kentaro				
Numbering	MEC_DOC75025				
Objectives of class	<p>本講義を履修することによって, 先進メカトロニクス基礎となるメカニズム, アクチュエータ, 計測制御技術の基礎知識を身につける。</p> <p>Students will acquire the basic knowledge of mechanisms, actuators, measurement and control methods which are fundamental and useful for advanced mechatronics by taking this course.</p>				
Contents of class	<p>以下を予定している。</p> <p>第1週 制御系設計のためのモデリング 第2週 システム同定 第3週 モデル構造 第4週 パラメーター同定 第5週 モデル検証 第6週 オブザーバと状態推定 第7週 モデルに基づく制御系設計 第8週 レポート1 第9週 精密運動システム(1) 第10週 精密運動システム(2) 第11週 精密運動システム(3) 第12週 精密運動システム(4) 第13週 精密運動システム(5) 第14週 精密運動システム(6) 第15週 精密運動システム(7)</p> <p>The following contents are provided; 1st week: Modeling for control system 2nd week: System identification 3rd week: Model Structure 4th week: Parameter identification 5th week: Validation 6th week: Obsever and State Estimation 7th week: Control system design based on model 8th week: Report1 9th week: Precision Motion System(1) 10th week: Precision Motion System(2) 11th week: Precision Motion System(3) 12th week: Precision Motion System(4) 13th week: Precision Motion System(5) 14th week: Precision Motion System(6) 15th week: Precision Motion System(7)</p>				
Self Preparation and Review	<p>前の講義内容を復習するとともに, その後の内容についてテキスト等を参考に予習すること</p> <p>Read the handouts before and after the lecture.</p>				
Related subjects	<p>線形代数, 微分方程式, 機構学, 計測工学, 制御理論, メカトロニクス</p> <p>Fundamentals of linear algebra, differential equation, mechanics, measurement and control theory, and mechatronics.</p>				
Notes for textbook					

資料を配布する Handouts will be prepared.
Notes for reference 特になし N/A
Goals to be achieved (1) 精密運動機構における構成要素の特性と効果的な利用方法を理解する (2) ロボットのシステム同定の基礎を理解する (1) Understand characteristics of components and their effective use in precision motion mechanisms (2) Understand the basic of system identification
Evaluation of achievement レポートによって100%評価する S: 90点以上 A: 80点以上 B: 65点以上 C: 55点以上 Report (100%) S: Score of the report is 90 or higher. A: Score of the report is 80 or higher. B: Score of the report is 65 or higher. C: Score of the report is 55 or higher.
Examination レポートで実施 By Report
Details of examination 特になし N/A
Other information 佐藤海二, D-408, 6676, sato@me.tut.ac.jp 佐野滋則, D-407, 6677, sano@me.tut.ac.jp Kaiji Sato, D-408, 6676, sato@me.tut.ac.jp Shigenori Sano, D-407, 6677, sano@me.tut.ac.jp
Reference URL 特になし N/A
Office hours e-mailにて、随時時間を打ち合わせる Contact the professors by e-mail first.
Relations to attainment objectives of learning and education (C) 高度な知識を統合的・発展的に活用できる実践力・創造力 機械工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。 (C) Practical and creative skills to utilize advanced knowledge in an integrated and progressive manner Have advanced knowledge about mechanical engineering and related fields, and have ability to create and practice original techniques for problem solving by acquiring the research and development methodology that combines such knowledge in an extensive and organic manner
Key words メカトロニクス, 制御, センサ, アクチュエータ, 機構学, 機械システム Mechatronics, Control, Sensor, Actuator, Mechanism, Mechanical system

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering 2[Seminar on Electrical and Electronic Information Engineering 2]				
Schedule number	D52010020	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	4
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_DOC71015				
Objectives of class					
The seminar aims to provide a broad understanding of theoretical and experimental approaches related to the electrical and electronic engineering for the research work of his/her master thesis.					
Contents of class					
The class provides both of fundamental knowledge on the research work of master thesis and the most advanced results in the related field by reading research papers and monographs. Contents of the class depend on the supervisor. To be announced by individual supervisors.					
Self Preparation and Review					
N/A					
Related subjects					
N/A					
Notes for textbook					
Textbook or material will be made available from the supervisor. To be announced by individual supervisors.					
Notes for reference					
N/A					
Goals to be achieved					
To acquire fundamental knowledge on individual research fields. To acquire the ability of finding a problem, the ability of solving the problem and the presentation skill.					
Evaluation of achievement					
Coursework, presentation and/or report. Grades: S: 90-100, A:80-89, B:70-79, C:60-69					
Examination					
試験期間中には何も行わない None during exam period					
Details of examination					
N/A					
Other information					
N/A					
Reference URL					
N/A					
Office hours					
N/A					
Relations to attainment objectives of learning and education					
<p>(C) 高度な知識を統合的・発展的に活用できる実践力・創造力 電気・電子情報工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。</p> <p>(D) グローバルに活躍できるコミュニケーション力</p>					

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

(E) 最新の技術や社会環境の変化に対する探究心と持続的学習力

社会、環境、技術等の変化の本質を探究し、生涯にわたって自発的に計画し学習する能力を身につけている。

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

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

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members

(E) Inquisitive mind and continuous learning skill for changes in the state-of-the-art technology and in the social environment

Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

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

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

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members

(E) Inquisitive mind and continuous learning skill for changes in the state-of-the-art technology and in the social environment

Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Seminar on Electrical and Electronic Information Engineering 3[Seminar on Electrical and Electronic Information Engineering 3]				
Schedule number	D52010030	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	2~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D2
Charge teacher name[Roman alphabet mark]	S2系教務委員 2kei kyomu Iin-S				
Numbering	ELC_DOC71015				
Objectives of class					
The seminar aims to provide a broad understanding of theoretical and experimental approaches related to the electrical and electronic information engineering for the research work of his/her master thesis.					
Contents of class					
The class provides both of fundamental knowledge on the research work of master thesis and the most advanced results in the related field by reading research papers and monographs. Contents of the class depend on the supervisor. To be announced by individual supervisors.					
Self Preparation and Review					
N/A					
Related subjects					
N/A					
Notes for textbook					
Textbook or material will be made available from the supervisor. To be announced by individual supervisors.					
Notes for reference					
N/A					
Goals to be achieved					
To acquire fundamental knowledge on individual research fields. To acquire the ability of finding a problem, the ability of solving the problem and the presentation skill.					
Evaluation of achievement					
Coursework, presentation and/or report. Grades: S: 90-100, A:80-89, B:70-79, C:60-69					
Examination					
試験期間中には何も行わない None during exam period					
Details of examination					
N/A					
Other information					
N/A					
Reference URL					
N/A					
Office hours					
N/A					
Relations to attainment objectives of learning and education					
<p>(C) 高度な知識を統合的・発展的に活用できる実践力・創造力 電気・電子情報工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。</p> <p>(D) グローバルに活躍できるコミュニケーション力</p>					

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

(E) 最新の技術や社会環境の変化に対する探究心と持続的学習力

社会、環境、技術等の変化の本質を探究し、生涯にわたって自発的に計画し学習する能力を身につけている。

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

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

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members

(E) Inquisitive mind and continuous learning skill for changes in the state-of-the-art technology and in the social environment

Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

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

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members

(E) Inquisitive mind and continuous learning skill for changes in the state-of-the-art technology and in the social environment

Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

Subject name[English]	Advanced Electronic Materials 1[Advanced Electronic Materials 1]				
Schedule number	D52030010	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Wed.4~4	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	内田 裕久, 中村 雄一, 河村 剛 UCHIDA Hironaga, NAKAMURA Yuichi, KAWAMURA Go				
Numbering	ELC_DOC72025				
Objectives of class					
Objective of this subject is to learn about the forefront research and development on spin electronics and photonics in electronic materials, materials processing, and thermoelectrics.					
Contents of class					
1. Spin electronics. You will learn about advanced magnetic materials and area from fundamentals to applications of magnetics. 1) Magnetic materials, 2) Applications of magnetics and magnetic materials, 3) Correlations between spins and various physical quantities, 4) Micro-magnetic devices and systems, 5) Spintronics and spin photonics.					
2. Caloritronics You will learn about materials processing and thermoelectric conversion. 1) thermodynamics, 2) processing and 3) thermoelectrics					
Self Preparation and Review					
Related subjects					
Notes for textbook					
Lecture materials will be distributed.					
Notes for reference					
Goals to be achieved					
It aims at acquiring the broad knowledge of research and development by learning about the recent research and development in various fields.					
Evaluation of achievement					
The reports or tests will be set in each categories. The result is evaluated from the sum of those marks. Grades: S: 89-100, A:80-90, B:70-79, C:60-69.					
Examination					
試験期間中には何も行わない None during exam period					
Details of examination					
Other information					
Spin electronics: Hironaga Uchida: uchida@ee.tut.ac.jp Caloritronics: Yuichi Nakamura: nakamura@ee.tut.ac.jp : Go Kawamura: gokawamura@ee.tut.ac.jp					
Reference URL					
Office hours					
Please make an appointment via e-mail.					
Relations to attainment objectives of learning and education					

Key words

spin electronics, processing, thermoelectrics.

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

Subject name[English]	Advanced Electrical Systems 2[Advanced Electrical Systems 2]				
Schedule number	D52030040	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Wed.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	稲田 亮史, 村上 義信 INADA Ryoji, MURAKAMI Yoshinobu				
Numbering	ELC_DOC73025				
Objectives of class					
<p>This lecture is implemented as an introduction to electrical energy systems and intended for students and other engineering disciplines. It is being useful as reference and self-study guide for the professional dealing with this important area. There are following three subcourses to choose from.</p> <p>This lecture is implemented as an introduction to electrical energy systems and intended for students and other engineering disciplines. It is being useful as reference and self-study guide for the professional dealing with this important area. There are following three subcourses to choose from.</p>					
Contents of class					
Subcourse 1					
<ol style="list-style-type: none"> 1. Introduction of carbon nanomaterials and their relationship to electrical engineering 2. Mechanical property of carbon nanomaterials 3. Electrical property of carbon nanomaterials 4. Application of carbon nanomaterials to energy devices 5. Application of carbon nanomaterials to power electronics 					
Subcourse 2 (R. Inada)					
<ol style="list-style-type: none"> 1. Introduction of Electrochemical Energy Conversion Devices 2. Fundamentals of Electrochemical Energy Conversion Devices 3. Lithium-Ion Secondary Batteries (1) 4. Lithium-Ion Secondary Batteries (2) 5. Recent Trend in Electrochemical Energy Conversion Devices 					
Subcourse 3 (Yo. Murakami)					
<ol style="list-style-type: none"> 1. Introduction of Electric Energy Systems (1 week) 2. High Voltage Engineering and Electrical Insulation (2 weeks) 3. Fundamental Properties of Dielectrics and Electrical Insulating Materials(2 weeks) 					
Subcourse 1					
<ol style="list-style-type: none"> 1. Introduction of carbon nanomaterials and their relationship to electrical engineering 2. Mechanical property of carbon nanomaterials 3. Electrical property of carbon nanomaterials 4. Application of carbon nanomaterials to energy devices 5. Application of carbon nanomaterials to power electronics 					
Subcourse 2 (R. Inada)					
<ol style="list-style-type: none"> 1. Introduction of Electrochemical Energy Conversion Devices 2. Fundamentals of Electrochemical Energy Conversion Devices 3. Lithium-Ion Secondary Batteries (1) 4. Lithium-Ion Secondary Batteries (2) 5. Recent Trend in Electrochemical Energy Conversion Devices 					

Subcourse 3 (Yo. Murakami)						
1. Introduction of Electric Energy Systems (1 week)						
2. High Voltage Engineering and Electrical Insulation (2 weeks)						
3. Fundamental Properties of Dielectrics and Electrical Insulating Materials(2 weeks)						
Self Preparation and Review						
Materials to be used in the lecture will be distributed from the lecturer before starting each subcourse. The lecturers will give a lecture on the premise that all the students have prepared this material before the lecture begins. It may not be possible to attend a lecture if you do not prepare materials.						
Materials to be used in the lecture will be distributed from the lecturer before starting each subcourse. The lecturers will give a lecture on the premise that all the students have prepared this material before the lecture begins. It may not be possible to attend a lecture if you do not prepare materials.						
Related subjects						
Basic electrical power engineering course is prerequisite.						
Basic electrical power engineering course is prerequisite.						
Notes for textbook						
Materials will be prepared by the lecturer.						
Materials will be prepared by the lecturer.						
Reference1	Book title	Fuel Cell Systems Explained			ISBN	
	Author	J. Larminie and A. Dicks	Publisher	Wiley	Publish year	
Reference2	Book title	Lithium Ion Batteries: Science and Technologies			ISBN	
	Author	M. Yoshio, R.J. Brodd and A. Kozawa	Publisher	Springer-Verlag	Publish year	
Reference3	Book title	High Voltage Engineering			ISBN	
	Author	E. Kuffel, W. Zaengel and J. Kuffel	Publisher	Newnes	Publish year	
Notes for reference						
N/A						
Goals to be achieved						
Evaluation of achievement						
In final exams we will ask questions on the contents of all subcourses. We evaluate the results only based on the final exam scores. The result is evaluated in the following five stages.						
S: If the score of the final exam is 90 points or more						
A: If the score of the final exam is 80 points or more						
B: If the score of the final exam is 70 points or more						
C: If the score of the final exam is 60 points or more						
D: If the score of the final exam is less than 60 points						
In final exams we will ask questions on the contents of all subcourses. We evaluate the results only based on the final exam scores. The result is evaluated in the following five stages.						
S: If the score of the final exam is 90 points or more						
A: If the score of the final exam is 80 points or more						
B: If the score of the final exam is 70 points or more						
C: If the score of the final exam is 60 points or more						
D: If the score of the final exam is less than 60 points						
Examination						
定期試験を実施(対面)						
Examination(Face to Face)						
Details of examination						
In order to obtain good results in final exams, we will also conduct a small test at any time while each subcourse is offered. Therefore, it is desirable to prepare lecture materials beforehand and attend all the lectures.						
In order to obtain good results in final exams, we will also conduct a small test at any time while each subcourse is offered. Therefore, it is desirable to prepare lecture materials beforehand and attend all the lectures.						
Other information						
N/A						
Reference URL						
N/A						
Office hours						
We do not have an office hour, so contact first by e-mail.						

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

Relations to attainment objectives of learning and education

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

電気・電子情報工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

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

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

Key words

(D52030050)Advanced Microelectronics 1[Advanced Microelectronics 1]

Subject name[English]	Advanced Microelectronics 1[Advanced Microelectronics 1]				
Schedule number	D52030050	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Wed.1~1	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	澤田 和明, 石川 靖彦, 関口 寛人, 野田 俊彦 SAWADA Kazuaki, ISHIKAWA Yasuhiko, SEKIGUCHI Hiroto, NODA Toshihiko				
Numbering	ELC_DOC74025				
Objectives of class					
From the viewpoint of deep understanding of advanced microelectronics, physics of semiconductors including material design and an example of latest device will be lectured.					
From the viewpoint of deep understanding of advanced microelectronics, physics of semiconductors including material design and an example of latest device will be lectured.					
Contents of class					
a) Physics and Properties of Semiconductors					
Crystal growth and device processing					
Energy band engineering					
Alloy semiconductor					
Strain effect					
Superlattice					
Carrier transport phenomena					
Tummeling effect					
b)Metal-Semiconductor Contacts					
Schottky barrier					
Current transport processes					
Ohmic contact					
c) Integrated circuits					
device processing					
MEMS/NEMS					
Latest MOS FETs					
Current topics in IC/MEMS					
a) Physics and Properties of Semiconductors					
Crystal growth and device processing					
Energy band engineering					
Alloy semiconductor					
Strain effect					
Superlattice					
Carrier transport phenomena					
Tummeling effect					
b)Metal-Semiconductor Contacts					
Schottky barrier					
Current transport processes					
Ohmic contact					
c) Integrated circuits					
device processing					
MEMS/NEMS					
Latest MOS FETs					
Current topics in IC/MEMS					
Self Preparation and Review					
毎回の講義内容を復習するとともに、次週の内容についてテキスト等を参考に予習しておくこと					
Review each lecture and prepare for the next class with reference to the textbook.					

Related subjects

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

Semiconductor Physics, Master course

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

Semiconductor Physics, Master course

Notes for textbook

Physics of Semiconductr Devices

S.M.Sze, Willy

Physics of Semiconductr Devices

S.M.Sze, Willy

Notes for reference

特になし

N/A

Goals to be achieved

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

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

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

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

Evaluation of achievement

Reports (100%)

Reports (100%)

Examination

レポートで実施

By Report

Details of examination**Other information**

K. Sawada (C-605)

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sekiguchi@ee.tut.ac.jp

ext. 6744

T. Noda (C-611)

noda-t@eiiris.tut.ac.jp

ext. 6745

Reference URL

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

(department)

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

(devison)

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/>
(devison)

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

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力
電気・電子情報工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力
電気・電子情報工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

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

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

Key words

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

Subject name[English]	Advanced Information and Communication Systems 1[Advanced Information and Communication Systems 1]				
Schedule number	D52030070	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Mon.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	大平 孝, 上原 秀幸, 竹内 啓悟 OHIRA Takashi, UEHARA Hideyuki, TAKEUCHI Keigo				
Numbering	ELC_DOC75025				
Objectives of class					
Students select one course from the following three courses: A first course is intended for learning how to design microwave circuits needed for advanced wireless communication systems and wireless power transmission systems. The distributed constant element theory is addressed to characterize linear circuits at high frequencies. Based on this technique, students challenge synthesis of a variety of microwave signal and power processing functions. A second course is intended for learning mainly medium access control, multi-hop communications and other topics related to wireless networks. Students are required to give solutions of the problems which cause performance degradation. The last course is intended for learning point-to-point communication systems, multiuser communication systems, and multiple-input multiple-output (MIMO) systems in the physical layer of wireless communications. Students challenge a unified understanding of existing advanced schemes in wireless communications.					
Contents of class					
Course 1 provided by Prof. Ohira: 1. Transmission lines 2. Scattering matrix 3. Mizuhashi Smith chart Course 2 provided by Prof. Uehara: 1. Medium access control protocols 2. Multi-hop communications 3. Ad hoc and sensor networks Course 3 provided by Prof. Takeuchi: 1. Point-to-point communication systems 2. Multiuser communication systems 3. MIMO systems					
Self Preparation and Review					
Review each lecture and prepare for the next class with reference to the black board and handouts.					
Related subjects					
The students who register for this lecture must have studied the Information and Communication Technology 1 and 2 (Ohira, Uehara, & Takeuchi) in master course program, or its equivalent. All courses taken at other universities must be approved by the professors before registering for this course. Prerequisite of Course 1: Deep understanding on electromagnetic field theory, linear passive and reciprocal circuit theory, and sophisticated experience on complex and matrix mathematics. Prerequisite of Course 2: Sufficient knowledge about the following; wireless digital modulation and demodulation, radio propagation characteristic, signal processing, probability, random variables and stochastic process. Prerequisite of Course 3: Deep understanding on modulation/demodulation, signal processing, probability theory, and information theory is prerequisite. In					

particular, sufficient knowledge about probability theory is required.
<p>Notes for textbook</p> <p>Course 1: Lecture on the blackboard without resorting to textbooks.</p> <p>Course 2: Instruct in 1st class.</p> <p>Course 3: Same as Course 2.</p>
<p>Notes for reference</p> <p>N/A</p>
<p>Goals to be achieved</p> <p>Course 1:</p> <ul style="list-style-type: none"> - 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. <p>Course 2:</p> <ul style="list-style-type: none"> - 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 <p>Course 3:</p> <ul style="list-style-type: none"> - Understand the concept of detection, diversity, and channel uncertainty in point-to-point communication systems. - Understand resource allocation and interference management in multiuser communication systems. - Understand statistical channel models and basic multiuser detection schemes in MIMO systems.
<p>Evaluation of achievement</p> <p>Course 1: Marks are based on the final test.</p> <p>Course 2: Marks are based on reports and presentations.</p> <p>Course 3: Marks are based on reports and tests.</p>
<p>Examination</p> <p>定期試験を実施(対面) Examination(Face to Face)</p>
<p>Details of examination</p> <p>N/A</p>
<p>Other information</p> <p>For e-mail address information, visit http://www.comm.ee.tut.ac.jp/</p>
<p>Reference URL</p> <p>http://www.comm.ee.tut.ac.jp/</p>
<p>Office hours</p> <p>Appoint a time slot via email</p>
<p>Relations to attainment objectives of learning and education</p> <p>(C) 高度な知識を統合的・発展的に活用できる実践力・創造力 電気・電子情報工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。 (C)</p> <p>(C) Practical and creative skills to utilize advanced knowledge in an integrated manner Have advanced knowledge about electrical and electronic information engineering as well as related fields; have the practical and creative skills toutilize such knowledge for problem solving in an integrated manner</p>
<p>Key words</p> <p>microwave, circuit, electromagnetic field, Smith chart, scattering matrix, distributed constant element, wireless networks, medium access control, multi-hop, wireless communications, modulation/demodulation, MIMO</p>

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

Subject name[English]	Seminar on Computer Science and Engineering 1[Seminar on Computer Science and Engineering 1]				
Schedule number	D53010010	Subject area	Advanced Computer Science and Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	4
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	S3系教務委員 3kei kyomu Iin-S				
Numbering	CMP_DOC71015				
Objectives of class					
<p>各研究室が指定する情報学に関する最先端の技術情報(特に英語による最先端の技術情報)を発見する能力、ならびに、その技術情報を理解、説明、質疑・応答できる能力を養う。</p> <p>The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering.</p> <p>It is also aimed for students to acquire various skills, required in general research work, such as those for oral presentation, and technical discussion and writing.</p>					
Contents of class					
<p>教員が指定する最先端の技術情報(特に英語による最先端の技術情報)について理解したところを説明する。</p> <p>教員は技術情報の内容の発見、理解、説明、質疑・応答する方法について直接指導を行う。</p> <p>While specific contents depend on the research areas students are involved in, it is usually the case for students to read relevant textbooks/research papers and report on them, as well as to present and discuss on the research work of their own.</p>					
Self Preparation and Review					
<p>教員が指定する内容に関し、予習・復習を行う。</p> <p>Consult with your advisor.</p>					
Related subjects					
<p>指導教員に問い合わせること。</p> <p>Consult with your advisor.</p>					
Notes for textbook					
<p>指導教員に問い合わせること。</p> <p>Consult with your advisor.</p>					
Notes for reference					
Goals to be achieved					
<p>(1)最先端の専門分野の英文が理解でき、わかりやすく説明できる。</p> <p>(2)技術的な情報を扱う英文が解釈でき、作文できる。</p> <p>(3)論文の標準的な構成ができる。</p> <p>(4)発表というスタイルでの情報提供ができる。</p> <p>(5)情報の不足を質問という形式で指摘できる。</p> <p>(1) To understand English literature on state-of-the-art areas of expertise, and to explain clearly.</p> <p>(2) To interpret technical information written in English, and to write such information in English.</p> <p>(3) To make a standard construction of a technical paper.</p> <p>(4) To provide information by oral presentation.</p> <p>(5) To point out the lack of information by questions.</p>					
Evaluation of achievement					
<p>技術情報の発見に向けた自主性、技術情報の理解度、説明の方法、質問への回答、議論への参加の様子等から総合的に指導教員が判定する。</p> <p>The score is assigned by the supervisor considering autonomy for the discovery and understanding of technical information, the method of the description, the answer to the question determines, and the participation to the discussion.</p>					
S: more than or equal to 90, A: more than or equal to 80, B: more than or equal to 60, C: more than or equal to 60.					

Examination 試験期間中には何も行わない None during exam period
Details of examination 課題レポートやプレゼンテーションに基づいて評価する。 Your supervisor will evaluate your presentation and your reports.
Other information
Reference URL
Office hours 指導教員に問い合わせること。 Consult with your advisor.
Relations to attainment objectives of learning and education
Key words

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

Subject name[English]	Seminar on Computer Science and Engineering 2[Seminar on Computer Science and Engineering 2]				
Schedule number	D53010020	Subject area	Advanced Computer Science and Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	2~
Department Offered	Computer Science and Engineering			Beggining grade	D2
Charge teacher name[Roman alphabet mark]	S3系教務委員 3kei kyomu Iin-S				
Numbering	CMP_DOC71015				
Objectives of class					
<p>各研究室が指定する情報学に関する最先端の技術情報(特に英語による最先端の技術情報)を発見する能力、ならびに、その技術情報を理解、説明、質疑・応答できる能力を養う。</p> <p>The course is intended for students to study basic materials in depth, related to his/her research subjects in computer science and engineering.</p> <p>It is also aimed for students to acquire various skills, required in general research work, such as those for oral presentation, and technical discussion and writing.</p>					
Contents of class					
<p>教員が指定する最先端の技術情報(特に英語による最先端の技術情報)について理解したところを説明する。</p> <p>教員は技術情報の内容の発見、理解、説明、質疑・応答する方法について直接指導を行う。</p> <p>While specific contents depend on the research areas students are involved in, it is usually the case for students to read relevant textbooks/research papers and report on them, as well as to present and discuss on the research work of their own.</p>					
Self Preparation and Review					
<p>教員が指定する内容に関し、予習・復習を行う。</p> <p>Consult with your advisor.</p>					
Related subjects					
<p>指導教員に問い合わせること。</p> <p>Consult with your advisor.</p>					
Notes for textbook					
<p>指導教員に問い合わせること。</p> <p>Consult with your advisor.</p>					
Notes for reference					
Goals to be achieved					
<p>(1)最先端の専門分野の英文が理解でき、わかりやすく説明できる。</p> <p>(2)技術的な情報を扱う英文が解釈でき、作文できる。</p> <p>(3)論文の標準的な構成ができる。</p> <p>(4)発表というスタイルでの情報提供ができる。</p> <p>(5)情報の不足を質問という形式で指摘できる。</p> <p>(1) To understand English literature on state-of-the-art areas of expertise, and to explain clearly.</p> <p>(2) To interpret technical information written in English, and to write such information in English.</p> <p>(3) To make a standard construction of a technical paper.</p> <p>(4) To provide information by oral presentation.</p> <p>(5) To point out the lack of information by questions.</p>					
Evaluation of achievement					
<p>技術情報の発見に向けた自主性、技術情報の理解度、説明の方法、質問への回答、議論への参加の様子等から総合的に指導教員が判定する。</p> <p>The score is assigned by the supervisor considering autonomy for the discovery and understanding of technical information, the method of the description, the answer to the question determines, and the participation to the discussion.</p>					
S:more than or equal to 90, A:more than or equal to 80, B:more than or equal to 70, C:more than or equal to 60					

Examination 試験期間中には何も行わない None during exam period
Details of examination 課題レポートやプレゼンテーションに基づいて評価する。 Your supervisor will evaluate your presentation and your reports.
Other information
Reference URL
Office hours 指導教員に問い合わせること。 Consult with your advisor.
Relations to attainment objectives of learning and education
Key words

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

Subject name[English]	Web Data Engineering, Advanced 1[Web Data Engineering, Advanced 1]				
Schedule number	D53030150	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective
Time of starting a course	Spring1 term	Day of the week,period	Mon.1~1	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	青野 雅樹 AONO Masaki				
Numbering	CMP_DOC72425				
Objectives of class					
<p>インターネット、すなわち Web 上には、大量のデータが日々作成・蓄積・更新されている。この中から有用なデータを検索し、抽出する Web アプリケーション技術や、複数の Web アプリケーション間でデータをやりとりする技術も重要になってきている。特に、このようなビッグデータをどう表現するかも、アプリケーションをカスケードする場合、必須である。</p> <p>本講義では、Web 上やデータファイルにあるテキストだけでなく、画像、動画、3D モデルなど様々なメディアに対するデータ表現技術、特徴量抽出技術、次元削減を含むインデクシング、テキストマイニング、データマイニング、自然言語処理、情報検索技術、回帰・分類・クラスタリングに代表される統計的機械学習、リンク解析に代表される Web マイニング技術、ならびに深層学習技術に焦点を当て、最新のデータサイエンス技術を講述する。</p> <p>Day by day, a massive amount of data has been generated, accumulated, and updated on the Internet, where data include texts, images, sounds, movies, 2D/3D shapes, numeric values, and their composites. Extracting important pieces of information is crucial in many Closed/Open Web applications. The objectives of this lecture is to demonstrate the state-of-the-art technologies in data science ranging from data representation, data mining, text mining, natural language processing, information retrieval, information extraction, machine learning (including both unsupervised and supervised learning with/without deep learning frameworks), based on fundamental data science technologies.</p>					
Contents of class					
<p>(1)はじめに(Web で扱うデータ、データサイエンス、統計的機械学習の基礎)</p> <p>(2)情報検索序論(検索、類似度、言語モデル、次元削減、評価尺度)、自然言語処理の基礎</p> <p>(3)特徴量抽出、検索、分類、マルチメディア</p> <p>(4)リンク解析、教師なし学習(クラスタリング技術)</p> <p>(5)時系列データマイニング、教師あり学習(特徴抽出と分類)</p> <p>(6)深層学習基礎</p> <p>(7)深層学習応用</p> <p>(8)定期テスト</p> <p>(1) Introduction (Basics of Data Science including Data Representation and Statistical Machine Learning)</p> <p>(2) Information Retrieval (Search, Similarity, Language Model, Dimensional Reduction, Evaluations), and Natural Language Processing</p> <p>(3) Feature Extraction, Search, Classification, Multimedia</p> <p>(4) Web Link Analysis, Unsupervised Learning (Clustering)</p> <p>(5) Time Series Data Mining, Supervised Learning (Classification)</p> <p>(6) Deep Learning Basics</p> <p>(7) Deep Learning Applications</p> <p>(8) Final Exam</p>					
Self Preparation and Review					
<p>基本的なデータマイニング技術(主成分分析・判別分析・回帰分析、クラスタリング)に関しては、各自、予習・復習をしておくこと。特に、授業の補助用 Web ページで、Python (Jupyter notebook) を使った自習教材を準備するので、慣れておくことが好ましい。</p> <p>It is desirable to self-study as well as to review fundamental data mining techniques such as clustering, classification, and regression. It should be noted that the knowledge on machine learning and multivariate analysis techniques such as principal component analysis is a prerequisite to this class. It is recommended installing Python into your computer, because some of the lecture materials are assumed the knowledge of Python.</p>					
Related subjects					
特になし					

N/A

Notes for textbook

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

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

Reference1	Book title	Information Retrieval, Implementing and Evaluating Search Engines			ISBN	978-0-262-02651-2
	Author	Stefan Butcher, Charles L.A. Clarke, Gordon V. Cormack	Publisher	MIT Press	Publish year	2010
Reference2	Book title	Data Mining and Analysis			ISBN	978-0-521-76633-3
	Author	Mohammed J. Zaki, Wagner Meira Jr.	Publisher	Cambridge University Press	Publish year	2014
Reference3	Book title	Data Mining Practical Machine Learning Tools and Techniques, Third Edition			ISBN	978-0-12-374856-0
	Author	Ian H. Witten, Eibe Frank, and Mark A. Hall	Publisher	Morgan Kaufmann	Publish year	2011
Reference4	Book title	Python Machine Learning			ISBN	978-1-78355-513-0
	Author	Sebastian Raschka	Publisher	PACKT Publishing	Publish year	2016

Notes for reference

参考書 5

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

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

出版社: Addison Wesley

ISBN: 978-0-321-41691-9

出版年: 2011

参考書 6

書名「Google's PageRank and Beyond」

著者名: Amy N. Langville, Carl D. Meyer

出版社: Princeton University Press

ISBN: 978-0-691-12202-1

出版年: 2006

Reference #5

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

Authors: Ricardo Baeza-Yates, Bertier Ribeiro-Neto

Publisher: Addison Wesley

ISBN: 978-0-321-41691-9

Year: 2011

Reference #6

Title: 「Google's PageRank and Beyond」

Authors: Amy N. Langville, Carl D. Meyer

Publisher: Princeton University Press

ISBN: 978-0-691-12202-1

Year: 2006

Goals to be achieved

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

The following items have to be achieved:

1. Able to implement and apply fundamental data science (mining) technologies.
2. Able to understand fundamental technologies of information retrieval such as natural language processing, search

performance measures, feature extraction, and ranking methods such as language model
3. Able to understand basics of machine learning (classification, regression, clustering) and deep learning
4. Able to understand basics of Web link analysis, Web content mining, Time series data mining

Evaluation of achievement

原則として、すべての授業に出席したのにつき、下記のように成績を評価する。

定期試験 80 点、課題 20 点の合計で評価する。

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

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

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

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

Examination

定期試験を実施(対面)

Examination(Face to Face)

Details of examination

特になし

N/A

Other information

C-511、TEL: 6764, Email: aono@tut.jp

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

Reference URL

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

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

Office hours

事前に aono@tut.jp まで電子メールで予約をとること。

It is recommended that prior email appointment is preferable.

Relations to attainment objectives of learning and education

情報・知能工学専攻

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

情報・知能工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、身につけている。

Graduate Program of Computer Science and Engineering for Doctoral Degree

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

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically.

Key words

データ・テキストマイニング、情報検索、特徴量抽出、機械学習、深層学習

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

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

Subject name[English]	Advanced Statistical Natural Language Processing[Advanced Statistical Natural Language Processing]					
Schedule number	D53030230	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective	
Time of starting a course	Spring1 term	Day of the week,period	Wed.3~3	Credit(s)	1	
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~	
Department Offered	Computer Science and Engineering			Beggining grade	D1	
Charge teacher name[Roman alphabet mark]	秋葉 友良 AKIBA Tomoyoshi					
Numbering	CMP_DOC72525					
Objectives of class						
Important topics on statistical natural language processing will be discussed by focusing on statistical machine translation.						
Contents of class						
Week 1: Introduction						
Week 2: Basic of Probability and Statistics						
Week 3: Language Models						
Week 4: Translation Models						
Week 5: Parameter Estimation						
Week 6: EM Algorithm						
Week 7: Advanced methods in SMT						
Self Preparation and Review						
Review each lecture and prepare for the next class with reference to the textbook.						
Related subjects						
Probability theory, Information theory, Formal language theory						
Notes for textbook						
Resumes will be provided, which are based on:						
•Kevin Knight						
A Statistical MT Tutorial Workbook						
•Seiichi Nakagawa et al.						
Spoken Language Processing and Natural Language Processing						
Reference1	Book title	Statistical Machine Translation			ISBN	978-0521874151
	Author	Philipp Koehn	Publisher	Cambridge University Press	Publish year	2010
Reference2	Book title	A Statistical MT Tutorial Workbook			ISBN	
	Author	Kevin Knight	Publisher		Publish year	
Notes for reference						
N/A						
Goals to be achieved						
Basics: Understand the basic concepts of natural language processing						
Natural Language Processing: Understand the role of language resources, language and translation models, word alignments, and parameter estimation methods,						
Applications: Understand statistical machine translation system.						
Evaluation of achievement						
Marks are based on reports (100%).						
Examination						

レポートで実施

By Report

Details of examination

N/A

Other information

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

Reference URL

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

Office hours

16:25-17:40, Tuesday

Relations to attainment objectives of learning and education

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力
情報・知能工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を
体得することで、身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated manner
Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and
creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original
technology, and integrating all knowledges organically.

Key words

spoken language processing, natural language processing, human language technology

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

Subject name[English]	Computers and Education, Advanced[Computers and Education, Advanced]				
Schedule number	D53030240	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Mon.5~5	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	河合 和久 KAWAI Kazuhisa				
Numbering	CMP_DOC72025				
Objectives of class					
<p>The purpose of the class is to deepen and broaden students' knowledge of their own expertise in relation to the society in learning about computers and technology in education.</p> <p>The purpose of the class is to deepen and broaden students' knowledge of their own expertise in relation to the society in learning about computers and technology in education.</p>					
Contents of class					
<p>Students will be offered some overviews of computers and education. Students will give some presentations on the following problems: (1) to make the teaching plan of their own research subjects for pupils or junior high school students, (2) to make a simulated class based on the plan, (3) to discuss the simulated class. At the end of term, students are required to submit an essay on computers and education.</p> <ol style="list-style-type: none"> 1.Guidance, Lecture#1(Introduction to subject "Information".) 2.Lecture#2(Computer system for education. and Software as course material.) 3.Lecture#3(Cooperation with the period of integrated study.) 4.Lecture#4(Simulated class: plan and evaluation.) 5.Lecture#5(Keep an "Information" teacher. and Teaching plan.) 6.Lecture#6(Information sending and presentation.) 7.Lecture#7(Group work by collaboration and presentation.) 8.Lecture#8(Media literacy., Information ethics education. and Network.) 9.Presentations of Teaching Plans #1 10.Presentations of Teaching Plans #2 11.Lecture#9(Expression of information and multimedia. and Topics in information society.) 12.Lecture#10(Algorithm and programming. and Information retrieval and database.) 13.Simulated Classes #1 14.Simulated Classes #2 15.Simulated Classes #3 16.Presentations of Final Reports <p>Students will be offered some overviews of computers and education. Students will give some presentations on the following problems: (1) to make the teaching plan of their own research subjects for pupils or junior high school students, (2) to make a simulated class based on the plan, (3) to discuss the simulated class. At the end of term, students are required to submit an essay on computers and education.</p> <ol style="list-style-type: none"> 1.Guidance, Lecture#1(Introduction to subject "Information".) 2.Lecture#2(Computer system for education. and Software as course material.) 3.Lecture#3(Cooperation with the period of integrated study.) 4.Lecture#4(Simulated class: plan and evaluation.) 5.Lecture#5(Keep an "Information" teacher. and Teaching plan.) 6.Lecture#6(Information sending and presentation.) 7.Lecture#7(Group work by collaboration and presentation.) 8.Lecture#8(Media literacy., Information ethics education. and Network.) 					

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

Self Preparation and Review

Students are required to solve the problems mentioned above.

Students are required to solve the problems mentioned above.

Related subjects

Notes for textbook

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

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

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

Notes for reference

Goals to be achieved

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

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

Evaluation of achievement

Weighting:
Reports 50%.
In class work 50%.

Grading scale:
90% and above S
80% - 89% A
70% - 79% B
60% - 69% C

Weighting:
Reports 50%.
In class work 50%.

Grading scale:
90% and above S
80% - 89% A
70% - 79% B
60% - 69% C

Examination

授業を実施
Regular Class

Details of examination

Other information

Reference URL

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

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

Office hours

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

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

Relations to attainment objectives of learning and education

情報・知能工学専攻

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

情報・知能工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、身につけている。

Graduate Program of Computer Science and Engineering for Doctoral Degree

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

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically.

Key words

Informatics, Computer Literacy, Scientific Communication.

Informatics, Computer Literacy, Scientific Communication.

(D53030300)Advanced Molecular Simulation 1[Advanced Molecular Simulation 1]

Subject name[English]	Advanced Molecular Simulation 1[Advanced Molecular Simulation 1]				
Schedule number	D53030300	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective
Time of starting a course	Spring1 term	Day of the week,period	Tue.5~5	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	栗田 典之 KURITA Noriyuki				
Numbering	CMP_DOC73125				
Objectives of class					
<p>The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry, that is, molecular orbital (MO) theory.</p> <p>In achieving this objective, students will be required to attempt to acquire the elementary concepts in MO theory, and they will learn about the electronic properties of biological molecules such as proteins, RNA and DNA.</p> <p>The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry, that is, molecular orbital (MO) theory.</p> <p>In achieving this objective, students will be required to attempt to acquire the elementary concepts in MO theory, and they will learn about the electronic properties of biological molecules such as proteins, RNA and DNA.</p>					
Contents of class					
<p>Considering the preliminary knowledge of the participates in this class, some topics from the following things will be chosen to be learned.</p> <p>(1) Basis and elementary concepts for molecular orbital (MO) theory (1 and 2 weeks)</p> <p>(2) Applications of MO method to small molecules (3 and 4 weeks)</p> <p>(3) MO calculations for amino acids and their peptides (5 and 6 weeks)</p> <p>(4) MO calculations for DNA, RNA bases and base pairs (7, 8 and 9 weeks)</p> <p>(5) MO calculations for complexes with proteins and ligand molecules (10, 11 and 12 weeks)</p> <p>(6) MO calculations for DNA, RNA and their complexes with proteins (13, 14 and 15 weeks)</p> <p>Considering the preliminary knowledge of the participates in this class, some topics from the following things will be chosen to be learned.</p> <p>(1) Basis and elementary concepts for molecular orbital (MO) theory (1 and 2 weeks)</p> <p>(2) Applications of MO method to small molecules (3 and 4 weeks)</p> <p>(3) MO calculations for amino acids and their peptides (5 and 6 weeks)</p> <p>(4) MO calculations for DNA, RNA bases and base pairs (7, 8 and 9 weeks)</p> <p>(5) MO calculations for complexes with proteins and ligand molecules (10, 11 and 12 weeks)</p> <p>(6) MO calculations for DNA, RNA and their complexes with proteins (13, 14 and 15 weeks)</p>					
Self Preparation and Review					
<p>Elementary concepts in MO theory as well as biomolecules such as proteins, RNA and DNA are required.</p> <p>Elementary concepts in MO theory as well as biomolecules such as proteins, RNA and DNA are required.</p>					
Related subjects					
<p>特になし N/A</p>					
Notes for textbook					
<p>教科書:資料配付 参考書: "Molecular orbital calculations for amino acids and peptides", by Anne-Marie Sapse "Molecular orbital calculations for amino acids and peptides", by Anne-Marie Sapse</p>					
Notes for reference					
<p>特になし</p>					

N/A

Goals to be achieved

The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry.

The objective of this class is to understand basis biophysical phenomena in the organisms based on the concept of quantum chemistry.

Evaluation of achievement

授業で与えられた課題に対するレポート内容で評価する。

S: レポートの合計点が 90 点(100 点満点)以上。

A: レポートの合計点が 80 点(100 点満点)以上。

B: レポートの合計点が 70 点(100 点満点)以上。

C: レポートの合計点が 60 点(100 点満点)以上。

Evaluation is based on reports (100 points).

S: total points of reports, 90 or higher (out of 100 points).

A: total points of reports, 80 or higher (out of 100 points).

B: total points of reports, 70 or higher (out of 100 points).

C: total points of reports, 60 or higher (out of 100 points).

Examination

レポートで実施

By Report

Details of examination

特になし

N/A

Other information

連絡先

教員の居室: F 棟 306 号室

電話番号: 0532-44-6875

E-mail: kurita@cs.tut.ac.jp

E-mail: kurita@cs.tut.ac.jp

Reference URL

特になし

N/A

Office hours

上記の E-mail による連絡により、適宜対応する。

Please contact by the above E-mail.

Relations to attainment objectives of learning and education

情報・知能工学専攻

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

情報・知能工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、身につけている。

(E) 最新の技術や社会環境の変化に対する探究心と持続的学習力

社会、環境、技術等の変化の本質を探求し、生涯にわたって自発的に計画し学習する能力を身につけている。

Graduate Program of Computer Science and Engineering for Doctoral Degree

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

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically.

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members. Have sophisticated ability as a leader to contribute for the achievement the goal of team.

(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology

Have the skills to research the essence of changes in society, environment, and technology. Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

DNA, RNA, Protein, molecular orbital calculation

DNA, RNA, Protein, molecular orbital calculation

(D53030310)Advanced Molecular Simulation 2[Advanced Molecular Simulation 2]

Subject name[English]	Advanced Molecular Simulation 2[Advanced Molecular Simulation 2]				
Schedule number	D53030310	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective
Time of starting a course	Spring2 term	Day of the week,period	Tue.5~5	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	後藤 仁志 GOTO Hitoshi				
Numbering	CMP_DOC73125				
Objectives of class					
<p>The objective of this class is to understand chemical, molecular biological and biophysical phenomena that can be solved by molecular simulation technologies.</p> <p>In achieving this objective, students will be required to attempt to acquire the elementary concepts in molecular mechanics (MM) method, molecular dynamics (MD) method, molecular orbital (MO) method, and will learn about thermodynamic and electronic properties of small molecules (drug candidate compounds and organic materials) and biopolymers (proteins, RNA and DNA).</p>					
Contents of class					
<p>Considering the preliminary knowledge of the participants in this class, some topics from the following things will be chosen to be learned.</p> <p>(1) Outline of molecular simulation (1st week) (2) Molecular mechanics (MM) method and local/global minimum search method (2nd and 3rd weeks) (3) Molecular dynamics (MD) method and motion equation (4th and 5th weeks) (4) Basis of quantum chemistry and molecular orbital (MO) method (6th, 7th and 8th weeks) (5) Stereochemistry, statistical thermodynamics and measurement techniques (9th week) (6) Analyses of chemical reaction and crystal structure of organic molecules (10 and 11th weeks) (7) Biopolymer simulations and bioinformatics (12th and 13rd weeks) (8) Chemoinformatics (machine learning) and molecular design theory (14th and 15th weeks)</p>					
Self Preparation and Review					
Related subjects					
Notes for textbook					
documents distributed					
Reference1	Book title	Introduction to Computational Chemistry, 3rd Ed.		ISBN	978-1118825990
	Author	Frank Jensen	Publisher	Wiley	Publish year 2016
Notes for reference					
Goals to be achieved					
<p>The objective of this class is to understand chemical, molecular biological and biophysical phenomena that can be solved by molecular simulation technologies.</p>					
Evaluation of achievement					
<p>[Evaluation basis] Students who attend all classes will be evaluated as follows: A: Achieved all goals and obtained total points of exam and reports, 80 or higher (out of 100 points).</p>					

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

Examination

レポートで実施

By Report

Details of examination

Other information

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

Reference URL

under construction

Office hours

Please check the schedule by E-mail in advance.

Relations to attainment objectives of learning and education

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

情報・知能工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、身につけている。

(E) 最新の技術や社会環境の変化に対する探究心と持続的学習力

社会、環境、技術等の変化の本質を探求し、生涯にわたって自発的に計画し学習する能力を身につけている。

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

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically

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

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically.

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members. Have sophisticated ability as a leader to contribute for the achievement the goal of team.

(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology

Have the skills to research the essence of changes in society, environment, and technology. Have the skills to voluntarily make plans and learn throughout one's life in response to changes in society, environment and technology

Key words

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

(D53030320)Biological Information System Engineering[Biological Information System Engineering]

Subject name[English]	Biological Information System Engineering[Biological Information System Engineering]				
Schedule number	D53030320	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective
Time of starting a course	Spring1 term	Day of the week,period	Mon.4~4	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	福村 直博 FUKUMURA Naohiro				
Numbering	CMP_DOC73025				
Objectives of class 人の巧みな運動を実現する生体の情報処理メカニズムの理解のための計算論的なアプローチの手法を理解する。 This course lectures on advanced studies on information processing in the nervous systems and computational models for motor controls of the human movements.					
Contents of class 1. 運動情報処理システムのイントロダクション 運動制御への計算論的アプローチ 2-3. 人の運動制御システムの中心的な問題 4-5. 到達運動 6. 把持運動 7. 描画運動 8. プレゼンテーション 1. Introduction to the computational neuroscience in the motor control system 2-3. Core Problems of human motor control 4-5. Reaching movement 6. Gasping movement 7. Drawing and writing 8. Final Examination (Presentation)					
Self Preparation and Review 講義資料を事前に Dream Campus にて公開するので、講義当日までにダウンロードしておくこと。 Lecture material is disclosed to Dream Campus system beforehand.					
Related subjects					
Notes for textbook 講義資料を事前に Dream Campus にて公開するので、講義当日までにダウンロードしておくこと。 Lecture material is disclosed to Dream Campus system beforehand.					
Reference1	Book title	Human motor control		ISBN	0123742269
	Author	David A. Rosenbaum	Publisher	Academic	Publish year 2010
Notes for reference					
Goals to be achieved 1) 脳機能を明らかにするための計算論的なアプローチの手法を理解する 2) ヒトの巧みな運動を実現する情報処理システムや学習機能について理解する 1) Understand the method of computational approach to reveal brain function 2) Understand the information processing system and learning function to achieve a skillful movement of the human					
Evaluation of achievement 最終日のプレゼンテーション 75%とその他授業中の質疑応答など 25% 左記の割合で総合的に評価する S: 達成目標をすべて達成しており、かつテスト・レポートの合計点(100点満点)が 90 点以上 A: 達成目標を 90%達成しており、かつテスト・レポートの合計点(100点満点)が 80 点以上 B: 達成目標を 75%達成しており、かつテスト・レポートの合計点(100点満点)が 70 点以上					

C:達成目標を60%達成しており、かつテスト・レポートの合計点(100点満点)が60点以上

Final presentation 75%, Discussions during class 75%

Students who attend all classes will be evaluated as follows:

S: Achieved all goals and obtained total point of report and final presentation, 90 or higher (out of 100 points).

A: Achieved 90 % of goals and obtained total point of report and final presentation, 80 or higher (out of 100 points).

B: Achieved 75 % of goals and obtained total point of report and final presentation, 70 or higher (out of 100 points).

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

Examination

授業を実施

Regular Class

Details of examination

Other information

Reference URL

Office hours

月曜日 16:20-17:50

Monday 16:20-17:50

Relations to attainment objectives of learning and education

Key words

生体情報、運動情報処理、計算論

Biological information, Motor Control System, Computational theory

(D53030360)Advanced Statistical Machine Learning Theory[Advanced Statistical Machine Learning Theory]

Subject name[English]	Advanced Statistical Machine Learning Theory[Advanced Statistical Machine Learning Theory]				
Schedule number	D53030360	Subject area	Advanced Computer Science and Engineering	Required or elective	Elective
Time of starting a course	Spring2 term	Day of the week,period	Thu.2~2	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	渡辺 一帆 WATANABE Kazuho				
Numbering	CMP_DOC73025				
Objectives of class 機械学習手法はパターン認識・データマイニング等の基本技術として幅広く応用されている。 本講義では、統計的推測としての機械学習手法の基本原理や性質を理解することを目標とする。 The objective of this course is to learn the fundamental theory of statistical machine learning as statistical inference, which has wide applications such as pattern recognition and data mining.					
Contents of class 1. 概論, 確率モデルの基礎 2. 最尤推定, 推定量の性質 3. 判別モデル, 最適化法 4. 正則化, モデル選択 5. ベイズ学習, サンプリング法 6. 潜在変数モデル, EM アルゴリズム 7. 経験ベイズ法, 近似ベイズ学習 8. 統計的学習理論 1. Introduction, Fundamentals of Probabilistic Models 2. Maximum Likelihood Method, Properties of Estimator 3. Discriminative Model, Optimization Methods 4. Regularization Methods, Model Selection 5. Bayesian Learning, Sampling Method 6. Latent Variable Model, EM Algorithm 7. Empirical Bayes Method, Approximate Bayesian Learning 8. Statistical Learning Theory					
Self Preparation and Review 各回の内容を参考書等で予習し、小テストやその類題を復習することが望ましい。 It is desirable to prepare each class by reading reference books and review each class by solving assigned exercises.					
Related subjects 特になし N/A					
Notes for textbook 講義スライドを配布 Lecture slides are distributed.					
Reference1	Book title	Information theory, inference, and learning algorithms		ISBN	978-

					0521642989
	Author	David J.C. MacKay	Publisher	Cambridge University Press	Publish year 2003
Reference2	Book title	Pattern recognition and machine learning		ISBN	978-0387310732
	Author	Christopher M. Bishop	Publisher	Springer	Publish year 2006
Reference3	Book title	Algebraic geometry and statistical learning theory		ISBN	978-0521864671
	Author	Sumio Watanabe	Publisher	Cambridge University Press	Publish year 2009
Notes for reference 特になし N/A					
Goals to be achieved 1) 代表的な機械学習手法についての基本的な知識と理解 2) 基本的な確率モデルと学習法について学習アルゴリズムが導出できること 3) 学習法の汎化性能について基礎的な理解を得ること 1) Fundamental knowledge and understanding of popular machine learning methods 2) Ability to derive learning algorithms for fundamental probabilistic models and learning methods 3) Fundamental understanding of generalization capabilities of learning methods					
Evaluation of achievement 毎回実施する小テストにより評価する。 評価基準: 原則的にすべての講義に出席したものに付き、下記のように成績を評価する。 S: 達成目標をすべて達成しており、かつ小テストの平均点(100点満点)が90点以上 A: 達成目標を80%達成しており、かつ小テストの平均点(100点満点)が80点以上 B: 達成目標を60%達成しており、かつ小テストの平均点(100点満点)が70点以上 C: 達成目標を40%達成しており、かつ小テストの平均点(100点満点)が60点以上 Scores will be measured comprehensively by the points of the small exercises assigned in every class: [Evaluation basis] Students who attend all classes will be evaluated as follows: S: Achieved all goals and obtained average points of exercises, 90 or higher (out of 100 points). A: Achieved 80 % of goals and obtained average points of exercises, 80 or higher (out of 100 points). B: Achieved 60 % of goals and obtained average points of exercises, 70 or higher (out of 100 points). C: Achieved 40 % of goals and obtained average points of exercises, 60 or higher (out of 100 points).					
Examination 授業を実施 Regular Class					
Details of examination 特になし N/A					
Other information 特になし N/A					
Reference URL 特になし N/A					
Office hours 随時 as needed					
Relations to attainment objectives of learning and education (C) 高度な知識を統合的・発展的に活用できる実践力・創造力 情報・知能工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、身につけている。					

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

Have advanced knowledge about computer science and engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically.

Key words

機械学習, 統計の推測, 統計の学習理論

Machine Learning, Statistical Inference, Statistical Learning Theory

(D54010080)Seminar on Applied Chemistry and Life Science 1[Seminar on Applied Chemistry and Life Science 1]

Subject name[English]	Seminar on Applied Chemistry and Life Science 1[Seminar on Applied Chemistry and Life Science 1]				
Schedule number	D54010080	Subject area	Advanced Applied Chemistry and Life Science	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	4
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Applied Chemistry and Life Science			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	CHE_DOC75015				
Objectives of class This course will provide the students with opportunities to study on his/her research subjects on applied chemistry and life science by reading scientific papers under the guidance of his/her supervisor. The aim of the lesson for the students is to learn the latest knowledge and presentation skills required for his/her research in the seminar as well as to deepen his/her understanding of applied chemistry and life science.					
Contents of class The students will be required to read scientific papers written by other language than Japanese, especially English, which are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.					
Self Preparation and Review					
Related subjects Seminar on Applied Chemistry and Life Sciences 2 All other relevant subjects in Applied Chemistry and Life Science					
Notes for textbook Supervisor will recommend textbooks, papers, and research materials to students.					
Notes for reference					
Goals to be achieved To acquire advanced knowledge on applied chemistry and life science To understand the contents of scientific papers in a given field of applied chemistry and life science To be able to make oral and poster presentations relevant to papers he/she has read.					
Evaluation of achievement The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores. S: 90 or higher (out of 100 points), A: 80 or higher (out of 100 points), B: 70 or higher (out of 100 points), C: 60 or higher (out of 100 points)					
Examination 試験期間中には何も行わない None during exam period					
Details of examination					
Other information Supervisor(s)					
Reference URL http://chem.tut.ac.jp/en/					
Office hours Students are encouraged visiting by appointment.					
Relations to attainment objectives of learning and education					

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

応用化学・生命工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、

課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、

リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

(E) 最新の技術や社会環境の変化に対する探究心と持続的学習力

社会、環境、技術等の変化の本質を探究し、生涯にわたって自発的に計画し学習する能力を身につけている。

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

Have the ability to create imaginative technology to solve problems and put them into practice through learning, by experience, methodologies for research and development on the basis of the integration of extensive knowledge about applied chemistry, life science and their related fields

(D) Communication skills for global success

Have the communication skills to effectively express and disseminate one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other teammembers as well as leadership ability to contribute to the team's achievements

(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment

Have the ability to explore the nature of changes in society, environment and technology and to voluntarily make plans and learn throughout one's life

Key words

Applied chemistry, Life science, Materials science and engineering

(D54010090)Seminar on Applied Chemistry and Life Science 2[Seminar on Applied Chemistry and Life Science 2]

Subject name[English]	Seminar on Applied Chemistry and Life Science 2[Seminar on Applied Chemistry and Life Science 2]				
Schedule number	D54010090	Subject area	Advanced Applied Chemistry and Life Science	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	2~
Department Offered	Applied Chemistry and Life Science			Beggining grade	D2
Charge teacher name[Roman alphabet mark]	S4系教務委員 4kei kyomu Iin-S				
Numbering	CHE_DOC75015				
Objectives of class This course will provide the students with opportunities to study on his/her research subjects on applied chemistry and life science by reading scientific papers under the guidance of his/her supervisor. The aim of the lesson for the students is to expand the knowledge and presentation skills acquired in Seminar on Seminar on Applied Chemistry and Life Science 1.					
Contents of class The students will be required to read scientific papers written by other language than Japanese, especially English, which are suggested by his/her supervisor, and to report and discuss deeply on his/her research subject in the seminar.					
Self Preparation and Review					
Related subjects Seminar on Applied Chemistry and Life Sciences 1 All other relevant subjects in Applied Chemistry and Life Science					
Notes for textbook Supervisor will recommend textbooks, papers, and research materials to students.					
Notes for reference					
Goals to be achieved To acquire advanced knowledge on applied chemistry and life science To understand the contents of scientific papers in a given field of applied chemistry and life science To be able to make oral and poster presentations relevant to papers he/she has read.					
Evaluation of achievement The evaluation is based on the scores of reading textbooks and scientific papers, discussions, reports and presentations of his/her research in the seminar. His/her supervisor evaluates the scores. S: 90 or higher (out of 100 points), A: 80 or higher (out of 100 points), B: 70 or higher (out of 100 points), C: 60 or higher (out of 100 points)					
Examination 試験期間中には何も行わない None during exam period					
Details of examination					
Other information Supervisor(s)					
Reference URL http://chem.tut.ac.jp/en/					
Office hours Students are encouraged visiting by appointment.					
Relations to attainment objectives of learning and education (C) 高度な知識を統合的・発展的に活用できる実践力・創造力					

応用化学・生命工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、

課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、

リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

(E) 最新の技術や社会環境の変化に対する探究心と持続的学習力

社会、環境、技術等の変化の本質を探求し、生涯にわたって自発的に計画し学習する能力を身につけている。

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

Have the ability to create imaginative technology to solve problems and put them into practice through learning, by experience, methodologies for research and development on the basis of the integration of extensive knowledge about applied chemistry, life science and their related fields

(D) Communication skills for global success

Have the communication skills to effectively express and disseminate one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other teammembers as well as leadership ability to contribute to the team's achievements

(E) Inquisitive outlook and skills for continuous learning in response to state-of-the-art technology and changes in the social environment

Have the ability to explore the nature of changes in society, environment and technology and to voluntarily make plans and learn throughout one's life

Key words

Applied chemistry, Life science, Materials science and engineering

(D54030030)Advanced Ecological Engineering[Advanced Ecological Engineering]

Subject name[English]	Advanced Ecological Engineering[Advanced Ecological Engineering]				
Schedule number	D54030030	Subject area	Advanced Applied Chemistry and Life Science	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Thu.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Applied Chemistry and Life Science			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	大門 裕之, 中野 裕美 DAIMON Hiroyuki, NAKANO Hiromi				
Numbering	CHE_DOC74225				
Objectives of class					
The course provides students with the opportunity to improve their level in the skills(reading, writing, presentation) through reading current research articles.					
Contents of class					
1. Students have to select at least three articles in the field of one of professors. Three weeks/professor & one week					
2. Students prepare both reports and present slides.					
3. The key words will be given at the first class.					
Self Preparation and Review					
毎回講義内容を復習するとともに、次週の内容についてテキスト等を参考に予習してくること。					
Review each lecture and prepare for the next class with reference to the textbook.					
Related subjects					
特になし					
Knowledge of environmental chemistry, chemical engineering and materials science is desirable.					
Notes for textbook					
特になし					
Papers(resume)will be distributed					
Notes for reference					
特になし					
N/A					
Goals to be achieved					
特になし					
To improve presentation skills(writing of reports and preparing of slides).					
Evaluation of achievement					
30% Report, 70% Presentation(30-45 min)					
S: 90 or higher (out of 100 points)					
A: 80 or higher (out of 100 points)					
B: 70 or higher (out of 100 points)					
C: 60 or higher (out of 100 points)					
Examination					
試験期間中には何も行わない					
None during exam period					
Details of examination					
特になし					

N/A

Other information

特になし

N/A

Reference URL

特になし

N/A

Office hours

Anytime, but reservation is desirable.

Relations to attainment objectives of learning and education

(B) 技術者・研究者としての正しい倫理観と社会性

高度上級技術者・研究者としての専門的・倫理的責任を有し、社会における技術的課題を発見・設定・解決・評価する能力を身につけている。

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

応用化学・生命工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

(B) Sound ethics and social awareness as advanced-level engineers and researchers

Be conscious of specialized and ethical responsibilities as highly advanced-level engineers and researchers; and have the ability to find, set, solve and evaluate technical issues in society

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

Have the ability to create imaginative technology to solve problems and put them into practice through learning, by experience, methodologies for research and development on the basis of the integration of extensive knowledge about applied chemistry, life science and their related fields

Key words

environmental chemistry, chemical engineering, materials science, sustainable engineering

(D54030040)Advanced Biotechnology 1[Advanced Biotechnology 1]

Subject name[English]	Advanced Biotechnology 1[Advanced Biotechnology 1]				
Schedule number	D54030040	Subject area	Advanced Applied Chemistry and Life Science	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Fri.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Applied Chemistry and Life Science			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	浴 俊彦, 田中 照通, 中鉢 淳 EKI Toshihiko, TANAKA Terumichi, NAKABACHI Atsushi				
Numbering	CHE_DOC73225				
Objectives of class					
This course will provide the students with the opportunity to study on advanced life sciences (e.g., genomics, molecular genetics, microbiology, and biotechnology).					
Contents of class					
In this course, the students will be expected to read several papers on the current progress in advanced life science (e.g., genomics, molecular genetics, microbiology, and biotechnology) to understand the frontier of these scientific fields. This course will be given by three instructors as described below (Eki, Tanaka, and Nakabachi).					
1st~5th week: Genome and gene sciences (Dr. T. Eki) 6th~10th week: Genetic and Protein engineering (Dr. T. Tanaka) 11th~15th week: Animal-microbe symbioses (Dr. A. Nakabachi)					
Self Preparation and Review					
Review each lecture and prepare for the next class with reference to the textbook.					
Related subjects					
The knowledge of basic molecular biology and biochemistry is absolutely essential.					
Notes for textbook					
Papers and references will be given by each instructor in the course.					
Notes for reference					
N/A					
Goals to be achieved					
To understand the current status in advanced life sciences including genomics, molecular genetics, microbiology and biotechnology by summarizing, and making presentations and/or reports.					
Evaluation of achievement					
Grades for the course will be based on the average of the subject scores (by Eki, Tanaka, and Nakabachi).					
[Evaluation basis]					
D1 and D2 students who attend all classes will be evaluated as follows:					
S: Achieved all goals and obtained total points of exam and reports, 90 or higher (out of 100 points).					
A: Achieved all goals and obtained total points of exam and reports, 80 or higher (out of 100 points).					
B: Achieved 70% of goals and obtained total points of exam and reports, 70 or higher (out of 100 points).					
C: Achieved 60% of goals and obtained total points of exam and reports, 60 or higher (out of 100 points).					
D3 students who attend all classes will be evaluated as follows:					
A: Achieved all goals and obtained total points of exam and reports, 80 or higher (out of 100 points).					
B: Achieved 70% of goals and obtained total points of exam and reports, 65 or higher (out of 100 points).					
C: Achieved 60% of goals and obtained total points of exam and reports, 55 or higher (out of 100 points).					
Examination					
試験期間中には何も行わない None during exam period					
Details of examination					
N/A					
Other information					
Dr. Toshihiko Eki: Room: G-505, Phone: 6907, E-mail: eki@chem.tut.ac.jp Dr. Terumichi Tanaka: Room: G-506. Phone: 6920, E-mail: terumichi-tanaka@tut.jp					

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

Reference URL

N/A

Office hours

Please make an appointment.

Relations to attainment objectives of learning and education

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力

応用化学・生命工学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

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

Have the ability to create imaginative technology to solve problems and put them into practice through learning, by experience, methodologies for research and development on the basis of the integration of extensive knowledge about applied chemistry, life science and their related fields

(D) Communication skills for global success

Have the communication skills to effectively express and disseminate one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other teammembers as well as leadership ability to contribute to the team's achievements

Key words

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

Subject name[English]	Advanced Molecular Function Chemistry 1[Advanced Molecular Function Chemistry 1]				
Schedule number	D54030060	Subject area	Advanced Applied Chemistry and Life Science	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Tue.1~1	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Applied Chemistry and Life Science			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	伊津野 真一, 岩佐 精二, 柴富 一孝, 原口 直樹 ITSUNO Shinichi, IWASA Seiji, SHIBATOMI Kazutaka, HARAGUCHI Naoki				
Numbering	CHE_DOC72225				
Objectives of class					
This course focuses on state-of-the-art technology of functional polymers and synthesis as for bioactive organic compounds. Synthesis and various applications of the functional polymers and bioactive organic compounds will be discussed.					
Contents of class					
(1) General aspects of functional polymers (Itsuno, Haraguchi) (2) Precise molecular design of functional polymers(Itsun, Haraguchi) (3) Preparation of highly functionalized polymers(Itsun, Haraguchi) (4) Reactive polymer synthesis(Itsun, Haraguchi) (5) Optically active polymers(Itsun, Haraguchi) (6) Asymmetric synthesis and polymerization(Itsun, Haraguchi) (7) Synthesis and structure-function relationship of biobased and biodegradable polymers(Itsun, Haraguchi) (8) Bioactive natural products (Iwasa) (9) Total synthesis of natural products (Iwasa) (10) Transition metal complexes and 18 electron rule (Iwasa) (11) Chiral catalysts and their applications (S. Iwasa) (12) Advanced Lewis acid catalysis. (Shibatomi) (13) Advanced organocatalysis. (Shibatomi) (14) Asymmetric synthesis of halogenated compounds and their synthetic applications. (Shibatomi) (15) Advanced organofluorine chemistry (Shibatomi)					
Self Preparation and Review					
Review each lecture and prepare for the next class with reference to the textbook.					
Related subjects					
D34030060 Advanced Molecular Function Chemistry 1 M44630100 Special Topics in Applied Organic Chemistry M24630460 応用有機化学特論					
Notes for textbook					
No textbooks are required.					
Notes for reference					
N/A					
Goals to be achieved					
To understand the latest trend of the research on functional polymers. To understand the latest trend of the research on total synthesis of natural products and their synthetic methods.					
Evaluation of achievement					
Presentation (50%) and discussion (50%) Evaluation basis] Students who attend all classes will be evaluated as follows: S: Achieved all goals and obtained total points of exam and reports, 90 or higher (out of 100 points). A: Achieved 80 % goals and obtained total points of exam and reports, 80 or higher (out of 100 points). B: Achieved 70 % of goals and obtained total points of exam and reports, 70 or higher (out of 100 points). C: Achieved 60 % of goals and obtained total points of exam and reports, 60 or higher (out of 100 points).					
Examination					
レポートで実施 By Report					
Details of examination					
N/A					
Other information					

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

Reference URL

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

Office hours

anytime

Relations to attainment objectives of learning and education

Key words

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

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

Subject name[English]	Advanced Building Environmental Engineering and Building Services[Advanced Building Environmental Engineering and Building Services]				
Schedule number	D55030030	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Mon.5~5	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Architecture and Civil Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	都築 和代, 島崎 康弘 TSUZUKI Kazuyo, SHIMAZAKI Yasuhiro				
Numbering	ARC_DOC74125				
Objectives of class					
The goal of this course is to help professionals update related to the recent research and development on life cycle assessment (LCA) for buildings, environmental symbiotic technologies, climatic building design and urban energy management.					
Contents of class					
The course consists of the following topics.					
1. Buildings and its Impact on the Global Environment					
2. Impact Assessment indices for Buildings					
3. Life Cycle Inventory for Buildings					
4. Overview of CASBEE					
5. Environmental Symbiotic Technologies (1)					
6. Environmental Symbiotic Technologies (2)					
7. Ecological Building Design (1)					
8. Ecological Building Design (2)					
9. Climatic Building Design (1)					
10. Climatic Building Design (2)					
11. Sustainable Building Design (1)					
12. Sustainable Building Design (2)					
13. Energy and Buildings (1)					
14. Energy and Buildings (2)					
15. Compact city –urban energy management–					
Self Preparation and Review					
The course materials such book chapter or academic paper related to this course will be appeared or provided at the first class or orientation.					
Related subjects					
Building science: Indoor Air Quality and Ventilation, Building and Urban Thermal Environment					
Notes for textbook					
The related handouts will be distributed.					
Reference1	Book title	Architecture for a Sustainable Future –All about the Holistic Approach in Japan–		ISBN	
	Author	Architectural Institute of Japan	Publisher	Institute for Building Environment and Energy Conservation	Publish year 2002
Notes for reference					
N/A					
Goals to be achieved					
Achievement level of this course is to understand the background of building's impact on the global environment, the practical strategies for sustainable building design, urban energy management and so on.					
Evaluation of achievement					
Reports related to this subject are reviewed to evaluate the achievement level.					
Examination					

レポートで実施 By Report
Details of examination N/A
Other information Kazuyo Tsuzuki: D-712, Phone: 0532-44-6840, Fax: 0532-44-6831, E-mail: ktsuzuki@ace.tut.ac.jp
Reference URL N/A
Office hours Kazuyo Tsuzuki: Thursday 13:00-14:30
Relations to attainment objectives of learning and education
Key words climatic building design, sustainable building design, building energy management, energy saving

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

Subject name[English]	Advanced Transportation Systems and Economics[Advanced Transportation Systems and Economics]				
Schedule number	D55030090	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Tue.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Architecture and Civil Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	洗澤 博幸, 杉木 直 SHIBUSAWA Hiroyuki, SUGIKI Nao				
Numbering	ARC_DOC73325				
Objectives of class					
To obtain the advanced knowledge of theories and methods for policies and planning for cities, regions,transportation, and the environment. To obtain the advanced knowledge of theories and methods for policies and planning for cities, regions,transportation and the environment.					
Contents of class					
By using books, reports and papers on cities, regions, infrastructure and the environment, students learn the advanced transportation systems and transportation economics. Discussion between the lecturer and students will be performed in the lecture time. By using books, reports and papers on cities, regions, infrastructure and the environment, students learn the advanced transportation systems and transportation economics. Discussion between the lecturer and students shall be performed in the lecture time.					
Self Preparation and Review					
Review each lecture and prepare for the next class with reference to the textbook.					
Related subjects					
Transportation systems Spatial economic system analysis Transportation systems Spatial economic system analysis					
Notes for textbook					
Textbooks and scientific papers will be announced at the start of the class. Textbooks and scientific papers will be announced at the start of the class.					
Notes for reference					
N/A					
Goals to be achieved					
1.To understand the necessity and significance of policy and planning for cities, regions,infrastructure and the environment. 2.To understand the concept of policy and planning for the above mentioned fields. 3.To understand methodologies in the above mentioned fields. 1.To understand the necessity and significance of policy and planning for cities, regions, infrastructure and the environment. 2.To understand the concept of policy and planning for the above mentioned fields. 3.To understand methodologies in the above mentioned fields.					

Evaluation of achievement

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

D1

- S: Total points obtained from exams and/or reports, etc., 90 or higher (out of 100 points).
A: Total points obtained from exams and/or reports, etc., 80 or higher (out of 100 points).
B: Total points obtained from exams and/or reports, etc., 70 or higher (out of 100 points).
C: Total points obtained from exams and/or reports, etc., 60 or higher (out of 100 points).

D2-3

- A: Total points obtained from exams and/or reports, etc., 80 or higher (out of 100 points).
B: Total points obtained from exams and/or reports, etc., 65 or higher (out of 100 points).
C: Total points obtained from exams and/or reports, etc., 55 or higher (out of 100 points).
Home work assignments shall be required. Final reports or examination shall be conducted.

D1

- S: Total points obtained from exams and/or reports, etc., 90 or higher (out of 100 points).
A: Total points obtained from exams and/or reports, etc., 80 or higher (out of 100 points).
B: Total points obtained from exams and/or reports, etc., 70 or higher (out of 100 points).
C: Total points obtained from exams and/or reports, etc., 60 or higher (out of 100 points).

D2-3

- A: Total points obtained from exams and/or reports, etc., 80 or higher (out of 100 points).
B: Total points obtained from exams and/or reports, etc., 65 or higher (out of 100 points).
C: Total points obtained from exams and/or reports, etc., 55 or higher (out of 100 points).

Examination

レポートで実施

By Report

Details of examination

N/A

Other information

Shibusawa: room(D-709), hiro-shibu@tut.jp, phone: 0532-44-6955
Sugiki: room(D-705), sugiki@ace.tut.ac.jp, phone: 0532-44-6833
Shibusawa: room(D-709), hiro-shibu@tut.jp, phone: 0532-44-6955
Sugiki: room(D-705), sugiki@ace.tut.ac.jp, phone: 0532-44-6833

Reference URL

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

Office hours

Hiroyuki Shibusawa: At any time. Please contact Shibusawa by e-mail in advance.
Nao Sugiki: At any time. Please contact Sugiki by e-mail in advance.
Hiroyuki Shibusawa: At any time. Please contact Shibusawa by e-mail in advance.
Nao Sugiki: At any time. Please contact Sugiki by e-mail in advance.

Relations to attainment objectives of learning and education

(C) 高度な知識を統合的・発展的に活用できる実践力・創造力
建築・都市システム学およびその関連分野に関する高度な知識を修得し、それらを広範囲に有機的に連携させた研究開発方法論を体得することで、課題解決のための独創的な技術を創造し、実践できる能力を身につけている。

(C) Practical and creative skills to utilize advanced knowledge in an integrated and developed manner
Have advanced knowledge about architecture and civil engineering as well as related fields; and have the practical and creative skills to utilize such knowledge for problem solving, understanding the methodology of research, creating original technology, and integrating all knowledges organically.

Key words

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

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

Subject name[English]	Advanced Management of Technology[Advanced Management of Technology]				
Schedule number	D55030110	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Wed.4~4	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Architecture and Civil Engineering			Begging grade	D1
Charge teacher name[Roman alphabet mark]	藤原 孝男 FUJIWARA Takao				
Numbering	ARC_DOC75025				
Objectives of class					
<p>The main objective is to understand the function of technological entrepreneurship for commercialization of basic research results from a perspective of financial engineering. Especially the decision-making model is examined for irreversible investment under uncertainty.</p> <p>The main objective is to understand the function of technological entrepreneurship for commercialization of basic research results from a perspective of financial engineering. Especially the decision-making model is examined for irreversible investment under uncertainty.</p>					
Contents of class					
<p>From a view point regarding the technological development as risky but competitive investment, this class has following topics: 1-2:Technological entrepreneurship 3-5:Investment decision 6-8:Basic real options 9-11:Optio valuation methods 12-15:Application and cases</p> <p>For each week class discussion, self-preview & review are expected.</p> <p>From a view point regarding the technological development as risky but competitive investment, this class has following topics: 1-2:Technological entrepreneurship 3-5:Investment decision 6-8:Basic real options 9-11:Optio valuation methods 12-15:Application and cases</p> <p>For each week class discussion, self-preview & review are expected.</p>					
Self Preparation and Review					
<p>Review each lecture and prepare for the next class with reference to the material. Review each lecture and prepare for the next class with reference to the material.</p>					
Related subjects					
<p>Management Science (English), Operations Management (Japanese), Real Options (Japanese), Game Theory (Japanese), Finance (Japanese), & Entrepreneurship (Japanese), Management Science (English), Operations Management (Japanese), Real Options (Japanese), Game Theory (Japanese), Finance (Japanese), & Entrepreneurship (Japanese).</p>					
Notes for textbook					
<p>Studying materials will be introduced at first class time. Studying materials will be introduced at first class time.</p>					
Notes for reference					
<p>N/A N/A</p>					
Goals to be achieved					

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

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

Evaluation of achievement

Evaluation method: Scoring is based on reports .

Evaluation criteria:

S: 90 or higher, A: 80 or higher, B: 70 or higher, C: 60 or higher (Maximum scoring 100).

Evaluation method: Scoring is based on reports .

Evaluation criteria:

S: 90 or higher, A: 80 or higher, B: 70 or higher, C: 60 or higher (Maximum scoring 100).

Examination

レポートで実施

By Report

Details of examination

N/A

N/A

Other information

N/A

N/A

Reference URL

N/A

N/A

Office hours

Anytime if available.

Anytime if available.

Relations to attainment objectives of learning and education

(B) 技術者・研究者としての正しい倫理観と社会性

高度上級技術者・研究者としての専門的・倫理的責任を有し、社会における技術的課題を発見・設定・解決・評価する能力を身につけている。

(B) Sound ethics and social awareness as advanced-level engineers and researchers

Be conscious of specialized and ethical responsibilities as leading -level engineers and researchers; and have the ability to discover, set, solve and evaluate technical issues in society

Key words

Real Options, Game Theory, & Technological Entrepreneurship

Real Options, Game Theory, & Technological Entrepreneurship

(D55030130)Advanced Western Culture[Advanced Western Culture]

Subject name[English]	Advanced Western Culture[Advanced Western Culture]				
Schedule number	D55030130	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Fri.2~2	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Architecture and Civil Engineering			Begging grade	D1
Charge teacher name[Roman alphabet mark]	相京 邦宏 AIKYO Kunihiro				
Numbering	ARC_DOC75025				
Objectives of class					
Research on a history of scientific ideas in the ancient world. Research on a history of scientific ideas in the ancient world.					
Contents of class					
Lecture on a view of nature and science in the ancient world. Modern science and ancient 'science'. What are similarities or differences between the two?					
Program of lecture					
1. Orientation (outline of the lecture)					
2. Purpose of the Series					
3. Science in Antiquity?					
4. Modern Science 1					
5. Modern Science 2					
6. History and Philosophy					
7. Building Histories 1					
8. Building Histories 2					
9. Building Histories 3					
10. Intellectual Paternities 1					
11. Intellectual Paternities 2					
12. Selective Survival of Texts					
13. Resources for History 1					
14. Resources for History 2					
15. Summary of the lecture					
Lecture on a view of nature and science in the ancient world. Modern science and ancient 'science'. What are similarities or differences between the two?					
Program of lecture					
1. Orientation (outline of the lecture)					
2. Purpose of the Series					
3. Science in Antiquity?					
4. Modern Science 1					
5. Modern Science 2					
6. History and Philosophy					
7. Building Histories 1					
8. Building Histories 2					
9. Building Histories 3					
10. Intellectual Paternities 1					
11. Intellectual Paternities 2					
12. Selective Survival of Texts					
13. Resources for History 1					
14. Resources for History 2					
15. Summary of the lecture					
Self Preparation and Review					

Preparation & review of text Preparation & review of text
Related subjects 「特になし」 N/A
Notes for textbook 特になし N/A
Notes for reference Roger French, Ancient Natural History. Routledge, 1994. Roger French, Ancient Natural History. Routledge, 1994.
Goals to be achieved (1)A correct perception of a history of science. (2)A comprehensive grasp of the origin of scientific ideas in Western Europe. (3)Understanding of basic terms on a history of science. (4)A correct understanding of a relation between modern science and pre-modern science. (5)A total appreciation of a transition of scientific ideas. (6)A correct understanding of literature on a history of science. (1)A correct perception of a history of science. (2)A comprehensive grasp of the origin of scientific ideas in Western Europe. (3)Understanding of basic terms on a history of science. (4)A correct understanding of a relation between modern science and pre-modern science. (5)A total appreciation of a transition of scientific ideas. (6)A correct understanding of literature on a history of science.
Evaluation of achievement Holding the end-of-term exams. Holding the end-of-term exams.
Examination レポートで実施 By Report
Details of examination 特になし N/A
Other information 特になし N/A
Reference URL 特になし N/A
Office hours pm. 1-4(Wednesday) pm. 1-4(Wednesday)
Relations to attainment objectives of learning and education 建築・都市システム学専攻 (A)幅広い人間性と考え方 人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち、人間と自然との共生、公共の福祉について俯瞰的にとらえる能力を身につけている。 (D)グローバルに活躍できるコミュニケーション力 グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。
Graduate Program of Architecture and Civil Engineering for Doctoral Degree (A) Personality and outlook with a broad perspective

Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare with a wide view.

(D) Communication skills for global success

Have the communication skills to effectively express and transmit one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other teammembers. Have sophisticated ability as a leader to contribute for the achievement the goal of team.

Key words

ancient, science, history

ancient, science, history

(D55030150)Advanced Environmental Control in Biology[Advanced Environmental Control in Biology]

Subject name[English]	Advanced Environmental Control in Biology[Advanced Environmental Control in Biology]				
Schedule number	D55030150	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Elective
Time of starting a course	Spring term	Day of the week,period	Tue.3~3	Credit(s)	2
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Architecture and Civil Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	高山 弘太郎, 東海林 孝幸 TAKAYAMA Kotaro, TOKAIRIN Takayuki				
Numbering	ARC_DOC75025				
Objectives of class 太陽光型植物工場や人工光型植物工場などの環境制御型農業生産施設における環境制御と植物環境応答について高度な知識を身に付ける。 Advanced Environmental Control in Biology [Advanced Environmental Control in Biology]					
Contents of class 第1回: 太陽光植物工場と人工光植物工場 第2回: クロロフィル蛍光と光合成の基礎, クロロフィル蛍光計測 I -インダクション法- 第3回: クロロフィル蛍光計測 II -飽和パルス法, PAM, 画像計測法- 第4回: 匂い成分計測技術 I -ガスクロマトグラフィの基礎- 第5回: 匂い成分計測技術 II -植物診断技術としての匂い成分計測- 第6回: 光合成と蒸散のガス収支の基礎 第7回: 開放型光合成蒸散測定 of 計算 第8回: 環境制御の概論 第9回: 太陽光植物工場の環境制御 第10回: 人工光植物工場の環境制御 第11回: 大気環境学1 大気の流れ 第12回: 大気環境学2 大気の流れの数式化 第13回: 大気環境学3 シミュレーション-1 第14回: 大気環境学4 シミュレーション-2 第15回: 総括 1. Intelligent greenhouse and plant factory of artificial lighting 2. Chlorophyll fluorescence measurement for plant diagnosis-1: Induction method 3. Chlorophyll fluorescence measurement for plant diagnosis-2: Saturation pulse method, PAM and imaging 4. Volatile organic compound measurement-1: Gas chromatography -1: Basics 5. Volatile organic compound measurement-1: Gas chromatography -1: For plant diagnosis 6. Photosynthesis and transpiration as gas exchanges between atmosphere and plant 7. Open chamber method for photosynthesis measurement 8. Outline of environmental control in biology 9. Environmental control in intelligent greenhouse 10. Environmental control in plant factory of artificial lighting 11. Atmospheric environment-1: Dynamics of air in atmosphere 12. Atmospheric environment-2: Formulation of air dynamics 13. Atmospheric environment-3: Simulation/modeling of atmosphere-1 14. Atmospheric environment-4: Simulation/modeling of atmosphere-2 15. Discussion for the prospect					
Self Preparation and Review 担当教員が執筆した研究論文を参考に学習を行う。 Referring the research papers published by the teachers in charge.					
Related subjects 特になし N/A					
Notes for textbook					

特になし N/A						
Reference1	Book title	Plants and microclimate : a quantitative approach to environmental plant physiology			ISBN	0521425247
	Author	Hamlyn G. Jones	Publisher	Cambridge University Press	Publish year	1992
Notes for reference 特になし N/A						
Goals to be achieved 1. 環境制御型農業生産に求められる環境制御技術を理解すること 2. 植物環境応答の高度な知識と理解 3. 大気環境の高度な知識と理解 1. Advanced knowledge and understanding of environmental control in horticulture 2. Advanced knowledge and understanding of plant environmental responses and plant diagnosis 3. Advanced knowledge and understanding of Atmospheric environment						
Evaluation of achievement レポート 50% 授業中の口頭試問 50% 左記の割合で、総合的に評価する。 50% on reports, 50% on oral examination in the lectures.						
Examination レポートで実施 By Report						
Details of examination 特になし N/A						
Other information 特になし N/A						
Reference URL 特になし N/A						
Office hours 火曜日 11～13時 Tuesday 11am-1pm						
Relations to attainment objectives of learning and education 建築・都市システム学専攻 (A) 幅広い人間性と考え方 人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち、人間と自然との共生、公共の福祉について俯瞰的にとらえる能力を身につけている。 (B) 技術者・研究者としての正しい倫理観と社会性 高度上級技術者・研究者としての専門的・倫理的責任を有し、社会における技術的課題を発見・設定・解決・評価する能力を身につけている。 Graduate Program of Architecture and Civil Engineering for Doctoral Degree (A) Personality and outlook with a broad perspective Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as publicwelfare with a wide view. (B) Sound ethics and social awareness as advanced-level engineers and researchers Be conscious of specialized and ethical responsibilities as leading -level engineers and researchers; and have the ability to discover, set, solve and evaluate technical issues in society						
Key words 環境制御, 大気, 大気環境, モデル, シミュレーション, 植物, 作物, 農業, 施設園芸, 環境応答, 植物診断 Environmental control, atmosphere, atmospheric environment, modeling, simulation, plant, crop, agriculture, horticulture, environmental response, plant diagnosis.						

(S51010090)Teaching Practice on Global Education[Teaching Practice on Global Education]

Subject name[English]	Teaching Practice on Global Education[Teaching Practice on Global Education]				
Schedule number	S51010090	Subject area	Advanced Mechanical Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Mechanical Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	池松 峰男 IKEMATSU Mineo				
Numbering	COM_DOC71011				
Objectives of class					
As a result of this course, students will develop: -English presentation skills relating to course topics -STEM education skills applying design thinking -Intercultural communication skills to give lectures for multi-cultural students As a result of this course, students will develop: -English presentation skills relating to course topics -STEM education skills applying design thinking -Intercultural communication skills to give lectures for multi-cultural students					
Contents of class					
- Class preparation (orientation, lecture about the presentation, etc.) - Students will provide active learning lectures for TUT students and local high school students. - Class preparation (orientation, lecture about the presentation, etc.) - Students will provide active learning lectures for TUT students and local high school students.					
Self Preparation and Review					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English. Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Related subjects					
N/A N/A					
Notes for textbook					
N/A N/A					
Notes for reference					
N/A N/A					
Goals to be achieved					
Students will be able to: -provide lectures using English presentation slide -give lectures to develop students' STEM skills applying design thinking -understand intercultural communication to accomplish these lectures Students will be able to: -provide lectures using English presentation slide -give lectures to develop students' STEM skills applying design thinking -understand intercultural communication to accomplish these lectures					
Evaluation of achievement					
Report (30%), Contribution (participation, presentation, etc.) (70%) S: ≥ 90 A: ≥ 80 B: ≥ 70 C: ≥ 60					

<p>Report (30%), Contribution (participation, presentation, etc.) (70%)</p> <p>S: ≥ 90</p> <p>A: ≥ 80</p> <p>B: ≥ 70</p> <p>C: ≥ 60</p>
<p>Examination</p> <p>試験期間中には何も行わない</p> <p>None during exam period</p>
<p>Details of examination</p> <p>N/A</p> <p>N/A</p>
<p>Other information</p> <p>N/A</p> <p>N/A</p>
<p>Reference URL</p> <p>N/A</p> <p>N/A</p>
<p>Office hours</p> <p>Drop-in basis.</p> <p>Drop-in basis.</p>
<p>Relations to attainment objectives of learning and education</p> <p>機械工学専攻</p> <p>(D)グローバルに活躍できるコミュニケーション力</p> <p>グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。</p> <p>Graduate Program of Mechanical Engineering for Doctoral Degree</p> <p>(D) Communication skills for global success</p> <p>Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members, and the high ability to contribute to the goals of the team as a leader</p>
<p>Key words</p>

(S52010090)Teaching Practice on Global Education[Teaching Practice on Global Education]

Subject name[English]	Teaching Practice on Global Education[Teaching Practice on Global Education]				
Schedule number	S52010090	Subject area	Advanced Electrical and Electronic Information Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Electrical and Electronic Information Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	池松 峰男 IKEMATSU Mineo				
Numbering	COM_DOC71011				
Objectives of class					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
Contents of class					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
Self Preparation and Review					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Related subjects					
N/A					
N/A					
Notes for textbook					
N/A					
N/A					
Notes for reference					
N/A					
N/A					
Goals to be achieved					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Evaluation of achievement					
Report (30%), Contribution (participation, presentation, etc.) (70%)					

S: ≥ 90

A: ≥ 80

B: ≥ 70

C: ≥ 60

Report (30%), Contribution (participation, presentation, etc.) (70%)

S: ≥ 90

A: ≥ 80

B: ≥ 70

C: ≥ 60

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

N/A

N/A

Reference URL

N/A

N/A

Office hours

Drop-in basis.

Drop-in basis.

Relations to attainment objectives of learning and education

電気・電子情報工学専攻

(A) 幅広い人間性と考え方

人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち、人間と自然との共生、公共の福祉について俯瞰的にとらえる能力を身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

Graduate Program of Engineering of Electrical and Electronic Information Engineering for Doctoral Degree

(A) Personality and outlook with a broad perspective

Have an international mindset to see human society from various angles with a global perspective; the ability to consider the symbiosis between humans and nature as well as public welfare

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on issues faced by a globally changing society in cooperation with other team members

Key words

(S53010090)Teaching Practice on Global Education[Teaching Practice on Global Education]

Subject name[English]	Teaching Practice on Global Education[Teaching Practice on Global Education]				
Schedule number	S53010090	Subject area	Advanced Computer Science and Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Computer Science and Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	池松 峰男 IKEMATSU Mineo				
Numbering	COM_DOC71011				
Objectives of class					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
Contents of class					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
Self Preparation and Review					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Related subjects					
N/A					
N/A					
Notes for textbook					
N/A					
N/A					
Notes for reference					
N/A					
N/A					
Goals to be achieved					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Evaluation of achievement					
Report (30%), Contribution (participation, presentation, etc.) (70%)					
S: ≥ 90					

A: ≥ 80

B: ≥ 70

C: ≥ 60

Report (30%), Contribution (participation, presentation, etc.) (70%)

S: ≥ 90

A: ≥ 80

B: ≥ 70

C: ≥ 60

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

N/A

N/A

Reference URL

N/A

N/A

Office hours

Drop-in basis.

Drop-in basis.

Relations to attainment objectives of learning and education

情報・知能工学専攻

(A) 幅広い人間性と考え方

人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち、人間と自然との共生、公共の福祉について俯瞰的にとらえる能力を身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、身につけている。

Graduate Program of Computer Science and Engineering for Doctoral Degree

(A) Personality and outlook with a broad perspective

Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as public welfare

(D) Communication skills for global success

Have the communication skills to effectively express one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other team members. Has sophisticated ability as a leader to contribute for the achievement the goal of team.

Key words

(S54010110)Teaching Practice on Global Education[Teaching Practice on Global Education]

Subject name[English]	Teaching Practice on Global Education[Teaching Practice on Global Education]				
Schedule number	S54010110	Subject area	Advanced Applied Chemistry and Life Science	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Applied Chemistry and Life Science			Begging grade	D1
Charge teacher name[Roman alphabet mark]	池松 峰男 IKEMATSU Mineo				
Numbering	COM_DOC71015				
Objectives of class					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
Contents of class					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
Self Preparation and Review					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Related subjects					
N/A					
N/A					
Notes for textbook					
N/A					
N/A					
Notes for reference					
N/A					
N/A					
Goals to be achieved					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Evaluation of achievement					
Report (30%), Contribution (participation, presentation, etc.) (70%)					
S: ≥ 90					

A: ≥ 80

B: ≥ 70

C: ≥ 60

Report (30%), Contribution (participation, presentation, etc.) (70%)

S: ≥ 90

A: ≥ 80

B: ≥ 70

C: ≥ 60

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

N/A

N/A

Reference URL

N/A

N/A

Office hours

Drop-in basis.

Drop-in basis.

Relations to attainment objectives of learning and education

応用化学・生命工学専攻

(A) 幅広い人間性と考え方

人間社会を地球的な視点から多面的にとらえるグローバルな感性を持ち、人間と自然との共生、公共の福祉について俯瞰的にとらえる能力を身につけている。

(D) グローバルに活躍できるコミュニケーション力

グローバルに変化する社会が抱える課題にチームとして協調して取り組む中で、自らの考えや成果を効果的に表現・発信するコミュニケーション力と、リーダーとしてチームの目標達成に寄与できる高い能力を身につけている。

Graduate Program of Applied Chemistry and Life Science for Doctoral Degree

(A) Personality and outlook with a broad perspective

Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as public welfare

(D) Communication skills for global success

Have the communication skills to effectively express and disseminate one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other teammates as well as leadership ability to contribute to the team's achievements

Key words

(S55010090)Teaching Practice on Global Education[Teaching Practice on Global Education]

Subject name[English]	Teaching Practice on Global Education[Teaching Practice on Global Education]				
Schedule number	S55010090	Subject area	Advanced Architecture and Civil Engineering	Required or elective	Required
Time of starting a course	Year	Day of the week,period	Intensive	Credit(s)	1
Faculty	Graduate Program for Doctoral Degree			Subject grade	1~
Department Offered	Architecture and Civil Engineering			Beggining grade	D1
Charge teacher name[Roman alphabet mark]	池松 峰男 IKEMATSU Mineo				
Numbering	COM_DOC71015				
Objectives of class					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
As a result of this course, students will develop:					
-English presentation skills relating to course topics					
-STEM education skills applying design thinking					
-Intercultural communication skills to give lectures for multi-cultural students					
Contents of class					
- Class preparation (orientation, lecture about the presentation, etc.)					
- Students will provide active learning lectures for TUT students and local high school students.					
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- Students will provide active learning lectures for TUT students and local high school students.					
Self Preparation and Review					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Students are required to facilitate communication by group members for discussion and preparation of presentation materials in English.					
Related subjects					
N/A					
N/A					
Notes for textbook					
N/A					
N/A					
Notes for reference					
N/A					
N/A					
Goals to be achieved					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Students will be able to:					
-provide lectures using English presentation slide					
-give lectures to develop students' STEM skills applying design thinking					
-understand intercultural communication to accomplish these lectures					
Evaluation of achievement					
Report (30%), Contribution (participation, presentation, etc.) (70%)					
S: ≥ 90					

A: ≥ 80

B: ≥ 70

C: ≥ 60

Report (30%), Contribution (participation, presentation, etc.) (70%)

S: ≥ 90

A: ≥ 80

B: ≥ 70

C: ≥ 60

Examination

試験期間中には何も行わない

None during exam period

Details of examination

N/A

N/A

Other information

N/A

N/A

Reference URL

N/A

N/A

Office hours

Drop-in basis.

Drop-in basis.

Relations to attainment objectives of learning and education

建築・都市システム学専攻

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Graduate Program of Architecture and Civil Engineering for Doctoral Degree

(A) Personality and outlook with a broad perspective

Have an international mindset to see human society from various angles with a global perspective; and the ability to consider the symbiosis between humans and nature as well as public welfare with a wide view.

(D) Communication skills for global success

Have the communication skills to effectively express and transmit one's own ideas and results while working on the issues faced by a globally changing society in cooperation with other teammates. Have sophisticated ability as a leader to contribute for the achievement the goal of team.

Key words