Department of Biological Functions Engineering ・Department of Human Intelligence Systems
Common Course

Course Title(科目名)	Society and Technology		
Lecturer(担当教員)	Toshio Anzaj, Kouichi Nakano		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Some of the most important things for the people who will lead the future technology are to make a contribution to the human happiness and to feel strongly about professional job consciousness. When we develop a new technology, engineer should seek a solution to a problem and should give careful attention to the trends of public opinion for the technology. It is important to consider the various social problems including an environmental problem and an energy problem from the point of view on the correlation between technology and society. In this lecture, first of all, we consider how to realize safety and peace of mind looking back at history of science and technology and accident examples. Next, we consider why the engineers responsibility and morals are inquired returning to the fundamentals. We explain about engineering strategy of companies, management sense, and legal knowledge for engineers. Material engineering from the past to the future is also explained returning to the craftmanship fundamentals.		
Topics/Schedule (授業計画)	1 Engineers morals (The engineers responsibility in the conpanies (1) 2 Engineers morals (The engineers responsibility in the conpanies (2) 3 Engineers morals (The engineers responsibility in the conpanies (3) 4 Engineers morals (Why the engineers morals are inquired ? (1)) 5 Engineers morals (Why the engineers morals are inquired ? (2)) 6 Engineers morals (Why the engineers morals are inquired ? (3)) 7 Engineering strategy of companies and management sense for engineers (1) 8 Engineering strategy of companies and management sense for engineers (2) 9 Engineering strategy of companies and management sense for engineers (3) 10 Legal knowledge for engineers (1) 11 Legal knowledge for engineers (2) 12 Legal knowledge for engineers (3) 13 Material engineering from the past to the future (1) 14 Material engineering from the past to the future (2) 15 Material engineering from the past to the future (3)		
Evaluation/Grading Policy (成績評価方法)	Basically, the evaluation by the reports for the given theme is executed.		
Remarks (履修上の注意)	Nothing		
Expected preparation and review (授業外学習(予習・復習)の指示)	Downloading a handout and reading through it once is required. You must submit the reports for the theme indicated at the end of class.		
Textbooks, References (教科書・参考書・資料)	The textbooks are not used. The reference books are shown below. (1) Murakami, Basis of modern engineering − History of engineering −, Iwanami, 2001 (in Japanese) (2) The institution of professionsl engineers,Japan, The morals of scientific technicians − its way of thinking and examples −, Maruzen, 1998 (in Japanese) (3) Satsuno, Enginners morals, University of the air educational promotion, 2004 (in Japanese) (4) a Compendium of Laws (in Japanese) Materials for class are distributed during class.		
Language (使用言語)	Usually, we conduct class in Japanese. If there are some students wishing explanation in English, we will give individual advice to the students.		

Course Title(科目名)	Introduction to Green Technology		
Lecturer(担当教員)	Prof. Kato, Prof.Abe, Prof.Hayase, Prof.Nishida		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Green Technology which is technology in harmony with nature is necessary to create sustainable society. Lectureres from Div of Green Technology, Green Electronics, Environmentally Conscious Chemistry and Bioengineering would give you outlook of Green Technology.		
Topics/Schedule (授業計画)	1. Current situation and perspectives on the Energy use 2. Solid Oxide Fuel Cell Technology 3. Hydrogen Production Technology and High Temperature Steam Electrolysis 4. Energy technology for zero-emission 5. History of Switched Mode of Power Supply(SMPS) 6. Circuit of SMPS 7. Control of SMPS 8. Power Supply System and SMPS 9. Outlook of Solar Cell 10. Printable Solar Cell 11. Solar Cell Application for Green Technology 12. Outlook of Fuel Cell 13. Outlook of Bioplastics 14. Basic Functions and Applications of Bioplastics 15. Bioplastics and Recycling 16. Bioplastics and Sustainability		
Evaluation/Grading Policy (成績評価方法)	Grading will be decided based on attendance, and reports to each lectureres.		
Remarks (履修上の注意)	Strongly recommended for attendance of students who belongs to Dept of Biological Funtions Engineering. Mind the schedule to be announced.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	It is recommended to visit each lectures website to know the area of research beforehand. Searching books or website relating to topics of each lectures will be helpful for your better understanding.		
Textbooks, References (教科書・参考書・資料)	Will be introduced in the class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Introduction to Human Intelligence Systems		
Lecturer(担当教員)	Professors/Associate professors of Department of Human Intelligence Systems		
Course intended for (対象学年)	1st or 2nd year student		
Credit Category(単位区分)	Elective and required course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Department of Human Intelligence Systems aims to train students to become engineers/researchers who can solve social problems through researches related to development of intelligent mechanical systems, artificial intelligent systems, brain science and principles of human reasoning. This course intends to provide students with basic knowledge to understand other specialized courses. This course will be provided by four divisions as following; Human Intelligence and Machines, Intelligence Systems and Emergent Design, Human Interaction and Brain Functions, and Human Behavioral Sciences.		
Topics/Schedule (授業計画)	1～5. (1) Basic knowledge, latest research topics, test of Human Intelligence and Machines Division ～10. (2) Basic knowledge, latest research topics, test of Intelligence Systems and Emergent Design Division ～15. (3) Basic knowledge, latest research topics, test of Human Interaction and Brain Functions Division 16. (4) Basic knowledge, latest research topics, test of Human Behavioral Sciences Division		
Evaluation/Grading Policy (成績評価方法)	Evaluation will be done by the summation of four tests.		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習 (予習・復習)の指示)	The students are expected to review all contents/keywords presented in the course.		
Textbooks, References (教科書・参考書・資料)	Will be lectured in the course.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Department of Biological Functions Engineering

Practical Course

科目名	英語 VIIC-1
科目名(英語表記)	English VIIC-1
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q1)
講義室	
曜日・時限	木曜4限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This comprehensive course aims at improving practical English proficiency in four skills: reading, listening, speaking and writing. By facilitating the learning of English in science fields, this course serves as a preparation for presenting at scholastic conferences and writing abstracts This course also offers opportunities to practice short oral presentations, and question and answers. Basic English proficiency is a prerequisite.
カリキュラムにおけるこの授業の位置付け	This is a level VII comprehensive course. Those who have passed any level VIII or higher courses (two quarters combined; VIIIA-1・2, VIIIB-1・ 2, VIIID-1・ 2, IXA-1・2, IXB-1・ 2, IXD-1・ 2, XA-1・2, XB-1・ 2, XD-1・ 2) cannot take this course.
授業項目	1. Course overview and Textbook Unit 1 Bare Bones 2. Unit 1 Bare Bones 3. Unit 2 Mummy Mystery 4. Unit 4 Mission to Mars 5. Unit 8 Free Fall 6. Unit 9 The Hidden Lives of Leaves 7. Unit 9 The Hidden Lives of Leaves 8. Final mini-presentation and Final Examination
授業の進めかた	Classes are a combination of listening, mini-presentations in groups, reading texts, answering the related questions and conversational practices.
授業の達成目標	1. To read and understand the basic English texts in science fields. 2. To write concise summaries of the English texts in science fields. 3. To listen and be able to understand the basic spoken English in science fields. 4. To be able to speak English confidently by presenting mini-talks in a group.
成績評価の基準および評価方法	Abstract writing 30% Listening Quiz 30% Mini-presentations in group 20% Short final presentation in group 5% Final exam 15%
授業外学習(予習・復習)の指示	Students are expected to prepare a mini-presentation each week as well as write concise abstracts of each unit. Pre-studying the texts and listening to the audios of the summary texts are also required.
キーワード	comprehensive English, reading, writing, listening, speaking
教科書	Science Frontiers: Developing Your English with National Geographic. Keiko Hattori, Toshio Hidaka, Yayoi Yamashita, Kana Matsuda, Judy Noguchi. Cengage 978-4-86312-289-5
参考書	Students are encouraged to bring their dictionaries and use them in the class.
備考	原則として英語 VIIC-2と対で連続で履修すること。

科目名	英語 VIIC-2
科目名(英語表記)	English VIIC-2
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q2)
講義室	
曜日・時限	木曜4限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This comprehensive course aims at improving practical English proficiency in four skills: reading, listening, speaking and writing. By facilitating the learning of English in science fields, this course serves as a preparation for presenting at scholastic conferences and writing abstracts This course also offers opportunities to practice short oral presentations, and question and answers. Basic English proficiency is a prerequisite.
カリキュラムにおけるこの授業の位置付け	This is the second quarter continuation of English VIIC-1. Those who want to take this course must have passed English VIIC-1.
授業項目	1. Course overview and Textbook Unit 10 Getting the Shot 2. Unit 10 Getting the Shot 3. Unit 11 Attack of the Germs 4. Unit 12 Just Like the Earth? 5. Unit 13 The Skin You're In 6. Unit 14 Weirdest Wonders 7. Unit 15 Aquarius 8. Final-mini presentation and Final Examination
授業の進めかた	Classes are a combination of listening, mini-presentations in groups, reading texts, answering the related questions and conversational practices.
授業の達成目標	1. To read and understand the basic English texts in science fields. 2. To write concise summaries of the English texts in science fields. 3. To listen and be able to understand the basic spoken English in science fields. 4. To be able to speak English confidently by presenting mini-talks in a group.
成績評価の基準および評価方法	Abstract writing 30% Listening Quiz 30% Mini-presentations in group 20% Short final presentation in group 5% Final exam 15%
授業外学習(予習・復習)の指示	Students are expected to prepare a mini-presentation each week as well as write concise abstracts of each unit. Pre-studying the texts and listening to the audios of the summary texts are also required.
キーワード	comprehensive English, reading, writing, listening, speaking
教科書	Science Frontiers: Developing Your English with National Geographic. Keiko Hattori, Toshio Hidaka, Yayoi Yamashita, Kana Matsuda, Judy Noguchi. Cengage 978-4-86312-289-5
参考書	Students are encouraged to bring their dictionaries and use them in the class.
備考	原則として英語 VIIC-1と対で連続で履修すること。

科目名	英語 IXD-1
科目名(英語表記)	English IXD-1
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	後期(Q3)／(Q4)
講義室	
曜日・時限	木曜5限／月曜6限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	The purpose of this course is to help students to gain confidence with speaking in English. In this course, you will learn about using English by completing various guided activities, group speaking activities and practical exercises. This course will also practice other English skills such as listening, reading and writing. However, the focus will be on speaking and understanding practical, realistic styles of English.
カリキュラムにおけるこの授業の位置付け	This is a level IX course for speaking concentration. Those who want to take this course must have passed any level VIII courses (two quarters combined; VIIIA-1・2, VIIIB-1・2, VIIID-1・2) or by instructors' permission.
授業項目	1 Course outline and Textbook Lessons 1A. "Gender and Society". 3 Textbook Lessons 1B. " Gender and Society" 3 Textbook Lessons 2A. " Reproducing Life" 4 Textbook Lessons 2B. " Reproducing Life" 5 Textbook Lessons 3A. "Human Migration " 6 Textbook Lessons 3B. "Human Migration " 7 Group Listening Activity/Presentation preparation. 8 Group Listening Activity/Final Presentation.
授業の進めかた	Following the texbook topics, students practice speaking activities, discuss, and making speeches. There will be homework acitivites, in-class quizzes, and final presentation.
授業の達成目標	The purpose of this course is to help students to gain confidence with speaking in English.
成績評価の基準および評価方法	Final Presentation: (40%) Listening Quizzes: (40%) Homework Activities (10%) Textbook Quiz (10%)
授業外学習(予習・復習)の指示	In preparation for this class it would be good if you could listen and watch some news programs or presentations in English. These web sites are useful: http://www3.nhk.or.jp/nhkworld/ or http://www.elllo.org/index.htm
キーワード	Speaking, English, English speaking, discussion, debate
教科書	Pathways: Listening, Speaking and Critical Thinking 3: Combo Split 3A with Online Workbook Access Code〔2012 年〕新版 (Cengage Learning) ISBN 978-1-285-15976-8 Becky, Traver Chase, Kristin L. Johannsen et al.
参考書	Students are encouraged to bring a dictionary to class.
備考	原則として英語 IXD-2と対で連続で履修すること。

科目名	英語 IXD-2
科目名(英語表記)	English IXD-2
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	後期(Q4)／(Q4)
講義室	
曜日・時限	木曜5限／木曜6限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	The purpose of this course is to help students to gain confidence with speaking in English. In this course, you will learn about using English by completing various guided activities, group speaking activities and practical exercises. This course will also practice other English skills such as listening, reading and writing. However, the focus will be on speaking and understanding practical, realistic styles of English.
カリキュラムにおけるこの授業の位置付け	This is the second quarter continuation of English IXD-1. Those who want to take this course must have passed English IXD-1.
授業項目	1 Review of Q1 and Homework Presentation 2 Textbook Lessons 4A. "Fascinating Planet" 3 Textbook Lessons 4B. "Fascinating Planet" 4 Textbook Lessons 5A. "Making a Living, Making a Difference" 5 Textbook Lessons 5B. "Making a Living, Making a Difference" 6 Texbook Review and completion quiz 7 Group Listening Activity/Presentation preparation 8 Final Pair Presentation
授業の進めかた	Following the texbook topics, students practice speaking activities, discuss, and making speeches. There will be homework acitivites, in-class quizzes, and final presentation.
授業の達成目標	The purpose of this course is to help students to gain confidence with speaking in English.
成績評価の基準および評価方法	Final Presentation: (40%) Listening Quizzes: (40%) Homework Activities (10%) Textbook Quiz (10%)
授業外学習(予習・復習)の指示	In preparation for this class it would be good if you could listen and watch some news programs or presentations in English. These web sites are useful: http://www3.nhk.or.jp/nhkworld/ or http://www.elllo.org/index.htm
キーワード	Speaking, English, English speaking, discussion, debate
教科書	Pathways: Listening, Speaking and Critical Thinking 3: Combo Split 3A with Online Workbook Access Code〔2012 年〕新版 (Cengage Learning) ISBN 978-1-285-15976-8 Becky, Traver Chase, Kristin L. Johannsen et al.
参考書	Students are encouraged to bring a dictionary to class.
備考	原則として英語 IXD-1と対で連続で履修すること。

科目名	英語 XA-1
科目名(英語表記)	English XA-1
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q1)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	Learning how to write an abstract and design a winning poster are crucial steps for researchers. This course is designed to equip students with the skills and experience required to effectively write an academic/scientific abstract to specific and/or general audiences in a real-world situation. Students will be expected to: 1. become familiar with the specific structure of academic abstracts 2. write an abstract and present it as a poster presentation 3. critically evaluate own and other students' writing
カリキュラムにおける この授業の位置付け	This is a level X course for writing concentration. Those who want to take this course must have passed any level IX courses (two quarters combined; IXA-1・2, IXB-1・ 2, IXD-1・ 2) or by instructors' permission.
授業項目	1. Course overview; Introduction to structure; writing evaluation 2. Abstract grammar and vocabulary 3. Summarizing 4. Abstract Introduction and Method; Designing a Poster 5. Abstract Results and Conclusion; Designing a Poster 6. Self- and Peer-Evaluation: Abstract and Poster 7. Submit Final Abstract; Poster Presentation 8. Final Exam; Reflection
授業の進めかた	Classes are a combination of lecture, poster presentations and writing practice. Students will share their writing in groups and edit each other's work.
授業の達成目標	1. To understand the basic structure of an abstract 2. To concisely state research objective, explain the research background, describe the research design and present results 3. To use appropriate register and tone for the specific genre of writing 4. To write grammatically accurate sentences using appropriate vocabulary
成績評価の基準および 評価方法	50% Final Abstract 20% Poster Presentation 20% Instructor Points 10% Final Exam
授業外学習(予習・復習) の指示	Students are expected to prepare a topic for a mini poster presentation each week as well as write and revise each section of their writing assignment in a timely manner. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Abstract Writing; Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	The teacher will provide a list of reference books in the first class
備考	原則として英語 XA-2と対で連続で履修すること。

科目名	英語 XA-2
科目名(英語表記)	English XA-2
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q2)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	Learning how to write an abstract and design a winning poster are crucial steps for researchers. This course is designed to equip students with the skills and experience required to effectively write an academic/scientific abstract to specific and/or general audiences in a real-world situation. Students will be expected to: 1. become familiar with the specific structure of academic abstracts 2. write an abstract and present it as a poster presentation 3. critically evaluate own and other students' writing
カリキュラムにおける この授業の位置付け	This is the second quarter continuation of English XA-1. Those who want to take this course must have passed English XA-1.
授業項目	1. Review XA-1 Skills; Introduction to Content; Research resources 2. Mini Research Project (PBL) 3. Abstract Introduction; ; Poster Design 4. Abstract Method; Poster Design 5. Abstract Results and Conclusion; Poster Design 6. Self- and Peer-Evaluation: Abstract and Poster 7. Submit Final Abstract; Poster Presentation 8. Final Exam; Reflection
授業の進めかた	Classes are a combination of lecture, poster presentations and writing practice. Students will share their writing in groups and edit each other's work.
授業の達成目標	1. To understand the basic structure of an abstract 2. To concisely state research objective, explain the research background, describe the research design and present results 3. To use appropriate register and tone for the specific genre of writing 4. To write grammatically accurate sentences using appropriate vocabulary
成績評価の基準および 評価方法	50% Final Abstract 20% Poster Presentation 20% Final Exam 10% Instructor Points
授業外学習(予習・復習) の指示	Students are expected to prepare a topic for a mini poster presentation each week as well as write and revise each section of their writing assignment in a timely manner. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Abstract Writing; Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	The teacher will provide a list of reference books in the first class
備考	原則として英語 XA-1と対で連続で履修すること。

科目名	英語 XD-1
科目名(英語表記)	English XD-1
クラス	1
担当教員	ホロウェイ・グレゴリー
対象学年	M1, 2
開講学期	前期(Q1)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This course is designed to equip students with the skills and experience required to effectively give an oral presentation and write an academic/scientific abstract to a general audience in a real-world situation. Specifically, students will be expected to: 1) Do two well-organized academic presentations; 2) Conduct a Q&A session confidently; 3) Critically evaluate your and other students' presentations; 4) Participate actively in each class.
カリキュラムにおけるこの授業の位置付け	This is a level X course for speaking concentration. Those who want to take this course must have passed any level IX courses (two quarters combined; IXA-1・2, IXB-1・2, IXD-1・2) or by instructor's permission.
授業項目	1. Course Overview; Example of Academic Presentation; Introduction to Fluency 2. Introduction to Presentation Skills 3. Introduction to Content/Structure 4. Presentation 1 5. Self- and Peer-Evaluation; Introduction to Q&A 6. Q&A Practice session; Practice for Finals 7. Individual Presentation 2; Submit abstract 8. Individual Presentation 2
授業の進めかた	Classes are a combination of lecture and presentation practice. This class will encourage real-life scenarios in that students will do mini poster preesntations frequently to practice fluency and Q&A.. Students will also work together in groups on specific tasks and help edit each other's work.
授業の達成目標	By the end of this course, students should be able to 1. understand the basic structure of an academic presentation 2. crtically evaluate a strong and weak presentation 3. stand confidently in front of peers and deliver a good presentation and Q&A session
成績評価の基準および評価方法	40% Presentation 1 40% Presentation 2 20% Instructor Points
授業外学習(予習・復習)の指示	To participate acticely in class, students are expected to prepare a topic for homework every week which will be presented in the next class. Homework must be completed in a timely manner in order to be prepared for group tasks. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Oral Presentation; PowerPoint; KeyNote; Academic Abstract Writing; Mini Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	A reference list will be given to students in the first class
備考	原則として英語 XD-2と対で連続で履修すること。

科目名	英語 XD-2
科目名(英語表記)	English XD-2
クラス	1
担当教員	ホロウェイ・グレゴリー
対象学年	M1, 2
開講学期	前期(Q2)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This course is designed to equip students with the skills and experience required to effectively give an oral presentation and write an academic/scientific abstract to a general audience in a real-world situation. Specifically, students will be expected to: 1) Do two well-organized academic presentations; 2) Conduct a Q&A session confidently; 3) Critically evaluate your and other students' presentations; 4) Participate actively in each class.
カリキュラムにおける この授業の位置付け	This is the second quarter continuation of English XD-1. Those who want to take this course must have passed English XD-1.
授業項目	1. Review of XD-1 skills; Introduction to Content/Visuals 2. Introduction to Abstract Writing; Presentation Language (Vocabulary and Grammar) 3. Final Presentation Preparation; Self- and Peer-Evaluation Visuals; Abstract wiriting 4. Final Presentation Preparation; Self- and Peer-Evaluation Fluency/Q&A; Abstract writing 5. Final Presentation Preparation; Self- and Peer-Evaluation: Presentation Skills; Language 6. Final Presentation; ; Submit Final Abstract 7. Final Presentation 8. Final Presentation
授業の進めかた	Classes are a combination of lecture and presentation practice. This class will encourage real-life scenarios in that students will do mini poster preesntations frequently to practice fluency and Q&A.. Students will also work together in groups on specific tasks and help edit each other's work.
授業の達成目標	By the end of this course, students should be able to 1. understand the basic structure of an academic presentation 2. crtically evaluate a strong and weak presentation 3. stand confidently in front of peers and deliver a good presentation and Q&A session
成績評価の基準および 評価方法	20% Abstract 40% Final Presentation 20% Instructor Points 20% Final Written Exam
授業外学習(予習・復習) の指示	To participate acticely in class, students are expected to prepare a topic for homework every week which will be presented in the next class. Homework must be completed in a timely manner in order to be prepared for group tasks. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Oral Presentation; PowerPoint; KeyNote; Academic Abstract Writing; Mini Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	A reference list will be given to students in the first class
備考	原則として英語 XD-1と対で連続で履修すること。

Course Title（科目名）	International Internship		
Lecturer（担当教員）	Professor in charge of International Internship		
Course intended for（対象学年）	1st or 2nd year student		
Credit Category（単位区分）	Elective course	Credits（単位数）	2
Course Objectives/Outlines（目的・概要）	In order to foster the ability to communicate in a foreign language and acquire a global perspective which are required to become global engineers, students will engage in engineering internship at overseas universities, research institutes, or companies.		
Topics/Schedule（授業計画）	Students must engage in internship at overseas universities, research institutes, or companies for 60 hours or longer in total, and submit a report of the internship activities after completing the internship. An alternative reporting assignment may be given to students from overseas who cannot engage in engineering internship.		
Evaluation/Grading Policy（成績評価方法）	The final grade will be determined by the quality of report.		
Remarks（履修上の注意）	All students who engage in internship must gain approval from their supervising professors. They must purchase overseas travelers' personal accident insurance and Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). They should assess local culture and customs of countries where they will be staying. They should check the website for overseas safety of MOFA (Ministry of Foreign Affairs of Japan), and fully confirm the information for local safety risks of theft, infection, etc.		
Expected preparation and review（授業外学習（予習・復習）の指示）	Students should prepare to introduce themselves and explain their research contents in English. They should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internships, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References（教科書・参考書・資料）	Textbooks or references may be assigned by internship supervisors.		
Language（使用言語）	English will be used.		

Course Title（科目名）	Domestic Internship 1		
Lecturer（担当教員）	Professor in charge of Domestic Internship		
Course intended for（対象学年）	1st year student		
Credit Category（単位区分）	Elective course	Credits（単位数）	1
Course Objectives/Outlines（目的・概要）	In order to acquire the practical skills to logically analyze and solve engineering problems, and to understand the role engineers play in society, students will engage in internship at domestic companies, research institutes, or universities (other than Kyutech).		
Topics/Schedule（授業計画）	Students must engage in engineering internship at domestic companies, research institutes, or universities (other than Kyutech) for 30 hours or longer in total, and submit a report of the internship activities after completing the internship.		
Evaluation/Grading Policy（成績評価方法）	The final grade will be determined by the quality of report.		
Remarks（履修上の注意）	All students who engage in internship must gain approval from their supervising professors. They must purchase Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). Those who engage in internships at two or more organizations can get credit for this course if the total internship time is 30 hours or longer. Those who get credit for this course cannot get credit for Domestic Internship 2.		
Expected preparation and review（授業外学習（予習・復習）の指示）	Students should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internship, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References（教科書・参考書・資料）	Textbooks or references may be assigned by internship supervisors.		
Language（使用言語）	Language depends on organizations where students engage in internship.		

Course Title(科目名)	Domestic Internship 2		
Lecturer(担当教員)	Professor in charge of Domestic Internship		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In order to acquire the practical skills to logically analyze and solve engineering problems, and to understand the role engineers play in society, students will engage in internship at domestic companies, research institutes, or universities (other than Kyutech).		
Topics/Schedule (授業計画)	Students must engage in engineering internship at domestic companies, research institutes, or universities (other than Kyutech) for 60 hours or longer in total, and submit a report of the internship activities after completing the internship. An alternative reporting assignment may be given to adult students who cannot engage in internship.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by the quality of report.		
Remarks (履修上の注意)	All students who engage in internship must gain approval from their supervising professors. They must purchase Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). Those who engage in internships at two or more organizations can get credit for this course if the total internship time is 60 hours or longer. Those who get credit for this course cannot get credit for Domestic Internship 1.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internship, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by internship supervisors.		
Language (使用言語)	Language depends on organizations where students engage in internship.		

Specialized Course

Course Title(科目名)	Organic electronics for energy conversion		
Lecturer(担当教員)	Shuzi Hayase		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Plants and other organisms realize efficiency energy conversion. Our purpose is to lean the efficient energy conversion from them and to realized them artificially with other architecture and material.This course ideals with various energy conversions consisting of organic and inorganic materials. The lecture topics include printable solar cells with artificial photosynthesis (Dye-sensitized solar cells, organic thinfilm solar cells, perovskite solar cells , hybrid solar cells), fuel cells, organic FET devices, and organic semiconductive materials employed for these printable devices.		
Topics/Schedule (授業計画)	1. Intorduction 2. Solar cells with artificial photosynthesis mechanism 1 3. Solar cells with artificial photosynthesis mechanism 2 4. Solar cells with artificial photosynthesis mechanism 3 5. Solar cells with artificial photosynthesis mechanism 4 6. Organic thin film solar cells 1 7. Organic thin film solar cells 2 8. Organic-inorganic hybrid solar cells and perovskite solar cells 1 9. Organic-inorganic hybrid solar cells and perovskite solar cells 2 10. Fuel cells 1 11. Fuel cells 2 12. Organic semiconductive material 1 13. Organic semiconductive material 1 14. Application 1 15. Application 2		
Evaluation/Grading Policy (成績評価方法)	Attendance:50%、Reprot: 50%		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習 (予習・復習)の指示)	Preparation for the next class and review for the last class.		
Textbooks, References (教科書・参考書・資料)	Without text		
Language (使用言語)	Language: Japanese. PPTs are described in English. The lecture will be partially done in English.		

Course Title(科目名)	Semiconductor Power Devices		
Lecturer(担当教員)	Ichiro Omura		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Semiconductor Power Devices are widely used in energy management and power control such as motor drive circuits and power supplies. The lecture includes topics of semiconductor physics, device design of power MOSFET, IGBT and PiN diodes, reliability, device packaging technology.		
Topics/Schedule (授業計画)	1. Power electronics and power devices 2. Basics of semiconductor physics 1 3. Basics of semiconductor physics 2 4. Formulation of power device design 5. Breakdown voltage design 6. PN-diodes 7. PiN-diodes 8. Power MOSFETs 9. IGBT 10. High power IGBT 11. Edge termination design 12. Safe operating area 13. Cosmic ray induced failure 14. Future of Power devices 15. Report presentations		
Evaluation/Grading Policy (成績評価方法)	Group project activity and presentation		
Remarks (履修上の注意)	None		
Expected preparation and review (授業外学習(予習・復習)の指示)			
Textbooks, References (教科書・参考書・資料)	Handout A. Grove, "Physics and Technologies of Semiconductor Devices," John and Wiley & Sons.		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English if there are students who need explanation in English.		

Course Title(科目名)	Advanced Electrochemical Technology		
Lecturer(担当教員)	Shyam S. PANDEY		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The aim of this course is to introduce the power of electrochemistry from fundamental levels to advanced application level. Starting from basic concepts of electrochemstry focussing mainly towards the application potential in the diverse field of technology. The main emphasis will be given on moving from the simplicity to the complexity. Lecture will be conducted in both of easy English as well as Japanese languages to enable both of Japanese as well as foreign students to grasp easily and conveniently.		
Topics/Schedule (授業計画)	1 Fundamentals of Electrochemistry-I 2 Fundamentals of Electrochemistry-II 3 Electrochemical Techniques-I 4 Electrochemical Techniques-II 5 Electrochemical Techniques-III 6 Technological Applications of Electrochemistry-I 7 Technological Applications of Electrochemistry-II 8 Electrochemistry and Dye-Sensitized Solar Cells 9 Electrochromic Devices 10 Electrochemical Sensors 11 Electrochemical Biosensors 12 Electrochemiluminiscent Devices 13 Primary Cells and Secondary Batteries 14 Fuel cells-I 15 Fuel cells-II 16 Final Summary		
Evaluation/Grading Policy (成績評価方法)	Evaluation based on performance during lectures, results of small tests and final report summarization		
Remarks (履修上の注意)	Nothing specifically		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students are advised to have prior study of the lecture consudering the suitable keywords before attending the lectures. During the course of the lectue, problems for self study will also be provided folloed by evalution.		
Textbooks, References (教科書・参考書・資料)	Nothing specifically. If necessary information about additional study will be provided at the end of the lectures.		
Language (使用言語)	In general lecture will be conducted in Japanese but in case of need due to large number of foreign students it will be in English and Japanese both.		

Course Title(科目名)	Nano materias and energy conversion		
Lecturer(担当教員)	Tingli Ma		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Introduction of globe warming, solar energy and solar cells, including types, structures, work pricinples, advatages and disadvantages of Si, CIGS, CdTe, and new concept solar cells. The lecture also introduce the batteries, such as Li- ion and Na-ion batteries, Fuel Cells		
Topics/Schedule (授業計画)	1 Globe warming and introduction of solar cell research 2 Sicon solar cells 3 CIGS and CZTS solar cells 4 CdTe and multijunction solar cells 5 Dye-sensitized solar cells 6 Organic solar cells 7 Perovskite solar cells 8 Progress in new concept solar cells 9 Nano inorganic materials and their applications 10 Nano catalysts and theis applicatons 11 Nano Carbon materials and their applications 12 Photocatalyst and hydreogen production 13 Fuel Cells 14 Li-ion and Na-ion batteries 15 Metal air batteries 16 Summary and report		
Evaluation/Grading Policy (成績評価方法)	Lecture 50%; Report:50%		
Remarks (履修上の注意)	Serach and learn the backgroud before each lecture		
Expected preparation and review (授業外学習(予習・復習)の指示)	Review after lecture		
Textbooks, References (教科書・参考書・資料)	PPT		
Language (使用言語)	Japanese／English		

Course Title(科目名)	SoftMatter Device		
Lecturer(担当教員)	Wataru TAKASHIMA		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Organic materials such as polymer shows flexible characteristics. This is mainly caused by the conformation change on main-chain, Besides this, conjugated functional materials possesses variety of electronic, photonic and chemical functions thanks to the pi-electron distribution. This lecture focus on these functions mixing with the flexible characteristics in these materials, and then, reviews the usage as SoftMatter device		
Topics/Schedule (授業計画)	1. Over veiw of Soft matter Device 2. Polymer Physics 1: Structure and Conformation 3. Polymer Physics 2: Thermodynamic Characteristics 4. Polymer Physics 3: Summary 5. Semiconductor Physics 1: Electronic Structure 6. Semiconductor Physics 2: Interface 7. Semiconductor Physics 3: Electronic Devices 8. Semiconductor Physics 4: Summary 9. Organic Electronics 1: Molecular Electronics 10. Organic Electronics 2: Electronic Devices 11. Organic Electronics 3: Summary 12. Organic Electrochemisty 1: Blectronic Structure 13. Organic Electrochemisty 2: Electrochemical Devices 14. Organic Electrochemisty 3: Summary 15. Soft Device		
Evaluation/Grading Policy (成績評価方法)	Short exam. at each section in the lecture: 80% / Final exam.: 20%		
Remarks (履修上の注意)	You can take dictionalies and related materials to follow the lecture.		
Expected preparation and review (授業外学習(予習・復習)の指示)	All the technical terms should be cast by your own expression, completely.		
Textbooks, References (教科書・参考書・資料)	Handbook of oligo- and polythiophenes		
Language (使用言語)	English		

Course Title(科目名)	Applied power electronics		
Lecturer(担当教員)	Tsuyoshi Hanamoto		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Electrical energy is one of the important energy for human society because it can change to other kinds of energy with fast response and easy to control.Power electronics is the technology to control the electrical power using the power semiconductor,and it can achieve the high efficiency and high, precision control simultaneously. In this class, applied power electronics technology is learned, for example power conversion and motor drive control. In addition, the principal and future trend of the Electrical Vehicle is also explained by the visiting professor working for the automobile company.		
Topics/Schedule (授業計画)	1 Introduction of power electronics 2 Power Semiconductor devices 3 DC-DC conversion 4 DC-AC conversion(single phase inverter) 5 DC-AC conversion(three phase PWM inverter) 6 Principle of the electrical motors 7 Coordinate transformation and mathematical model of AC motor 8 Control method of the motor driving (Vector control) 9 Control system design(laplace transformation and state space equation) 10 Control system design (feedback control) 11 Torque control and speed control using observer theory 12 Minimum order observer and applied the disturbance compensation 13 Observer based position sensorless control 14 Applied power electronics to the Electrical Vehicle (1) 15 Applied power electronics to the Electrical Vehicle (2)		
Evaluation/Grading Policy (成績評価方法)	Class attendance and attitude in class/ Some reports		
Remarks (履修上の注意)	It is desirable about the follwing in under graduate class: Electric machine, control system, energy tramsmission The the demo version of the simulation software for the power electronics and control design are used inthe class; "PSIM" and "Scilab". Download and try to use them by yourselves. Breaf instruction of these software are explained in the class.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Download and read the documents of the class from "Live campus". Simulate and check the circuits explained in the class.		
Textbooks, References (教科書・参考書・資料)	All the documents of the class can be downloaded from "Live campus".		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English if there are students who need explanation in English.		

Course Title(科目名)	Bio-MEMS		
Lecturer(担当教員)	Takashi Yasuda		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	MEMS (Micro Electro Mechanical Systems) are micron-size structures and their integrated systems which are fabricated using microfabrication such as semiconductor processing. MEMS for biomedical applications are called "Bio-MEMS", and include microdevices for blood testing, cell analysis, drug discovery, etc. In order to help students acquire basic knowledge about Bio-MEMS, this course will start with microfabrication techniques followed by MEMS examples such as microactuators and microsensors, and give detailed explanations over structures, principles, and applications of various Bio-MEMS.		
Topics/Schedule (授業計画)	1. Introduction: What is MEMS? 2. Basic microfabrication technique 3. 3D microfabrication technique 4. Scale effect and electrostatic microactuators 5. Microactuators 6. Physical microsensors (1) 7. Physical microsensors (2) 8. Neural interfaces 9. Chemical microsensors and microfluidic devices 10. Cell analysis devices 11. Microliquid handling devices 12. Electrostatic manipulation of biological samples 13. Biomolecule detection devices (1) 14. Biomolecule detection devices (2) 15. Final examination 16. Review		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by quality of brief reports during lectures (50%) and score of final examination (50%).		
Remarks (履修上の注意)	The course materials must be downloaded from LiveCampus prior to each lecture.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	For better understanding, key words in the course materials should be researched on the Internet prior to each lecture, and a review of each lecture should be carried out using literatures referred to in the course materials.		
Textbooks, References (教科書・参考書・資料)	No textbooks are assigned. Reference literatures are given in the course materials.		
Language (使用言語)	The course will be taught in Japanese. All of the course materials are written in English. For students who need lecture in English, language assistance is negotiable.		

Course Title(科目名)	Biothermal Engineering		
Lecturer(担当教員)	Hiroshi ISHIGURO		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The living system is a complicated heat and mass transfer system and the thermal effect is useful to medical technology. The objective of this course is to give a lecture on fundamentals and applications of heat and mass transfer related to the living system and medicine technology on the basis of thermal engineering and heat transfer. Mathematical description of the event is also provided.		
Topics/Schedule (授業計画)	Introduction of thermal engineering related to living system and medical technology: 1. What is "Biothermal Engineering"? Living body under thermal condition: physiological, high and low tempareatures. 2. Basic transport phenomena 3. Momentum transfer: Viscosity, Conservation equation of momentum, Friction and pressure drags 4. Heat transfer (1): Conduction heat transfer, Heat conduction equation 5. Heat tarnsfer (2): Convection heat transfer, Conservation equation of thermal energy, Thermal conductivity 6. Heat transfer (3): Radiation heat transfer, Basic laws of radiation heat transfer 7. Mass transfer: Mass diffusion, Convection mass transfer, Conservation equation of chemical species, Mass transfer coefficient 8. Dimensionless numbers and anlogy of transport phenomena 9. Living body under physiological temperature (1): Heat transfer in living body 10. Living body under physiological temperature (2): Heat transfer between living body and outside environment 11. Living body under high temperature (1): Damage 12. Living body under high temperature (2): Utilization of high-temperature effect in medical technology 13. Living body under low temperature (1): Damage, Cryosurgery 14. Living body unde low temperature (2): Cryopreservation 15. Thermal effects of electromagnetic wave, ultrasound and laser light on living body		
Evaluation/Grading Policy (成績評価方法)	Final grade will be detrmined mainly from final paper and quizzes.		
Remarks (履修上の注意)	Request to students: Undestanding of bases, phenomena and medical application on biothermal engineering, Notice for students: To learn basic heat transfer and/or thermal engineering in advance will be helpful for the class though not nesessary condition.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Through the class, handouts will be used. To review the class is basically very effective. If the preparation is needed, instruction will be given in advance.		
Textbooks, References (教科書・参考書・資料)	Textbooks are not used. References will be introduced in the class. Handouts will be given in the class.		
Language (使用言語)	Japanese language is used usually in the class. If english language need to be used, instructions will be given.		

Course Title(科目名)	Biomechanical dynamics		
Lecturer(担当教員)	Kazuto Takashima		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course introduces the structure, the function and the response of human body parts from the viewpoint of dynamics of machinery and design of machine elements. Dynamics of machinery deals with the motion of a rigid body and the dynamic properties of a machine. It is important to understand not only the static but also the dynamic behaviors of the human body parts.		
Topics/Schedule (授業計画)	1. Introduction 2. Motion of rigid body 1 (equations of motion and mechanism) 3. Motion of rigid body 2 (basic mathematics) 4. Motion of rigid body 3 (dynamics of skeletal muscle) 5. Motion of rigid body 4 (nerve) 6. Motion of rigid body 5 (numerical analysis) 7. Vibration 1 (introduction) 8. Vibration 2 (effect of sound wave on living tissue) 9. Vibration 3 (skin and tactile sense) 10. Vibration 4 (tactile sensor) 11. Machine element 1 (introduction) 12. Machine element 2 (friction and lubrication in human joint) 13. Machine element 3 (circulatory organ) 14. Measurement of living tissue 1 (basic) 15. Measurement of living tissue 2 (application)		
Evaluation/Grading Policy (成績評価方法)	Grading will be decided based on the following: - Quizzes in each class, - Final exam (or final paper).		
Remarks (履修上の注意)	Students are not necessarily required to have the knowledge of dynamics of machinery and design of machine elements because the basics are explained first. Quiz is conducted after each lecture and the answer is explained before the next lecture.		
Expected preparation and review (授業外学習(予習・復習)の指示)	We recommend to read the material provided before each class, and review the lecture content to help understand the class.		
Textbooks, References (教科書・参考書・資料)	Text books are not used. References may be introduced. Materials are provided before each class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Biomechanics		
Lecturer(担当教員)	Hiroshi Yamada		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	A human body is subjected to external and internal forces, and some functions and behaviors of body components can be dealt as mechanical phenomena. By revealing the correlations between biological phenomena and mechanical factors, one can enhance healthy conditions and protect the body from disorders and diseases with an aid of engineering. This class introduces the methods in solid biomechanics to evaluate or analyze the structures, functions and responses of human body components to learn the mechanical characteristics of musculoskeletal and cardiovascular systems, etc. It also introduces some approaches to the body components with engineering discipline.		
Topics/Schedule (授業計画)	1. Overview of biomechanics and related fields 2.1 Fundamentals of Newtonian mechanics and weightlessness 2.2 Static force applied to the musculoskeletal system 3.1 Basic theory of strength of mechanics for hard tissues with infinitesimal strain 3.2 Mechanical characteristics of bones and teeth (normal and repaired cases) Summary of Chapter 1 to Section 3.2 and research learning 4.1 Fundamentals of viscoelastic theory 4.2 Visoelasticity of soft tissues 4.3 Mechanical characteristics of skeletal muscles with active contaction 4.4 Fundamentals of continuum mechanics for soft tissues with large strain 4.5 Mechanics of cardiovascular system (physiological functions) 4.6 Mechanics of cardiovascular system (aging and disease) 4.7 Dynamic characteristics of living tissues with impact 5. Mechanical tests and finite element analyses for cells and tissues Summary of Section 4.1 to Chapter 5 and research learning Final examination		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class will be decided based on reports during each class (60%) and term-end examination (40%).		
Remarks (履修上の注意)	It is imortant to understand the mechanics. Basics of Newtonian mechanics, strangth of materials and continuum mechanics are explained in the class. Each short report should be submitted by the end of each class.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	As preparations, students need to study fundamentals of Newtonian mechanics, strength of materials and contiuum mechanics. As reviews, students need to understand the mechanical characteristics of living tissues deeply.		
Textbooks, References (教科書・参考書・資料)	Textbook: H. Yamada, Fundamentals of mechanics and biomechanics, in Jap (ISBN 978-4-339-07230-3) Materials are provided and references are introduced in each class.		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English on a different day if there are students who need explanation in English.		

Course Title(科目名)	Functional Biomaterials		
Lecturer(担当教員)	Toshiki Miyazaki		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course deals with structure, design and development of biomaterials used for medical fields. Especially this course focuses on hard tissue repair such as bone and tooth. Ceramics, metals, polymers and composites materials for biomaterials will be introduced.		
Topics/Schedule (授業計画)	1 What is biomaterial? 2 Current development process and production of biomaterials 3 Structure and function of bone 4 Structure and function of tooth 5 Interaction between biomaterial and body 6 Cytotoxicity of various elements 7 Ceramic biomaterials 8 Polymer biomaterials 9 Composite biomaterials 10 Metallic biomaterials 11 Ceramics produced by living things 12 Principle of biomimetic process 13 Development of biomaterials and environmental materials by biomimetic process 14 Biomaterials for tissue engineering 15 Biomaterials for cancer treatment		
Evaluation/Grading Policy (成績評価方法)	Midterm paper and final exam		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習(予習・復習)の指示)	Students should read English handout distributed by PDF file in advance.		
Textbooks, References (教科書・参考書・資料)	Textbook is not used. Reference book is as follows. L.L. Hench (ed.), "An Introduction to Bioceramics (2nd Edition)", Imperial College Press, 2013 T. Kokubo (ed.), "Bioceramics and their Clinical Applications", Woodhead Publishing, 2008		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Physical Chemistry of Environmental Materials		
Lecturer(担当教員)	Nobuya Shinozaki		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Purpose : Understanding on the interfacial phenomenon which causes large effect in material processing and rearing of the application force. Outline : Surface tension, adsorption and wetting are lectured, and actual study examples are introduced for the purpose.		
Topics/Schedule (授業計画)	1 Interfacial phenomena in material processing 2 Surface tension and free energy 3 Laplace's equation and capillary phenomena 4 Surface tension and adsorption 5 Wetting 6 Young' equation and contact angle 7 Dupre's equation and adhision 8 Interfacial phenomena between molten iron and ceramics 9 Wetting between molten manganese and ceramics 10 Wetting and infiltration between molten manganese and porous ceramics 11 Wetting between molten aluminum and ceramics 12 Wetting between molten magnesium and graphite 13 Wetting between molten copper-titanium alloy and graphite 14 New measuring method of interfacial tension 15 Presentation bystudents		
Evaluation/Grading Policy (成績評価方法)	It is evaluated by reports on the lecture content and presentation. The attendance is also emphasized.		
Remarks (履修上の注意)	It may not be beforehand warned.		
Expected preparation and review (授業外学習(予習・復習)の指示)	The keyword explained in each lecture is examined after the class, and the understanding should be tried.		
Textbooks, References (教科書・参考書・資料)	小野　周:表面張力(共立出版) 表面および界面(共立出版) 丸井智敬他:表面と界面の不思議(工業調査会) etc.		
Language (使用言語)	Generally, the lecture is carried out Japanese. It necessarily responds, English is used.		

Course Title(科目名)	Materials Design		
Lecturer(担当教員)	Satoshi Iikubo		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The function of the materials depends on the microscopic structure. Therefore, we need the information about the structure, and its stability in order to design nobel eco-friendly materials. The purpose of this course is to help students understand the materials design, and the useful simulation techniques.		
Topics/Schedule (授業計画)	1 Introduction: Design for environmentally friendly materials 2 Introduction: Simulation method 3 Crystal structure 4 Crystal structure and electron 5 Schrödinger equation (1) 6 Schrödinger equation (2) 7 First-principles calculation (1) 8 First-principles calculation (2) 9 Moleculer dynamics (1) 10 Moleculer dynamics (2) 11 Calphad method (1) 12 Calphad method (2) 13 Calculation of lattice vibration 14 Cluster expansion and Cluster variation method 15 Review		
Evaluation/Grading Policy (成績評価方法)	Your final grade will be calculated according to the following process: Short examination (50%), and a fraction of in-class contribution		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習(予習・復習)の指示)	The students are expected to review all keywords presented in the class.		
Textbooks, References (教科書・参考書・資料)	Will be introduced in the class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Eco-material Engineering		
Lecturer(担当教員)	Haruo Nishida		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The shift in raw materials from fossil resources to renewable ones is gradually progressing in polymer field. Will the renewable resources-based bioplastics, namely, "Ecomaterials" replace fossil resources-based common plastics? Moreover, will the ecomaterials add more excellent properties and/or novel functions than the common plastics to become indispensable ones in our life? In this course, I want to discuss what kinds of materials will be necessary in a future based on many topics in academia and industry.		
Topics/Schedule (授業計画)	1 Introduction and summary of course 2 Current status and issues of fossil resources-based common plastics 3 Trends in polymer technologies and social circumstance 4 What is the Ecomaterials? 5 Synthesis of Ecomaterials 6 Structural properties of Ecomaterials 7 Processing and molding of Ecomaterials 8 Performance of Ecomaterials 9 Functions of Ecomaterials 10 Reactivity of Ecomaterials 11 Circulative utilization of Ecomaterials 12 Biodegradability of Ecomaterials 13 Environmental harmonization of Ecomaterials 14 Ecomaterials in a future 15 Comprehensive discussion		
Evaluation/Grading Policy (成績評価方法)	Evaluation is based on the stance on studying and reports. Particularly, original thought and ideas will be rated high.		
Remarks (履修上の注意)	Basic knowledge of polymer chemistry is necessary.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Lecture materials are distributed as pdf files that have been downloaded and read through before the lecture. Checking the meanings of unknown technical terms is important.		
Textbooks, References (教科書・参考書・資料)	Printed materials are used and these are distributed as pdf files before the lecture.		
Language (使用言語)	Usually, the lecture is delivered in Japanese. Extra lecture will be delivered in English as necessary.		

Course Title(科目名)	Biological Recycling		
Lecturer(担当教員)	Minato WAKISAKA		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course deals with the sustainability issues of biomass utilization.		
Topics/Schedule (授業計画)	1 Earth Structure and Biochemical Cycle 2 Ecosystem and Biochemical Cycle 3 Plant Biomass and Ecosystem 4 Ecological Connectivity and its Linkages with Human Activities 5 Biodiversity 6 Interrelationship between Ecosystems and Human Activities(Food) 7 Interrelationship between Ecosystems and Human Activities(Life Style) 8 Interrelationship between Local Ecosystems and Human Activitie 9 Interrelationship between Global Ecosystems and Human Activities 10 Essence of Global Environment Issues 11 Biomass Resources for Sustainable Society 12 Biomass Energy for Sustainable Society 13 Biomass Material for Sustainable Society 14 Biomass Utilization and Social System Design in Japan 15 Biomass Utilization and Social System Design of World		
Evaluation/Grading Policy (成績評価方法)	Grading will be decided based on attendance, reports, and a fraction of in-class contribution.		
Remarks (履修上の注意)	Basic knowledge about chemstry and biology are necessary.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	It is recommended to search for keywords of each lecture beforehand. Reading assighments will be helpful for your better understanding.		
Textbooks, References (教科書・参考書・資料)	Will be introduced in the class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Biochemical Zero-Emission		
Lecturer(担当教員)	Yoshihito Shirai		
Course intended for (対象学年)	1st semester		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	To indicate rational methodologies for recycling wastes to new resources and energy referring to biological and ecological functions. We consider about rational methods for recycling wastes to new resources and energy by referring to biological and ecological functions (metabolism, competition, symbiotic and parasitic relations, evolution). Then any suitable topics concerning waste recycles shall be provided to discuss with students.		
Topics/Schedule (授業計画)	1 Basic concept of this lecture 2 Chmical Recycling 3 Global Warming and Heat Island Effect 4 Power Geneation from Municipal Waste 5 Utilization of Wastes in Urban Area 6 Economy in Recycling 7 Reduction of Greenhouse Effect Gas and International Collaboration 8 Desertification and Renewable Energy 9 Zeroemission Society 10 A Scenario for the Zeroemission Society 11 A Critisism of Recycling 12 Recycling Sosiety turgeted in 21sr Century 13 Workshop 1 14 Workshop 2 15 Workshop 3 16 Workshop 4		
Evaluation/Grading Policy (成績評価方法)	Evaluation based on the results from workshop 1 – 4. Proposals of unique idea and solutions should be highly evaluated.		
Remarks (履修上の注意)	–		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Materials for the kecture can be downloaded from website「www.kyutech.ac.jp~shirai」. You can freely donwnload them and study in advance. Then after you can review them for the workshop.		
Textbooks, References (教科書・参考書・資料)	The materisals above		
Language (使用言語)	Usually Japanese, but English also avvailable in case.		

Course Title(科目名)	Environmental Bio-adaptation		
Lecturer(担当教員)	Toshinari MAEDA		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Bacterial can adapt any enviroments such as high salinity, acidic, alkaline, high pressure conditions. The adaptation can be regulated by the gene expression (on-off switch), gene mutation, and protein evolution. As a result, there are several unique bacterial functions by which bacterial cannibalism, biofilm formation, cell-to-cell communication, and bioenergy production can be seen as a bacterial event. The objective of this lecture is to understand how living organisms can adapt and regulate the functions and how the bacterial functions can be applied to an eco-friendly technology.		
Topics/Schedule (授業計画)	1 What is "Environmental Bio-adaptation"? 2 DNA and structure of chromosome DNA 3 DNA replication, repair, and gene mutation 4 Central Dogma 5 Gene expression 6 Regulation of gene expression 7 Translation —Messenger RNA to Protein— 8 Protein and enzyme and its catalytic mechanism 9 Protein evolution 10 Strategy of bacterial predation and cannibalism 11 Cell-to-cell communication and bacterial quorum sensing 12 Bacterial chemotaxis and other environmental adaptation by bacteria 13 Biodegradation of environmental pollutants and bioremediation 14 Reduction and utilization of Waste activated sludge 15 Future environmental biotechnology 16 Examination		
Evaluation/Grading Policy (成績評価方法)	Short test in each lecture and final examination		
Remarks (履修上の注意)	Nothing special		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Prior to the lecture, need to read lecture materials which can be available from the homepage of Dr. Maeda laboratory (http://www.life.kyutech.ac.jp/~toshi.maeda/). The password for the materials can be informed in the first lecture.		
Textbooks, References (教科書・参考書・資料)	Voet D., Voet J.G.; Biochemistry, 4th Edition		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English on a different day if there are students who need explanation in English.		

Course Title(科目名)	Functional Interface Engineering		
Lecturer(担当教員)	Professor Tetsuya HARUYAMA, PhD		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This lecture introduces the Functional Interface Engineering to study taking this lecture. the Functional Interface Engineering is an engineering academic field which includes chemistry, electrochemistry, molecular science, analytical chemistry: and physical chemistry.		
Topics/Schedule (授業計画)	1 General introduction of the Functional Interface Engineering 2 Electron and organic molecules 3 Element of electrochemical reactuon 1 4 Element of electrochemical reactuon 2 5 Element of catalytic electrochemical reaction 6 Electrochemical biosensors: Case study of R&D 7 Element of mammalian cell 8 Cultured cell based biosensors: Case study of R&D 9 Functional modulation of cellular function: Case study of R&D 10 Element of molecular functions 11 Functional Interface Engineering 12 Interigent materials 1: Case study of R&D 13 Interigent materials 2: Case study of R&D 14 Novel chemical reaction locus at gas/liquid interface: Case study of R6D 15 General summarize of the Functional Interface Engineering		
Evaluation/Grading Policy (成績評価方法)	Final grade of you will be decided accordong to quiz which is held in the every lecture		
Remarks (履修上の注意)	Prohibited both recording and photography		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Encourage volunteerism of every student		
Textbooks, References (教科書・参考書・資料)	Adviced in the Lecture		
Language (使用言語)	This lecture will be given in Japanese. If some one who would like to study as for the ″Functional Intwerface Engineering″. The issue will be conducted through an individual consultation		

Course Title(科目名)	Biofunctional molecular engineering		
Lecturer(担当教員)	Shinya Ikeno		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Biomolecules have an important role in the life activity of all living things on the earth. It can also be said it is a masterpiece of a molecule that is constructed by living things during the evolutionary process. This course deasl with basis of biomolecular engineering using various types of biofunctional molecules. It also enhances to introduce the application of the technology with new topics.		
Topics/Schedule (授業計画)	1. Introduction 2. Genetic information of cell (Basic) 3. bioinformatic molecules (1) DNA 4. bioinformatic molecules (2) DNA 5. bioinformatic molecules (3) RNA 6. Amino acid, Peptide, and Protein (Basic) 7. Biofunctional molecules (1) Enzyme 8. Biofunctional molecules (2) Receptor 9. Biofunctional molecules (3) Antibody 10. Analysis the interaction of biofunctional molecules 11. Biofunctional molecules as a molecular recognition elements 12. Biosensor; analytical method by using biofunctional molecules 13. Application of nanomaterials in biotechnology 14. Biofunctional molecules with nanotechnoloy 15. Overview, Next-generation technology using biological functional molecules		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class will be decided based on the following: Class attendance and mini-examination: 50% Term-end examination:50%		
Remarks (履修上の注意)	This course will be more or less demanding depending on the initial level in chemistry and biology.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	We highly recommend you to prepare each lecture by reading the handout, and to review lecture for your understanding.		
Textbooks, References (教科書・参考書・資料)	No text book in this course. We provide the handout of each lecture.		
Language (使用言語)	This course will be taught in Japanse. But one of the course materials are in English. One English-spreaking teacheing assistant will be assigned to help non-Japanese students.		

Course Title(科目名)	Photo-functional materials		
Lecturer(担当教員)	Naoya MURAKAMI		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course deals with the basic concepts and principles of photo-functional materials, such as semiconductor photocatalyst, from the viewpoints of photochemistry. It also introduces the basis of fundamental photochemistry and physical chemistry. The goals of this course are to obtain basic knowledge of principles and application of photo-functional materials.		
Topics/Schedule (授業計画)	1. Introduction of Photo-functional materials 2. Photocatalysis(1) Principle / water splitting 3. Photocatalysis(2) Organic decomposition / visible light response 4. Photocatalysis(3) Light-induced super-hydrophilicity / organic synthesis 5. Photocatalysis(4) Photocatalyst-particles / Co-catalyst loading 6. Photocatalysis(5) Physical and chemical propeties of particles 7. Photocatalysis(6) Semiconductor films 8. Photocatalysis(7) Semiconductor electrode 1 9. Photocatalysis(8) Semiconductor electrode 2 10. Solar cells (1) silicon 11. Solar cells (2) inorganic 12. Solar cells (3) organic 13. Luminescent materials and device 14. Photo-functional materials 15. Optical parts and optical apparatus		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class will be decided based on the following: Class attendance and attitude(40%) and Reports(60%)		
Remarks (履修上の注意)	This course will be taught in Japanese. But all of course materials are in English.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students are expected to review after the lecture.		
Textbooks, References (教科書・参考書・資料)			
Language (使用言語)	Japanese		

Course Title(科目名)	Biomolecular Design		
Lecturer(担当教員)	Shokici Ohuchi		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Various artificial organic molecules or biomolecules have been developed based on the molecular recognition mechanism for the purpose of elucidating or controlling functions of organisms. As a basis for comprehensively understanding the biomolecule design method and synthesis method, their features will be lectured on various organic reactions to be performed when synthesizing organic molecules / biomolecules. In addition, recent research examples on biomolecular design methods and synthesis methods will be described.		
Topics/Schedule (授業計画)	1 Fundamentals of Organic Reaction (1) Organic Electron Theory and Structure of Organic Molecules 2 Fundamentals of organic reaction (2) How to draw chemical reaction equations 3 Fundamentals of organic reaction (3) Electron transfer 4 Basis of organic reaction (4) Acid and base 5 Fundamentals of organic reaction (5) Hetero-reaction and homo-reaction 6 Fundamentals of organic reaction (6) Reaction solvent 7 Fundamentals of organic reaction (7) Design of reaction formula Intermolecular force related to biomolecules (1) Van der Waals force, ion, hydrogen bond 8 Intermolecular interaction related to biomolecules (1) Van der Waals force, ion, hydrogen bond 9 Intermolecular interaction related to biomolecules (2) Other intermolecular interactions 10 Molecular design of bio-related compounds (1) Protein / peptide 11 Molecular design of bio-related compounds (2) Genes / nucleic acids / nucleotides 12 Molecular design of bio-related compounds (3) Enzyme catalyst 13 Molecular design of bio-related compounds (4) Combinatorial chemistry 14 Molecular design of bio-related compounds (5) Green chemistry 15 Molecular design of bio-related compounds (6) Microwave chemistry		
Evaluation/Grading Policy (成績評価方法)	Evaluated by final exam.		
Remarks (履修上の注意)	It is assumed that students are taking organic chemistry, physics chemistry, quantum chemistry, biochemistry / biochemistry, molecular biology etc. in the undergraduate course.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Leave it to the students.		
Textbooks, References (教科書・参考書・資料)	(1)D.Klein,, Organic Chemistry, 2nd ed., Wiley (2013) (2)M.B.Smith, March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 7th ed., Wiley (2013) (3)A. Miller, P.H. Solomon, Writing Reaction Mechanisms in Organic Chemistry, 2nd ed., Academic Press (2000)		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Work Physiology System		
Lecturer(担当教員)	Kohji Hirakoba		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Exercise is developed as the integration in physiological system related to muscle contraction. This course deals with the series of physiological reactions on structure and metabolism of muscle, and transport system associated with oxygen uptake and carbon dioxide output in respiratory and circulatory system during exercise. Moreover, this course also deals with the technological application of basic theory in work physiology system.		
Topics/Schedule (授業計画)	1 The mechanism in muscle contraction (structure in muscle and outline of muscle contraction) 2 The mechanism in muscle contraction (muscle contraction in more detail) 3 The mechanism in energy production and provision during exercise (anaerobic energy) 4 The mechanism in energy production and provision during exercise (aerobic energy) 5 Muscle fiber types (classfication of muscle fiber types) 6 Muscle fiber types (characteristics of contraction and metabolism in muscle fiber types) 7 Muscle fiber types (possibility of transfer in muscle fiber types due to exercise training) 8 The mechanism in muscle hypertrophy (genes in muscle growth factor and defence factor) 9 The transport of gases in blood (transport capacity and limiting factors in oxygen uptake) 10 The transport of gases in blood (transport capacity and limiting factors in carbon dioxide output) 11 Oxygen uptake kinetics during a constant work rate and the related controlling system in muscle energy production 12 Evaluation in oxygenation dynamics in a local exercising muscle by near infrared spectroscopy (NIRS) 13 Muscle fatigue (concept and definition of muscle fatigue) 14 Muscle fatigue (central and peripheral fatigue) 15 Muscle fatigue (mechanism attenuating peripheral fatigue due to buffering capacity		
Evaluation/Grading Policy (成績評価方法)	Your final grade will be assessed according to the following process: Usual performance score 30%, two reports 70% . To pass, students should earn at least 60 points of 100.		
Remarks (履修上の注意)	We highly recommend to prepare each lecture by reading reference books and to actively discuss the topics.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	The goals of this course are to (1) To understand the knowledge related to muscle contraction and direct energy necessary to muscle contraction, (2) To be able to explain classification of muscle fiber types and characteristics of muscle contraction and energy production system, (3) To be able to calculate three phases of oxygen uptake kinetics during a constant work rate, and to explain the physiological background of each phase of oxygen uptake kinetics, (4) To check a technological principle of NIRS, and to be able to describe oxygenation dynamics in exercising muscle due to NIRS, (5) To state the concrete main cause of muscle fatigue, (6) To understand the contribution rate of buffering capacity to peripheral fatigue.		
Textbooks, References (教科書・参考書・資料)	Textbook will be not used in this course, but students should read the following reference books. The materials necessary to each lecture will be provided.		
Language (使用言語)	This course will be taught in Japanese, but in case of the students who need to take lecture in English, we will cope individually.		

Course Title(科目名)	Mechatronics		
Lecturer(担当教員)	Hideki HONDA		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Aims of this course are to introduce a basic knowledge of Mechatronics and to practice some examples in order to operate the knowledge in actual scene. In order to get higher machine performance, Mechatronics covers various aspects of the engineering – machine, electricity/electronics, computer and control –, but to grasp easily and conveniently, this lecture will be conducted according to processes of ″Stabilization of inverted pendulum″ and ″Designing a automatice vending machine″.		
Topics/Schedule (授業計画)	1. Introduction – Birth and history of Mechatronics 2. Dynamics and Mechanics (How can we express a dynamics?) 3. Acutators – Principle of motor 4. Real-time control (1) ; Feedback control theory 5. Real-time control (2) ; Feedforward control theory 6. Real-time control (3) ; 2-degree of freedom control and Advanced control 7. Design a control system-Feedback control; Inverted pendulum 8. Sequence Control (1) ; Introduction 9. Sequence Control (2) ; Components 10. Sequence Control (3) ; Design logical circuits 11. Sequence Control (4) ; Design tools 12. Sequence Control (5) ; Design an automatic vending machine 13. Conponents of Mechatronics system (The above schedule will be carried out in 15 classes.)		
Evaluation/Grading Policy (成績評価方法)	A total of scores of exercises in each class are evaluated.		
Remarks (履修上の注意)	Nothing specifically.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	To prepare a distributed document that will be sent by e-mail before each class.		
Textbooks, References (教科書・参考書・資料)	The lecture will be given using the distributed document. The references are specified in the class.		
Language (使用言語)	In general, the course is conducted in Japanese. But the distributed documents are written in both Japanese and English and as needed, conducted in English.		

Course Title(科目名)	Micro-Technology		
Lecturer(担当教員)	Iwao SASAKI		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The aim of this course is to help students acquire Micro-Technology fabricated by deposition, removeing, modification and junction tecnologies. The goals of this course are to understand (1)The concept of Micro-Tecnology. (2)The applications, for example, mechatronics equipments, communication tools, eviromental frendly parts and so on. (3)Magnetism and magnetic materials by learning HDD and MRAM. (4)Measurement and analysis of micro fabrication.		
Topics/Schedule (授業計画)	1. Guidance -Concept 2. Example of parts and products 3. Fundamentals of micro fabrications 4. Deposition 5. Removing 6. Modification 7. Junction 8. Elementary technology and actual fabrication for micro-technology 9. Actual PVD for micro-technology 10. Measurement and analysis of micro fabrications 11. Equipments 12. Fundamental of magnetism and magnetic material 13. HDD (hard disk drive) 14. MRAM (Magnetoresistive random-access memory) 15. Review		
Evaluation/Grading Policy (成績評価方法)	Grading will be decided based on quizes and reports.		
Remarks (履修上の注意)	Students should review the fundamental physics and chemistry.		
Expected preparation and review (授業外学習(予習・復習)の指示)	[prereration] The handout should be read deeply before attendance. [review] The handout should be understood after lecture.		
Textbooks, References (教科書・参考書・資料)	Handouts will be used.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Biorobotics		
Lecturer(担当教員)	Tomohiro Kawahara		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Investigation of the characteristics of organs, tissues, cells, and molecules is quite important for understanding the unknown mechanisms of living organisms and to develop state-of-the-art biomedical robots. In this class, design, fabrication, mechanism, and application of recent biorobots are introduced and discussed.		
Topics/Schedule (授業計画)	1. Overview of Biorobotics 2. Fundamentals of Robotics 3. Medical Robot I 4. Medical Robot II 5. Bio-inspired Robot I 6. Bio-inspired Robot II 7. Soft Robot I 8. Soft Robot II 9. Micro Robot I 10. Micro Robot II 11. Nano Robot I 12. Nano Robot II 13. Wet Robot I 14. Wet Robot II 15. Summary		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class will be decided based on short reports in each class and term-end examination.		
Remarks (履修上の注意)	Students should read handout distributed by PDF file in advance.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	It is highly recommended to search related keywords in the handout before the class. It will support your better understanding.		
Textbooks, References (教科書・参考書・資料)	Text books are not used. Handout is provided before each class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Exercises on Computational Biomechanics		
Lecturer(担当教員)	Hiroshi Yamada, Masaaki Tamagawa, Kazuto Takashima, Tomohiro Kawahara		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	This course deals with basic techniques of formulating and solving initial boundary value problems with a computer for a variety of mechanical phenomena in a human body. It enhances the students' skills in using the well-known software such as Abaqus, ANSYS and MATLAB to solve basic boundary value problems in the fields of solid mechanics, fluid dynamics, dynamics of machinery and thermodynamics.		
Topics/Schedule (授業計画)	1. Finite element analysis of solid structures: identification of the material properties of a soft elastic material in 2. Finite element analysis of solid structures: deformation of the blood vessel and stresses in the soft tissue 3. Computational fluid dynamics: numerical analysis of flows on pipe and stenosis which are models of blood 4. Computational fluid dynamics: numerical analysis of flows on pipe and stenosis which are models of blood 5. Numerical analysis for dynamics of machinery: motion analysis of rigid body pendulum 6. Numerical analysis for dynamics of machinery: motion analysis of human joint 7. Numerical analysis on the thermodynamics: programming for the thermal conduction problem 8. Numerical analysis on the thermodynamics: programming for the thermal conduction problem		
Evaluation/Grading Policy (成績評価方法)	Grading will be decided based on your results of tasks in the exercises.		
Remarks (履修上の注意)	Students are requiered to have the knowledge of the strength of materials, fluid dynamics, dynamics of machinery and thermodynamics. Students need to bring laptop comptuers and use desktop computers in a computer room. The computer room in the Division of Biological Mechanics is used for the exercises on finite element analyses of solid mechanics (1, 2) and the computer terminal room No. 1 is used for the other excercises (3-8).		
Expected preparation and review (授業外学習(予習・復習)の指示)	As preparations, students need to study fundamentals of the exercises, e.g., the strength of materials, fluid dynamics, dynamics of machinery and thermodynamics. As reviews, students need to understand the excercises deeply by studying the theories used in the class.		
Textbooks, References (教科書・参考書・資料)	Text books are not used. References may be introduced. Materials may be provided in each class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Department of Human Intelligence Systems

Basic Course

Course Title(科目名)	Basic Engineering 1 (Introduction to Electric Circuits)		
Lecturer(担当教員)	Prof. Hirofumi Tanaka		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	Knowledge of electric circuits is essential to learn variety of electric systems as well as function of living organism. This course introduce basic concepts from linear DC circuit to transient response. To promote understanding exercise is performed. For analysis of AC circuit, it is introduced that concept of impedance and admittance induced complex number allows expanding DC circuit spontaneously. The aim of this course is to read and to understand directly from English textbook. Furthermore advanced electric devices and integrated circuit technologies are introdecued and added to the exersice questions.		
Topics/Schedule (授業計画)	1. Basic concepts : International Systen of Unit, Electric Charge, Electric Current, Voltage, Power, Energy, Dependent Sources, Resistivity (Chap. 1,2 of textbook) 2. Exercise 3. Ohm's Law, Kirchhoff's Laws,Thevenin's and Norton's Theorems (Chap. 2-5 of textbook) 4. Exercise 5. Exercise 6. Superposition Theorem, Maximun Power Transfer Theorem, Y-Dand D-Y Transformations, Bridge Circuits (Chap. 5 of textbook) 7. Exercise 8. Capacitors and Transient Response (Chap. 8 of textbook), Inductors and Transient Response (Chap. 9 of textbook) 9. Exercise 10. Sinusoidal Alternating Voltage and Current, Phase Relations, Effective or RMS values, Inductor and Capacitor Sinusoidal Responses, Polar Form, Phasors (Chap. 10,11 of textbook) 11. Exercise 12. Impedance and Admittance (Chap. 12 of textbook) 13. Exercise 14. Exercise 15. Summary		
Evaluation/Grading Policy (成績評価方法)	Grading will be comprehensively evaluated by attitutde to exercise in class, short reports and term-end examination.		
Remarks (履修上の注意)	N/A		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Participants requested to read corresponding parts of textbook before classes.		
Textbooks, References (教科書・参考書・資料)	Textbook : Basic circuit analysis, Jhon O'malley, Schaum's outlines, McGraw-Hill		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English if there are students who need explanation in English.		

Course Title(科目名)	Introduction to Mechanics		
Lecturer(担当教員)	Miyamoto Hiroyuki		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	
Course Objectives/Outlines (目的・概要)	Knowledge of dynamics is indispensable not only for robots and mechanical systems but also for learning functions of living bodies. Here, lecture on the basic knowledge of the dynamics of the mass point system from the basic law of dynamics and exercise. Basically, I do classes of exercises to solve exercises of textbooks, but introduce topics of advanced robot technology in each item and add related problems to exercises.		
Topics/Schedule (授業計画)	1. Speed, Displacement, and Velocity: An Introduction to Vectors Uniformly Accelerated Motion 2. exercise 3. Newton's Laws 4. exercise 5. Equilibrium Under the Action of Concurrent Forces, Equilibrium of a Rigid Body Under Coplanar Forces 6. exercise 7. Work, Energy, and Power, Simple Machimes 8. exercise 9. Impulse and Momentum, Angular Motion in a plane 10. exercise 11. Rigid-Body Rotation 12. exercise 13. Simple Harmonic Motion And Spring 14. exercise 15. summary		
Evaluation/Grading Policy (成績評価方法)	As a general rule, evaluate based on the situation of the solution during the exercise hours, the state of the report submission as appropriate, and the final test result.		
Remarks (履修上の注意)	none		
Expected preparation and review (授業外学習(予習・復習)の指示)	Of the exercises of materials to be distributed, students should self-study on problems not done in class.		
Textbooks, References (教科書・参考書・資料)	distribute		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English if there are students who need explanation in English.		

Course Title(科目名)	Fundamentals of Mathematics 1		
Lecturer(担当教員)	Tetsuo Furukawa		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	This course deals with the basic concepts and principles of linear algebra as a fundation of engineering. There are two main aims of this course; one is to review the elementary knowledge learnt in undergraduate, and the other is to introduce some advanced concepts as well as some applied fields.		
Topics/Schedule (授業計画)	1 Vector 2 Linear space 3 Linear independence and basis 4 Linear mapping and matrix 5 Rank and the elementary operation of matrix 6 Linear system and solution space 7 Deteminant 8 Applications of determinant 9 Eignevalue and eigenvector 10 Inner product and orthonormal system 11 Quadratic form 12 Hilbert space 13 Differentiation of vector and matrix 14 Matrix decompositions and principal comonent analysis 15 Functional expansion and linear regression		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class is decided based on the followings: weekly report (40%) and term-end examination (60%).		
Remarks (履修上の注意)	This course is designed for graduate students who have already acquired the elementary skills of linear algebra. It is desirable that students review the elementary knowldege of linear algebra before taking this class.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Preparation: Download the materials in advance, and prepare the class. Weekly report: Some questions are indicated in the class. Solve them and submit the answers as weekly reports.		
Textbooks, References (教科書・参考書・資料)	Materials is provided in the class.		
Language (使用言語)	This course will be mainly taught in Japanese. But the course materials are in English. Students who do not speak Japanese are welcomed.		

Course Title(科目名)	Fundamentals of Mathematics 2		
Lecturer(担当教員)	Hiroaki Wagatsuma		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	Mathematical analysis includes theories of differentiation, integration, measure, limits, infinite series, and analytic functions. Analysis starts from the concept of limits and extends to elementary concepts and techniques of analysis. It can be applied to any space of mathematical objects that has a definition of nearness (a topological space). In this lecture, students lean why we need it in physics and engineering, even in biomechanics and brain science and how to treat it practically.		
Topics/Schedule (授業計画)	1. Mathematical analysis 1.1 Why mathematics is beautiful – developments of differential and integral calculus, ability to see the 1.2 Limits and infinitesimals, (ε, δ)-definition of limit 1.2 Derived function (1) – definition, meaning and geometric interpretation 1.4 Derived function (2) – its application, the extreme value problem and roots of the equation 1.5 Integral approach (1) – Area, definite integral and primitive function 1.6 Integral approach (2) – integral calculus, improper integral and its application 1.7 Partial differentiation, and differential and integral calculus of multivariate function 1.8 Differential equation (1) – definition, meaning and its calculus 1.9 Differential equation (2) – existence theorems and uniqueness theorems 1.10 Taylor expansion, Fourier series and the world-view of series expansion 1.11 Vector analysis – curve, surface and gradient/divergence/curl 2. Numerical analysis 2.1 Nonlinear algebraic equations – with a focus onNewton-Raphson method 2.2 Polynomial interpolations – Lagrange polynomial, Spline interpolation and so on 2.3 Numerical integral – derived function types, Runge-Kutta method and polynomial types 2.4 Approximate solvers of partial differentiation – calculus of finite differences and finite element technique		
Evaluation/Grading Policy (成績評価方法)	The achievement is evaluated based on scores of the final exam(60%) and exercises/assignments(40%).		
Remarks (履修上の注意)	This lecture covers a wide range of differential and integral calculus at the undergraduate level. For this reason, just taking this class is not enough. By reviewing your skill on individual issues after taking classes, well preparations are necessary before and after the classes.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	(prep) pre-learning by downloading the lecture handout. (assignment every week) exercises of the calculus in lectured contents and submission of the results. It can be completed in class after the instruction.		
Textbooks, References (教科書・参考書・資料)	Prepared by the lecturer		
Language (使用言語)	The lecture is organized as 45min in Japanese and 45 min in English (Japanese learners undertake exercises of the calculus after Japanese instructions and English learners undertake the same as homework).		

Course Title(科目名)	Basic Neurosciences 1		
Lecturer(担当教員)	Yoshitaka OHTUBO		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	Cells such as neurons in nervous systems and receptor cells in sense organs are functional units. Each cell expresses various proteins, the interaction and expression patterns of which determine the cell functions. This course introduces molecules involved in living organisms, then elucidates the basic neuroscientific principles at the molecular and cellular levels supporting transcription and translation mechanisms (from DNA to protein), ion channels and the electrical properties of membranes, and the functional structures of synapses for forming cell-cell interactions.		
Topics/Schedule (授業計画)	1. cell structures 2. DNA and RNA 3. amino acids 4. protein 5. lipid 6. plasma membranes 7. diffusion potential 8. ion channels 9. equivalent circuit of cells 10. membrane potential, action potential, receptor potential 11. chemical and electrical synapses 12. ionotropic receptor 13. metabotropic receptor 14. electrical recording and optical recording 15. signal transduction of five senses		
Evaluation/Grading Policy (成績評価方法)	Your final grade will be calculated according to the following: attitude in class (10%), short tests on respective topics (30%), and end-of-term examination (60%).		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習(予習・復習)の指示)	Students are expected to conduct a preliminary investigation of the topics presented above before taking each topic.		
Textbooks, References (教科書・参考書・資料)	Materials for the lecture will be distributed to students at each lecture. Reference textbooks are the following: Molecular Biology of the CELL (Garland Science; fifth edition), Ganong's Review of Medical Physiology (McGraw-Hill Medical), and Principles of Neural Science (McGraw-Hill Professional; fifth edition)		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Basic Neuroscience 2		
Lecturer(担当教員)	Kiyohisa NATSUME		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	The aim of this course is to understand evolusional processes of the central nervous sytems in different species and their basic brain structure and functions. Basic property of neuron and grial cells, hierarchical structue and function of the brain are discussed.		
Topics/Schedule (授業計画)	1 Structure of biological systems: cell, tissure, organ 2 Evolusion and development of biological systems and nervous sytem 3 Cellular basis of neurons and grial cells 4 Cental nervous system 5 Peripheral nervous system 6 Neural cirquits and neurotransmitters 7 Spinal cord: Reflex 8 Brain stem and cranial nerves: Autonomic functions 9 Celebellum: Motr control and skill learning 10 Thalamus: Cortico-subcortical relay of sensory and motor signals 11 Hypothalamus: Instinctive behaviors and related visceral functions 12 Basal ganglia: Involuntary movements and reward 13 Limbic system: Emotion, learning and memory 14 Cerebral cortes: sensory perception and voluntary movements 15 Hier brain functions: Decision making and soucial functions		
Evaluation/Grading Policy (成績評価方法)	Regular examination (70%), Short report after each lecture.		
Remarks (履修上の注意)	Basic knowleges of brain science, physiology and biology may help better understanding but not essencial.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Dowload lecture materials and read them before each lecture. Recheck contents of lecture materials and them for short reports after each lecture.		
Textbooks, References (教科書・参考書・資料)	Lecture materials are uploaded in "LiveCampus"		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Practical Course

科目名	英語 VIIC-1
科目名(英語表記)	English VIIC-1
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q1)
講義室	
曜日・時限	木曜4限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This comprehensive course aims at improving practical English proficiency in four skills: reading, listening, speaking and writing. By facilitating the learning of English in science fields, this course serves as a preparation for presenting at scholastic conferences and writing abstracts This course also offers opportunities to practice short oral presentations, and question and answers. Basic English proficiency is a prerequisite.
カリキュラムにおける この授業の位置付け	This is a level VII comprehensive course. Those who have passed any level VIII or higher courses (two quarters combined; VIIIA-1・2, VIIIB-1・2, VIIID-1・2, IXA-1・2, IXB-1・2, IXD-1・2, XA-1・2, XB-1・2, XD-1・2) cannot take this course.
授業項目	1. Course overview and Textbook Unit 1 Bare Bones 2. Unit 1 Bare Bones 3. Unit 2 Mummy Mystery 4. Unit 4 Mission to Mars 5. Unit 8 Free Fall 6. Unit 9 The Hidden Lives of Leaves 7. Unit 9 The Hidden Lives of Leaves 8. Final mini-presentation and Final Examination
授業の進めかた	Classes are a combination of listening, mini-presentations in groups, reading texts, answering the related questions and conversational practices.
授業の達成目標	1. To read and understand the basic English texts in science fields.
成績評価の基準および 評価方法	Abstract writing 30% Listening Quiz 30% Mini-presentations in group 20% Short final presentation in group 5% Final exam 15%
授業外学習(予習・復習) の指示	Students are expected to prepare a mini-presentation each week as well as write concise abstracts of each unit. Pre-studying the texts and listening to the audios of the summary texts are also required.
キーワード	comprehensive English, reading, writing, listening, speaking
教科書	Science Frontiers: Developing Your English with National Geographic. Keiko Hattori, Toshio Hidaka, Yayoi Yamashita, Kana Matsuda, Judy Noguchi. Cengage 978-4-86312-289-5
参考書	Students are encouraged to bring their dictionaries and use them in the class.
備考	原則として英語 VIIC-2と対で連続で履修すること。

科目名	英語 VIIC-2
科目名(英語表記)	English VIIC-2
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q2)
講義室	
曜日・時限	木曜4限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This comprehensive course aims at improving practical English proficiency in four skills: reading, listening, speaking and writing. By facilitating the learning of English in science fields, this course serves as a preparation for presenting at scholastic conferences and writing abstracts This course also offers opportunities to practice short oral presentations, and question and answers. Basic English proficiency is a prerequisite.
カリキュラムにおけるこの授業の位置付け	This is the second quarter continuation of English VIIC-1. Those who want to take this course must have passed English VIIC-1.
授業項目	1. Course overview and Textbook Unit 10 Getting the Shot 2. Unit 10 Getting the Shot 3. Unit 11 Attack of the Germs 4. Unit 12 Just Like the Earth? 5. Unit 13 The Skin You're In 6. Unit 14 Weirdest Wonders 7. Unit 15 Aquarius 8. Final-mini presentation and Final Examination
授業の進めかた	Classes are a combination of listening, mini-presentations in groups, reading texts, answering the related questions and conversational practices.
授業の達成目標	1. To read and understand the basic English texts in science fields. 2. To write concise summaries of the English texts in science fields. 3. To listen and be able to understand the basic spoken English in science fields. 4. To be able to speak English confidently by presenting mini-talks in a group.
成績評価の基準および評価方法	Abstract writing 30% Listening Quiz 30% Mini-presentations in group 20% Short final presentation in group 5% Final exam 15%
授業外学習(予習・復習)の指示	Students are expected to prepare a mini-presentation each week as well as write concise abstracts of each unit. Pre-studying the texts and listening to the audios of the summary texts are also required.
キーワード	comprehensive English, reading, writing, listening, speaking
教科書	Science Frontiers: Developing Your English with National Geographic. Keiko Hattori, Toshio Hidaka, Yayoi Yamashita, Kana Matsuda, Judy Noguchi. Cengage 978-4-86312-289-5
参考書	Students are encouraged to bring their dictionaries and use them in the class.
備考	原則として英語 VIIC-1と対で連続で履修すること。

科目名	英語 IXD-1
科目名(英語表記)	English IXD-1
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	後期(Q3)／(Q4)
講義室	
曜日・時限	木曜5限／月曜6限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	The purpose of this course is to help students to gain confidence with speaking in English. In this course, you will learn about using English by completing various guided activities, group speaking activities and practical exercises. This course will also practice other English skills such as listening, reading and writing. However, the focus will be on speaking and understanding practical, realistic styles of English.
カリキュラムにおけるこの授業の位置付け	This is a level IX course for speaking concentration. Those who want to take this course must have passed any level VIII courses (two quarters combined; VIIIA-1・2, VIIIB-1・2, VIIID-1・2) or by instructors' permission.
授業項目	1 Course outline and Textbook Lessons 1A. "Gender and Society". 3 Textbook Lessons 1B. " Gender and Society" 3 Textbook Lessons 2A. " Reproducing Life" 4 Textbook Lessons 2B. " Reproducing Life" 5 Textbook Lessons 3A. "Human Migration " 6 Textbook Lessons 3B. "Human Migration " 7 Group Listening Activity/Presentation preparation. 8 Group Listening Activity/Final Presentation.
授業の進めかた	Following the texbook topics, students practice speaking activities, discuss, and making speeches. There will be homework acitivites, in-class quizzes, and final presentation.
授業の達成目標	The purpose of this course is to help students to gain confidence with speaking in English.
成績評価の基準および評価方法	Final Presentation: (40%) Listening Quizzes: (40%) Homework Activities (10%) Textbook Quiz (10%)
授業外学習(予習・復習)の指示	In preparation for this class it would be good if you could listen and watch some news programs or presentations in English. These web sites are useful: http://www3.nhk.or.jp/nhkworld/ or http://www.elllo.org/index.htm
キーワード	Speaking, English, English speaking, discussion, debate
教科書	Pathways: Listening, Speaking and Critical Thinking 3: Combo Split 3A with Online Workbook Access Code〔2012 年〕新版 (Cengage Learning) ISBN 978-1-285-15976-8 Becky, Traver Chase, Kristin L. Johannsen et al.
参考書	Students are encouraged to bring a dictionary to class.
備考	原則として英語 IXD-2と対で連続で履修すること。

科目名	英語 IXD-2
科目名(英語表記)	English IXD-2
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	後期(Q4)／(Q4)
講義室	
曜日・時限	木曜5限／木曜6限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	The purpose of this course is to help students to gain confidence with speaking in English. In this course, you will learn about using English by completing various guided activities, group speaking activities and practical exercises. This course will also practice other English skills such as listening, reading and writing. However, the focus will be on speaking and understanding practical, realistic styles of English.
カリキュラムにおける この授業の位置付け	This is the second quarter continuation of English IXD-1. Those who want to take this course must have passed English IXD-1.
授業項目	1 Review of Q1 and Homework Presentation 2 Textbook Lessons 4A. "Fascinating Planet" 3 Textbook Lessons 4B. "Fascinating Planet" 4 Textbook Lessons 5A. "Making a Living, Making a Difference" 5 Textbook Lessons 5B. "Making a Living, Making a Difference" 6 Texbook Review and completion quiz 7 Group Listening Activity/Presentation preparation 8 Final Pair Presentation
授業の進めかた	Following the texbook topics, students practice speaking activities, discuss, and making speeches. There will be homework acitivites, in-class quizzes, and final presentation.
授業の達成目標	The purpose of this course is to help students to gain confidence with speaking in English.
成績評価の基準および 評価方法	Final Presentation: (40%) Listening Quizzes: (40%) Homework Activities (10%) Textbook Quiz (10%)
授業外学習(予習・復習) の指示	In preparation for this class it would be good if you could listen and watch some news programs or presentations in English. These web sites are useful: http://www3.nhk.or.jp/nhkworld/ or http://www.elllo.org/index.htm
キーワード	Speaking, English, English speaking, discussion, debate
教科書	Pathways: Listening, Speaking and Critical Thinking 3: Combo Split 3A with Online Workbook Access Code〔2012 年〕新版 (Cengage Learning) ISBN 978-1-285-15976-8 Becky, Traver Chase, Kristin L. Johannsen et al.
参考書	Students are encouraged to bring a dictionary to class.
備考	原則として英語 IXD-1と対で連続で履修すること。

科目名	英語 XA-1
科目名(英語表記)	English XA-1
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q1)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	Learning how to write an abstract and design a winning poster are crucial steps for researchers. This course is designed to equip students with the skills and experience required to effectively write an academic/scientific abstract to specific and/or general audiences in a real-world situation. Students will be expected to: 1. become familiar with the specific structure of academic abstracts 2. write an abstract and present it as a poster presentation 3. critically evaluate own and other students' writing
カリキュラムにおける この授業の位置付け	This is a level X course for writing concentration. Those who want to take this course must have passed any level IX courses (two quarters combined; IXA-1・2, IXB-1・ 2, IXD-1・ 2) or by instructors' permission.
授業項目	1. Course overview; Introduction to structure; writing evaluation 2. Abstract grammar and vocabulary 3. Summarizing 4. Abstract Introduction and Method; Designing a Poster 5. Abstract Results and Conclusion; Designing a Poster 6. Self- and Peer-Evaluation: Abstract and Poster 7. Submit Final Abstract; Poster Presentation 8. Final Exam; Reflection
授業の進めかた	Classes are a combination of lecture, poster presentations and writing practice. Students will share their writing in groups and edit each other's work.
授業の達成目標	1. To understand the basic structure of an abstract 2. To concisely state research objective, explain the research background, describe the research design and present results 3. To use appropriate register and tone for the specific genre of writing 4. To write grammatically accurate sentences using appropriate vocabulary
成績評価の基準および 評価方法	50% Final Abstract 20% Poster Presentation 20% Instructor Points 10% Final Exam
授業外学習(予習・復習) の指示	Students are expected to prepare a topic for a mini poster presentation each week as well as write and revise each section of their writing assignment in a timely manner. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Abstract Writing; Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	The teacher will provide a list of reference books in the first class
備考	原則として英語 XA-2と対で連続で履修すること。

科目名	英語 XA-2
科目名(英語表記)	English XA-2
クラス	1
担当教員	渡邉　浩明
対象学年	M1, 2
開講学期	前期(Q2)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	Learning how to write an abstract and design a winning poster are crucial steps for researchers. This course is designed to equip students with the skills and experience required to effectively write an academic/scientific abstract to specific and/or general audiences in a real-world situation. Students will be expected to: 1. become familiar with the specific structure of academic abstracts 2. write an abstract and present it as a poster presentation 3. critically evaluate own and other students' writing
カリキュラムにおける この授業の位置付け	This is the second quarter continuation of English XA-1. Those who want to take this course must have passed English XA-1.
授業項目	1. Review XA-1 Skills; Introduction to Content; Research resources 2. Mini Research Project (PBL) 3. Abstract Introduction; ; Poster Design 4. Abstract Method; Poster Design 5. Abstract Results and Conclusion; Poster Design 6. Self- and Peer-Evaluation: Abstract and Poster 7. Submit Final Abstract; Poster Presentation 8. Final Exam; Reflection
授業の進めかた	Classes are a combination of lecture, poster presentations and writing practice. Students will share their writing in groups and edit each other's work.
授業の達成目標	1. To understand the basic structure of an abstract 2. To concisely state research objective, explain the research background, describe the research design and present results 3. To use appropriate register and tone for the specific genre of writing 4. To write grammatically accurate sentences using appropriate vocabulary
成績評価の基準および 評価方法	50% Final Abstract 20% Poster Presentation 20% Final Exam 10% Instructor Points
授業外学習(予習・復習) の指示	Students are expected to prepare a topic for a mini poster presentation each week as well as write and revise each section of their writing assignment in a timely manner. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Abstract Writing; Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	The teacher will provide a list of reference books in the first class
備考	原則として英語 XA-1と対で連続で履修すること。

科目名	英語 XD-1
科目名(英語表記)	English XD-1
クラス	1
担当教員	ホロウェイ・グレゴリー
対象学年	M1, 2
開講学期	前期(Q1)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This course is designed to equip students with the skills and experience required to effectively give an oral presentation and write an academic/scientific abstract to a general audience in a real-world situation. Specifically, students will be expected to: 1) Do two well-organized academic presentations; 2) Conduct a Q&A session confidently; 3) Critically evaluate your and other students' presentations; 4) Participate actively in each class.
カリキュラムにおける この授業の位置付け	This is a level X course for speaking concentration. Those who want to take this course must have passed any level IX courses (two quarters combined; IXA-1・2, IXB-1・2, IXD-1・2) or by instructor's permission.
授業項目	1. Course Overview; Example of Academic Presentation; Introduction to Fluency 2. Introduction to Presentation Skills 3. Introduction to Content/Structure 4. Presentation 1 5. Self- and Peer-Evaluation; Introduction to Q&A 6. Q&A Practice session; Practice for Finals 7. Individual Presentation 2; Submit abstract 8. Individual Presentation 2
授業の進めかた	Classes are a combination of lecture and presentation practice. This class will encourage real-life scenarios in that students will do mini poster preesntations frequently to practice fluency and Q&A.. Students will also work together in groups on specific tasks and help edit each other's work.
授業の達成目標	By the end of this course, students should be able to
成績評価の基準および 評価方法	40% Presentation 1 40% Presentation 2 20% Instructor Points
授業外学習(予習・復習) の指示	To participate acticely in class, students are expected to prepare a topic for homework every week which will be presented in the next class. Homework must be completed in a timely manner in order to be prepared for group tasks. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Oral Presentation; PowerPoint; KeyNote; Academic Abstract Writing; Mini Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	A reference list will be given to students in the first class
備考	原則として英語 XD-2と対で連続で履修すること。

科目名	英語 XD-2
科目名(英語表記)	English XD-2
クラス	1
担当教員	ホロウェイ・グレゴリー
対象学年	M1, 2
開講学期	前期(Q2)
講義室	
曜日・時限	木曜5限
授業形態	生命体工学研究科　実践科目
単位区分	選択必修
単位数	0.5
授業の概要	This course is designed to equip students with the skills and experience required to effectively give an oral presentation and write an academic/scientific abstract to a general audience in a real-world situation. Specifically, students will be expected to: 1) Do two well-organized academic presentations; 2) Conduct a Q&A session confidently; 3) Critically evaluate your and other students' presentations; 4) Participate actively in each class.
カリキュラムにおける この授業の位置付け	This is the second quarter continuation of English XD-1. Those who want to take this course must have passed English XD-1.
授業項目	1. Review of XD-1 skills; Introduction to Content/Visuals 2. Introduction to Abstract Writing; Presentation Language (Vocabulary and Grammar) 3. Final Presentation Preparation; Self- and Peer-Evaluation Visuals; Abstract wiriting 4. Final Presentation Preparation; Self- and Peer-Evaluation Fluency/Q&A; Abstract writing 5. Final Presentation Preparation; Self- and Peer-Evaluation: Presentation Skills; Language 6. Final Presentation; ; Submit Final Abstract 7. Final Presentation 8. Final Presentation
授業の進めかた	Classes are a combination of lecture and presentation practice. This class will encourage real-life scenarios in that students will do mini poster preesntations frequently to practice fluency and Q&A.. Students will also work together in groups on specific tasks and help edit each other's work.
授業の達成目標	By the end of this course, students should be able to
成績評価の基準および 評価方法	20% Abstract 40% Final Presentation 20% Instructor Points 20% Final Written Exam
授業外学習(予習・復習) の指示	To participate acticely in class, students are expected to prepare a topic for homework every week which will be presented in the next class. Homework must be completed in a timely manner in order to be prepared for group tasks. Students who are absent should contact the teacher to know what work to complete before the next class.
キーワード	Academic Oral Presentation; PowerPoint; KeyNote; Academic Abstract Writing; Mini Poster Presentation
教科書	No textbook. The teacher will provide all the materials for the class.
参考書	A reference list will be given to students in the first class
備考	原則として英語 XD-1と対で連続で履修すること。

Course Title（科目名）	International Internship		
Lecturer（担当教員）	Professor in charge of International Internship		
Course intended for（対象学年）	1st or 2nd year student		
Credit Category（単位区分）	Elective course	Credits（単位数）	2
Course Objectives/Outlines（目的・概要）	In order to foster the ability to communicate in a foreign language and acquire a global perspective which are required to become global engineers, students will engage in engineering internship at overseas universities, research institutes, or companies.		
Topics/Schedule（授業計画）	Students must engage in internship at overseas universities, research institutes, or companies for 60 hours or longer in total, and submit a report of the internship activities after completing the internship. An alternative reporting assignment may be given to students from overseas who cannot engage in engineering internship.		
Evaluation/Grading Policy（成績評価方法）	The final grade will be determined by the quality of report.		
Remarks（履修上の注意）	All students who engage in internship must gain approval from their supervising professors. They must purchase overseas travelers' personal accident insurance and Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). They should assess local culture and customs of countries where they will be staying. They should check the website for overseas safety of MOFA (Ministry of Foreign Affairs of Japan), and fully confirm the information for local safety risks of theft, infection, etc.		
Expected preparation and review（授業外学習（予習・復習）の指示）	Students should prepare to introduce themselves and explain their research contents in English. They should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internships, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References（教科書・参考書・資料）	Textbooks or references may be assigned by internship supervisors.		
Language（使用言語）	English will be used.		

Course Title(科目名)	Domestic Internship 1		
Lecturer(担当教員)	Professor in charge of Domestic Internship		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	In order to acquire the practical skills to logically analyze and solve engineering problems, and to understand the role engineers play in society, students will engage in internship at domestic companies, research institutes, or universities (other than Kyutech).		
Topics/Schedule (授業計画)	Students must engage in engineering internship at domestic companies, research institutes, or universities (other than Kyutech) for 30 hours or longer in total, and submit a report of the internship activities after completing the internship.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by the quality of report.		
Remarks (履修上の注意)	All students who engage in internship must gain approval from their supervising professors. They must purchase Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). Those who engage in internships at two or more organizations can get credit for this course if the total internship time is 30 hours or longer. Those who get credit for this course cannot get credit for Domestic Internship 2.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internship, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by internship supervisors.		
Language (使用言語)	Language depends on organizations where students engage in internship.		

Course Title(科目名)	Domestic Internship 2		
Lecturer(担当教員)	Professor in charge of Domestic Internship		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In order to acquire the practical skills to logically analyze and solve engineering problems, and to understand the role engineers play in society, students will engage in internship at domestic companies, research institutes, or universities (other than Kyutech).		
Topics/Schedule (授業計画)	Students must engage in engineering internship at domestic companies, research institutes, or universities (other than Kyutech) for 60 hours or longer in total, and submit a report of the internship activities after completing the internship. An alternative reporting assignment may be given to adult students who cannot engage in internship.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by the quality of report.		
Remarks (履修上の注意)	All students who engage in internship must gain approval from their supervising professors. They must purchase Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). Those who engage in internships at two or more organizations can get credit for this course if the total internship time is 60 hours or longer. Those who get credit for this course cannot get credit for Domestic Internship 1.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internship, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by internship supervisors.		
Language (使用言語)	Language depends on organizations where students engage in internship.		

Specialized Course

Course Title(科目名)	Human Function Substitution System		
Lecturer(担当教員)	Chikamune Wada		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The aim of this course will provide with the concept of substitution system for sensory system, motor system and internal organs. In this course, the knowledge about physiology and anatomy for human body will be instructed firstly, the deficiency of human ability/performance because of being disabled/illness will be provided secondly, and substitution system will be explained lastly. In this course, you can understand the mechanism for human body and .learn how to support human ability by using engineering technique.		
Topics/Schedule (授業計画)	1. Introduction 2. Neural system 3. Visual system 1 4. Visual system 2 5. Substitution for visuall system 6. Auditory system 1 7. Auditory system 2 8. Substitution for auditory system 9. Vocalization and its substituion system 10. Motor system: Bone, muscle, upper limb 11. Motor system: Lower limb, trunk 12. Substitution for motor system 1 13. Substitution for motor system 2 14. Internal organs and its substituion system: Heart, lungs 15. Internal organs and its substituion system: kidneys, pancreas		
Evaluation/Grading Policy (成績評価方法)	Grading will be based on attendance and reports.		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習(予習・復習)の指示)	The students should download course materials in advance and read them.		
Textbooks, References (教科書・参考書・資料)	This course will not use a texbook. Course materials can be downloaed in advance.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Robot Learning		
Lecturer(担当教員)	Eiichi Inohira		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course aims at learning fundamentals and the-state-of-art of reinforcement learning including applications to robotics. The reinforcement learning is one of machine learning algorithms and different from supervised learning and unsupervised learning. The course introduces concepts of the reinforcement learning according to the references.		
Topics/Schedule (授業計画)	1 Reinforcement learning 2 Evaluative feedback 3 The Reinforcement Learning Problem 4 Dynamic Programming 5 Monte Carlo Methods 6 Temporal-Difference Learning 7 Eligibility Traces 8 Case Studies 9 Efficient Solution Framework 1 10 Efficient Solution Framework 2 11 Constructive-Representational Directions 1 12 Constructive-Representational Directions 2 13 Probabilistic Models 1 14 Probabilistic Models 2 15 Reinforcement learning in Robotics: A Survey		
Evaluation/Grading Policy (成績評価方法)	Exercise of every class(30%), Final exam(70%)		
Remarks (履修上の注意)	To understand this lecture, basic knowledge of linear algebra, mathematical analysis, probability theory, information technology, computer science, programming language is needed.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Read the references before the class Review the previous class because a question in an exercise is taken from the previous one.		
Textbooks, References (教科書・参考書・資料)	(1) R. S. Sutton, A. G. Barto, Reinforcement learning: An Introduction, MIT Press, 1998. (2) https://webdocs.cs.ualberta.ca/~sutton/book/ebook/the-book.html (3) M. Wiering, M. van Otterlo (Eds.), Reinforcement Learning State-of-the-art, Springer, 2012. (4) http://www.springer.com/us/book/9783642276446		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Intelligent integrated systems 1		
Lecturer(担当教員)	Takashi Morie		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In order to realize human intelligence, systems mimicking human brain functions are being developed. Since information processing performed in the brain is highly nonlinear and in massively parallel, its implementation by serial digital computers is ineffective and it is almost impossible to compute it in practical time. Therefore, dedicated hardware to implement brain-like algorithms is required. The objective of this course is to understand brain-like architectures. In the former part of this course, students learn the basics of CMOS devices and circuits, with which current digital computers are constructed. In the latter part, they learn the concepts and realizations of brain-like integrated circuits by digital and analog manners.		
Topics/Schedule (授業計画)	1. Introduction, and fundamentals of semiconductors and p-n junctions 2. Fundamentals of MOS devices 3. Basic operation of MOS transistors (1) 4. Basic operation of MOS transistors (2) 5. Fabrication technology of CMOS integrated circuits 6. CMOS LSI and digital circuits 7. Digital memory devices and circuits 8. Analog memory devices and circuits (1) 9. Analog memory devices and circuits (2) 10. Analog basic circuits for brain-like systems (1) 11. Analog basic circuits for brain-like systems (2) 12. Neural network LSI architecture 13. Visual information processing using physical phenomena 14. Merged analog/digital brain-like integrated circuits 15. Conclusion 16. Test		
Evaluation/Grading Policy (成績評価方法)	Based on the results of mini-tests after classes, reports assigned several times, and the test at the last class.		
Remarks (履修上の注意)	Students are expected to have learned basics of electric circuits and neural networks.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Read lecture materials and references, and try to understand the contents of lectures before classes. Review the lessons after classes, and try to understand the contents of mini-tests completely.		
Textbooks, References (教科書・参考書・資料)	Lecture materials are uploaded at “LiveCampus”. References are announced at the first class.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Intelligent integrated systems 2		
Lecturer(担当教員)	Prof. Hirofumi Tanaka		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In recent years, the electrical devices are certainly and rapidly down sizing. Size of a devices has achieved to several tens of nanometers. Physical properties of the devices in nanostructure have been different from that of macroscopic size because of perturbation. Mesoscopic physics is organized study of physical phenomena appeared in nanoscale. Without understanding the mesoscopic phenomena, integrated circuit of nanodevices can not be realized. In this course, to systematically study that the electronics in nanoscale elucidated in recent years by mesoscopic physics, and also to understand the phenomena which may occur in integration of nanodevices, basics of the nanostructure electronics is introduced in the first half, and basics of the electrical properties of nanomaterials except silicon semiconductor is introduced in the second half.		
Topics/Schedule (授業計画)	1. Introduction, Basic Concept of Mesoscopic Conduction 2. Conduction Mechanism in Solid 3. Band Theorem, Molecular Orbitals 1 4. Band Theorem, Molecular Orbitals 2 5. Electric Physics in Nanostructures 1 6. Electric Physics in Nanostructures 1 7. MOS Nanotransistor 1 8. MOS Nanotransistor 2 9. Organic Conductor 1 (Low Dimensional Organic Conductor) 10. Organic Conductor 2 (Organic Superconductor) 11. Nanocrystals, Clusters and Nanoparticles 12. Nanocarbon systems (C60, Carbon Nanotubes and Graphene) 13. New Principles and New Concept of Transistors 1 14. New Principles and New Concept of Transistors 2 15. Summary		
Evaluation/Grading Policy (成績評価方法)	Grading will be comprehensively evaluated by attitude to journal discussion in class and short reports.		
Remarks (履修上の注意)	N/A		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Participants are requested to read resume supplied before classes and to read journal articles on related topics in previous week class for discussion in class.		
Textbooks, References (教科書・参考書・資料)	Resume and journal articles will be supplied via Live Campus.		
Language (使用言語)	Usually lectures are given in English.		

Course Title(科目名)	Intelligent Digital Integrated Circuits		
Lecturer(担当教員)	Hakaru Tamukoh		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	With the continuous progress of integrated circuit technology, in recent years, it has become possible to implement around 10 billion transistors in one chip. Digital hardware based on logic circuits realized by this integrated circuit technology is an extremely important device for supporting our advanced information society. This course will provide the latest topics related to integrated circuits and explain fundamental knowledge about embedded image processing by logic circuits. The aim of this course is to understand digital hardware architecture and its performance evaluation.		
Topics/Schedule (授業計画)	1 Digital systems 1 (Logic circuits and programming) 2 Digital systems 2 (Microprocessors and computer systems) 3 Introduction 1 Latest topics on integrated circuits 4 Introduction 2 Brain-like computer, Brain-like chip 5 Embedded Real-time Image Processing 6 Field Programmable Gate Array (FPGA) 7 Design Process 1: Problem specification 8 Design Process 2: Algorithm Development, Architecture Selection and System Implementation 9 Mapping Techniques 1: Timing Constraints 1 10 Mapping Techniques 2: Timing Constraints 2 11 Mapping Techniques 3: Memory Bandwidth Constraints 1 12 Mapping Techniques 4: Memory Bandwidth Constraints 2 13 Mapping Techniques 5: Resource Constraints 1 14 Mapping Techniques 6: Resource Constraints 2 15 Conclusion and latest topics on brain-like integrate circuits		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class is decided based on the followings: weekly report (50%) and term-end examination(50%).		
Remarks (履修上の注意)	Students are expected to have learned basics of logic circuits, programming and computer systems.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Study the meaning of unknown technical term as preparation for the next lecture. After the class, list the keywords and investigate the research related to that keywords in books or search engine for academic texts.		
Textbooks, References (教科書・参考書・資料)	Donald G. Bailey, "Design for Embedded Image Processing on FPGAs", IEEE, John Wiley & Sons (Asia) Pte Ltd, 2011.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Practicum in Intelligent Machine Design 1		
Lecturer(担当教員)	Chikamune WADA and Hakaru TAMUKOH		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective and required course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In this practicum, students will learn basic signal processing method to develop intelligent machines or systems to realize human intelligence. To be specific, at first, students will learn measuring techniques for electromyogram through analog circuits, and also learn signal processing technique by LabVIEW. Next, students will learn digital circuit design using Field Programmable Gate Array (FPGA) for signal processing.		
Topics/Schedule (授業計画)	1. Basic knowledge of electromyogram 2. Designing analog circuit 1 3. Designing analog circuit 2 4. LabVIEW (I/O) 5. LabVIEW (Signal processing) 1 6. LabVIEW (Signal processing) 2 7. LabVIEW (Real tme processing) 1 8. LabVIEW (Real time processing) 2 9. Introduction to FPGA and digital circuit design 10. Tutorial on Xilinx ISE 11. Digital circuit design using FPGA 1 12. Digital circuit design using FPGA 2 13. Digital circuit design using FPGA 3 14. Advanced FPGA design 1 15. Advanced FPGA design 2 16. Advanced FPGA design 3		
Evaluation/Grading Policy (成績評価方法)	Evaluation will be done by attendance and achievement to the practice.		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students will be expected to do practice for LabVIEW/Xilinx ISE.		
Textbooks, References (教科書・参考書・資料)	Necessary material will be provided.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Machine learning and pattern recognition		
Lecturer(担当教員)	Tetsuo Furukawa		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course introduces the basic concepts and principles of probabilistic machine learning as a foundation of artificial intelligence. It mainly deals with probabilistic machine learning from Bayesian and optimization viewpoints.		
Topics/Schedule (授業計画)	Introduction: what is machine learning? 1 What is machine learning? Review of probability theory and information theory 2 (1) Random variable and probability distribution 3 (2) Multivariate random variable 4 (3) Information theory (5) Bayes'' rule Probabilistic estimation 6 (1) Maximum likelihood and maximum a posteriori 7 (2) Bayes' inference 8 (3) Conjugate distributions Supervised learning 9 (1) Least mean square error and ridge regression 10 (2) Bayesian regression 11 (3) Model selection 12 (4) Pattern classification Unsupervised learning 13 (1) Gaussian mixture model and EM algorithm 14 (2) Variational Bayesian and MCMC 15 (3) Topic model		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class is decided based on the followings: weekly report (50%) and term-end examination (50%).		
Remarks (履修上の注意)	Knowlege and skills of linear algebra is necessary. It is desirable that students take ″Fundamentals of Mathematics 1'' before taking this course.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Preparation: Download the materials in advance, and prepare the class. Weekly report: Students should submit a short report every week. The themes are presented in the class.		
Textbooks, References (教科書・参考書・資料)	No text book is needed. Some references are introduced in the class.		
Language (使用言語)	This course will be mainly taught in Japanese. But the course materials are in English. Students who do not speak Japanese are welcomed.		

Course Title(科目名)	Brain-Inspired Robotics and Neural Dynamics		
Lecturer(担当教員)	Hiroaki Wagatsuma		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In this lecture, we explore systems design inspired by biological intelligence based on body and mind (brain), through understanding of what makes us human to be intelligent. As fundamental basis to consider the system we need to learn about body kinetics/morphology, which are analyzed by mathematics, physics, and information representation in the brain. Starting from non-linear dynamics in the brain and body, and it extend to applications to human assist systems including automated driving system.		
Topics/Schedule (授業計画)	1. Fundamental mathematics of the modeling of biological systems 2. Equations for describing biological systems, especially for non-linear phenomena 3. Modeling of phenomenona with equations and principles 4. Numerical simulations with various basement techniques 5. Review of the motion equation and perspective – Multibody dynamics 6. Further analysis of the motion equation – Multibody dynamics 7. Understanding of the "state" – Observation of how the system behaves 8. Modes of regulation and bifurcation analysis – Observation of how the system behaves 9. Serious difference between information science and biological information – information representation 10. Meaning and context in the biological information – information representation 11. Brain-Body-Environment (1) Bernstein's the degree of freedom 12. Brain-Body-Environment (2) Global Entrainment 13. Implementation methods and a case study (1) Automated driving 14. Implementation methods and a case study (2) Humanoid robot 15. Brainstorming & Discussion		
Evaluation/Grading Policy (成績評価方法)	The achievement is evaluated based on scores of the final exam(40%) and exercises/assignments every week (60%).		
Remarks (履修上の注意)	This lecture covers a wide range of mathematics/physics/programming and those integrative knowledge. For this reason, just taking this class is not enough. By reviewing your skill on individual issues after taking classes, well preparations are necessary before and after the classes.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	(prep) checking the record of the previous class in the shared board, and preparing the next class according to the guidance. (assignment every week) retaining of keywords that you learnt in the class and submitting of the report and assignment every week through the instruction of the lecturer.		
Textbooks, References (教科書・参考書・資料)	Prepared by the lecturer. Some of handouts will be distributed in the class, which are related to i) kinematics/kinetics of robot hands ii) mathematical analysis of non-linear dynamics iii) multi-body dynamics iv) kinematics/kinetics of human body and brain-inspired systems		
Language (使用言語)	The lecture is organized as 45min in Japanese and 45 min in English (Japanese learners undertake exercises of the calculus after Japanese instructions and English learners undertake the same as homework).		

Course Title(科目名)	Brain-Like Learning Systems		
Lecturer(担当教員)	Keiichi Horio		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Regarding machine learning, regression, classification, which is a framework of supervised learning, dimensionality reduction and clustering which are unsupervised learning, interworking topics on the latest artificial intelligence, as a developmental topic , semi supervised learning, metastatic learning, multitasking learning and so on are introduced.		
Topics/Schedule (授業計画)	1. Machine Learning, and Learning Models 2. Least Squares Learning 3. Constrained Least Squares Learning 4. Sparse Learning 5. Clasification based on Least Squares Learning 6. Support Vector Machines 7. Ensemble Leanring 8. Probabilistic Classification 9. Dimensionality Reduction 10. Clustering 11. Semi-supervised Learning 12. Supervised Dimensionality Reduction 13. Transfer Learning 14. Multi Task Learning 15. Summary		
Evaluation/Grading Policy (成績評価方法)	Evaluation is achieved based on the reports and examination.		
Remarks (履修上の注意)	It is desirable to acquire basic linear algebra and probability statistics.		
Expected preparation and review (授業外学習(予習・復習)の指示)	After each class, students are required to review the class using the KWM system.		
Textbooks, References (教科書・参考書・資料)	Materials are introduced in the classes.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Visual Information Processing		
Lecturer(担当教員)	Kaori Yoshida		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	A Visual Information System is an information processing system which enables to understand meaning or contents of images such as pattern information. In addition, it is one of the important research areas of higher brain functions. In this course, I will explain basic image processing technologies and its applications mainly. Course objectives are (1) to study common image processing technologies, (2) to understand how visual systems work, (3) to apply image processing technologies to real-world tasks. After completing this course students will be able to (1) demonstrate understanding of common image processing technologies, (2) describe how visual systems work, (3) explore advanced image processing technologies.		
Topics/Schedule (授業計画)	1. Introduction 2. Image Representation 3. Image Compression 4. Image Binarization 5. Image Segmentation 6. Image Recognition 7. Advanced Image Recognition 8. Color System 9. Color Image Processing 10. Advanced Color Image Processing 11. Subjective Image Processing 12. Advanced Subjective Image Processing 13. Advanced Technologies on Visual Information Processing (1) 14. Advanced Technologies on Visual Information Processing (2) 15. Advanced Technologies on Visual Information Processing (3)		
Evaluation/Grading Policy (成績評価方法)	Evaluation will be given by tasks assigned on each topic. Task assignments 100%. Students need to earn at least 60 points to get the credits.		
Remarks (履修上の注意)	This course is not recommended to students who have mastered basic image processing technologies.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Download handouts in advance and read them before attending.		
Textbooks, References (教科書・参考書・資料)	No textbooks required. References will be introduced in the class if necessary. Lecture handouts are distributed through LiveCampus.		
Language (使用言語)	Usually lectures are given in English. However we will have lecture in Japanese if there are students who need explanation in Japanese.		

Course Title(科目名)	Brain Inspired Artificial Intelligence		
Lecturer(担当教員)	Motoaki Kawanabe, Eiji Uchibe, Stefan Elfwing		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course aims to provide an outline of brain-inspired artificial intelligence that tries to understand the mechanisms of the brain and implement brain models into artificial systems. At first, we show the basics of decision making theories such as optimal control and reinforcement learning, and then, we give an overview of deep learning and deep reinforcement learning that has been receiving attention recently. Finally, we introduce machine learning methods and their applications to neuroimaging, brain machine interface, and neurofeedback.		
Topics/Schedule (授業計画)	1. Introduction to decision making theory 2. Optimal control theory 3. Reinforcement learning (1): value-based reinforcement learning 4. Reinforcement learning (2): policy search method 5. Reinforcement learning (3): inverse reinforcement learning 6. Deep learning (1) 7. Deep learning (2) 8. Deep reinforcement learning (1) 9. Deep reinforcement learning (2) 10. Evolutionary computation 11. Neuroimaging 12. Brain machine interface 13. Machine learning for neural decoding (1) 14. Machine learning for neural decoding (2) 15. Neurofeedback		
Evaluation/Grading Policy (成績評価方法)	Students are assessed according to their performance on the course report.		
Remarks (履修上の注意)	Report submission is required because course content is given in lectures.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Reading handouts in advance and preparing a report after the lectures.		
Textbooks, References (教科書・参考書・資料)	No textbook		
Language (使用言語)	Lecture is conducted in Japanese. If a student desires a lecture in English, this may be arranged on an individual basis.		

Course Title(科目名)	Practicum in Human Intelligent Information Processing		
Lecturer(担当教員)	Kaori Yoshida, Keiichi Horio, Eiichi Inohira, Hiroshi Sho		
Course Intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	Learning MATLAB, R, C ++ as a programming language for realizing human intelligence information processing, and using them to perform basic simulation, pattern identification, statistical processing, signal processing, image processing, learning, optimization calculation To learn and implement. Also, from the eleventh time, grouping is done, and half of them carry out exercises using robots.		
Topics/Schedule (授業計画)	1. Introduction to MATLAB 2. Numerical Calculation by MATLAB 3. Simulation by MATLAB 4. Image Processing by MATLAB 5. Exercise by MATLAB 6. C++ Fundamental 1 7. C++ Fundamental 2 8. Pattern Classification by C++ 9. Image Processing by C++ 10. Exercise by C++ 11. Exercise of R 1、ROS+Python 12. Exercise of R 2、ROS+Python 13. Exercise of R 3、ROS+Python 14. Total Exercise of MATLAB、ROS+Python 15. Total Exercise of C++、ROS+Python		
Evaluation/Grading Policy (成績評価方法)	Evaluation is achieved based on the task execution status, report, completeness of the final task etc during the exercise.		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習(予習・復習)の指示)	In order to deepen the understanding in the lecture, studying each item beforehand in the book and the Internet, and experience is important for the programming language, so repeated review so that you can master it.		
Textbooks, References (教科書・参考書・資料)	Materials are introduced in the classes.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Information Processing using Brain Dynamical System		
Lecturer(担当教員)	Kiyohisa Natsume		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	In the class, I pick up the topic on the local neuronal network related to memory, motor control, and neuronal oscillation, and also pick up the topic on the Brain Machine Interface. In the first two classes, I review the basic knowledge of the neuroscience.		
Topics/Schedule (授業計画)	1. The basics of neuroscience ～Molecular biology～ 2. The basics of neuroscience ～Neurophysiology～ 3. Basic neuronal networkI ～From formal neuron to computer 4. Basic neuronal networkII ～From formal neuron to computer 5. Neuronal rhythm networkI ～Central Pattern Generator (CPG) in Lamprey (Experimental results)～ 6. Neuronal rhythm networkII ～CPG in Lamprey (Conputational Model)～ 7. Reflexion neuronal networkI ～The quick response of the brain to the stimulus～ 8. Reflexion neuronal networkII ～The control of the reflexion circuit by the brain～ 9. The rhythmic neuronal network in the cortex ～The neuronal network relating to the movement～ 10. Neuromodulation networkI ～The relation of the sleep and wake～ 11. Neuromodulation networkII ～The relation of the force learning～ 12. The neuronal network relating to the memory ～Cortex, hippocampus, reveberating circuit, and Hebb rule～ 13. Cell assembly neuronal network ～The unit in the information processign in the brain ～ 14. The neuronal map in the brain ～The representation of the brain on the function ～ 15. Brain machine interfaceI ～The controls of the machine using brain signals～ 16. Brain machine interfaceII ～The classification of brain signals～		
Evaluation/Grading Policy (成績評価方法)	There are no exams, but students are required to write reports. Your final score will be calculated based on the following points; Assessment of performance score 32%, and Reports score 68%.		
Remarks (履修上の注意)	To have this class, you should take two basic classes, Basic Neurosciences 1 and 2. You should submit the reports via LiveCampus.		
Expected preparation and review (授業外学習(予習・復習)の指示)	To prepare for the next class, please look up the meaning for unknown words. Students are expected to review what you learned in the class, and utilize that for the report.		
Textbooks, References (教科書・参考書・資料)	M.F. Bear et al., "Neuroscience: Exploring the Brain, 4th Edition", Lippincott Williams and Wilkins; 4th edition (2015) D. Purves et al. "Neuroscience, Fifth Edition", Sinauer Associates, Inc. (2011)		
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English on a different day if there are students who need explanation in English.		

Course Title(科目名)	Neural signal processing system		
Lecturer(担当教員)	Satoru Ishizuka		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Compared with a computer, the speed of neural signal processing (NSP) in the brain is very slow. However, the NSP function of the brain is outstanding, and it succeeds in performing functions that computers cannot. In order to understand the signal processing function of the brain, we will study the types of signal processing conducted in the actual brain while tracing the history of their discovery.		
Topics/Schedule (授業計画)	1. Discovery and History of Bioelectricity 2. Nature of Action Potentials and History of Their Discovery 3. Nature of Synaptic Potentials and History of Their Discovery 4. The Morphological and Electrophysiological Properties of Neurons 5. Spinal Reflex 6. Muscle Spindles and γ-Motor Neurons 7. Cerebellar Motor Control 8. Learning and Conditional Reflexes 9. Molluscan Gill-Withdrawal Reflex and Learning 10. Classification of Memory and Memory Disorders 11. Hippocampal Neural Circuits and Signal Processing (1) 12. Hippocampal Neural Circuits and Signal Processing (2) 13. Neurogenesis and Synaptic Plasticity 14. Coding of Sensory Information (Impulse Frequency and Temporal Patterns) 15. Non-Linear Response (Entrainment, Chaos) and Perception		
Evaluation/Grading Policy (成績評価方法)	Students will be evaluated based on reports for assignments.		
Remarks (履修上の注意)	In order to take this class, completion of a course on the introduction to the human intelligence system is preferable.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Students must prepare a report for the assignment that is given at the end of the class and submit it.		
Textbooks, References (教科書・参考書・資料)	No specific textbooks are used. The following is a list of reference books: (1)Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, "Principles of Neural Science , Fourth Edition", McGraw-Hill, 2000. (2)John G. Nicholls, A. Robert Martin, Bruce G. Wallace, Paul A. Fuchs, "From Neuron to Brain, Fourth Edition ", Sinauer Associates, Inc., 2001. (3)Mark F. Bear, Barry W. Connors, Michael A. Paradiso, "Neuroscience: Exploring the Brain, Second Edition ", Lippincott Williams & Wilkins, 2001.		
Language (使用言語)	Lectures are normally conducted in Japanese. Individual explanations will be provided for students who need instruction in English.		

Course Title(科目名)	Mathematical Neurophysiology		
Lecturer(担当教員)	Katsumi Tateno		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course, which was designed to introduce graduate students to mathematical neurophysiology, is targeted to a variety of students with diverse backgrounds and various experiences with biological study. The course introduces a mathematical approach to neurophysiology. Mathematical and physical laws that constitute the basis of cellular neurophysiology will be addressed. Procedures for computer simulation of a neuron model will be included.		
Topics/Schedule (授業計画)	1 Introduction of nonlinear dynamics: Phase plane, trajectory, fixed point 2 Introduction of nonlinear dynamics: Local stability analysis 3 Introduction of nonlinear dynamics: Bifurcation theory 4 Neurophysiology: Ion channel 5 Neurophysiology: Hodgkin-Huxley model 6 Neurophysiology: Calcium dynamics 7 Computational neuroscience: One-dimensional spiking neuron model 1 8 Computational neuroscience: One-dimensional spiking neuron model 2 9 Computational neuroscience: Two-dimensional spiking neuron model 1 10 Computational neuroscience: Two-dimensional spiking neuron model 2 11 Computational neuroscience: Bursting electrical activity - Conductance-based model 12 Computational neuroscience: Bursting electrical activity - Simplified model 13 Nonlinear dynamics of neurons: Periodic neural activity 14 Nonlinear dynamics of neurons: Chaotic neural activity 15 Nonlinear dynamics of neurons: Synchronization		
Evaluation/Grading Policy (成績評価方法)	Your overall grade in the class will be determined based on the following: - Quizzes: 30% - Final exam: 70%		
Remarks (履修上の注意)	Students are expected to earn a credit for "Basic Neuroscience 1".		
Expected preparation and review (授業外学習(予習・復習)の指示)	We highly recommend preparation for each lecture by reading the corresponding chapters in the books provided for reference. Computational models introduced in the class are found on Tateno's webpage. Please use those computational models for your revisions.		
Textbooks, References (教科書・参考書・資料)	Reference books: 1. Dynamical Systems in Neuroscience, Izhikevich, MIT Press, 2007 2. Mathematical Physiology I: Cellular Physiology, J. Keener, J. Sneyd, Springer, 2009 3. Understanding Nonlinear Dynamics, D. Kaplan, L. Glass, Springer, 1995 4.「神経システムの非線形現象」, 林初男, コロナ社		
Language (使用言語)	This course will be taught in Japanese. However, all course materials are in English.		

Course Title(科目名)	Molecular sensing systems		
Lecturer(担当教員)	Yoshitaka OHTUBO		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Higher organisms, including humans, have developed sensing systems such as vision and taste for detection of objects and phenomena in their environments. This course introduces how they convert physical and chemical stimuli involved in the outside world into biological information, and how they transmit that information from peripheral sensing organs to the central nervous system at molecular and cellular levels. In addition, methods of investigating molecules and cells and principles of electrophysiological and optical measurements will be introduced.		
Topics/Schedule (授業計画)	1. eukaryotic cell structure 2. nucleic acids, proteins, and lipids 3. cell cycle and programmed cell death 4. reverse transcription polymerase chain reaction (RT-PCR) technique 5. immunohistostaining and confocal microscopy 6. electrophysiological recording (patch-clamping) and Ca imaging 7. diffusion potential, ion channels, and membrane potential 8. excitability and receptors 9. cell communication (synapses and paracrine) 10. signal transduction in the retina 11. signal transduction of pain and temperature 12. signal transduction of mechanoreceptor cells and hair cells 13. signal transduction of olfactory cells 14. structures of taste buds and their postnatal development 15. signal transduction of taste bud cells and modulation of taste information		
Evaluation/Grading Policy (成績評価方法)	Your final grade will be calculated according to the following process: attitude in class, short test for each topic, and end-of-term examination.		
Remarks (履修上の注意)	Admission to this course will be recommended after taking Basic Neuroscience 1 and/or 2.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Students are expected to conduct a preliminary investigation of the topics presented above before each topic is studied in class.		
Textbooks, References (教科書・参考書・資料)	Materials for the lecture will be distributed to students at each lecture.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Team Management		
Lecturer(担当教員)	Doosub Jahng, Ph.D.		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Department of Human Intelligence Systems Team Management, TM_2017 (2.0 units; Elective Course/Senmon Kamoku) Instructor: Doosub Jahng, Ph.D. Lecture: Thurs 8:50–12:00 (90 min x 16 = 24 hrs.), 2nd Q Location: Room 7510 Course Description: This course will focus on the use of the interface concept when approaching the challenges of team management. Students will be exposed to basic research methods and gain insight into the scientific processes involved in carrying out a research project. Students will develop critical thinking skills needed to analyze the research questions and will learn how to work as a team. Course Objectives: 1. Discuss the historical significance and growing importance of soft skills. 2. Understand the organizational communication hierarchy and related models/ theories. 3. Diagnose situations and formulate appropriate solutions based on results from surveys. 4. Develop skills needed for team communication including visualization of evaluation, mission setting and sharing, information sharing, and scheduling.		
Topics/Schedule (授業計画)	1. Learning Tools Guidance; KWM (Key Words Meeting ®), Table Whiteboard, Multiscreen, and KW Map 2. Self-introduction, Study groups setting, Group Introduction 3. System & Management 4. PDCA Cycle, Team & Group 5. SWOT Analysis, Leader & Manager 6. Diversity and Multi-facet, Soft/ Hard Skills 7. Objective Management 8. Information Sharing (WESKT, 8W3H1S) 9. 70% Scheduling 10. Evaluation and Estimation 11. Communication; What, Why, How, Hierarchy 12. Detectable Activities for Retainable Transmission(DART) Scheme 13. Team Communication Interface 14. TCI Survey and Consultation 15. Study Group Presentation (1/2) 16. Study Group Presentation (2/2)		
Evaluation/Grading Policy (成績評価方法)	Grading Outline: Learning activity, After-class submission, Review of feedback, and In-class participation. Student Assessment: Grading Outline breakdown will be discussed and adjusted throughout the course. Students will be given the opportunities to negotiate with the professor and will be encouraged to use their negotiating skills and learn how to mold consensus when discussing the percentage breakdown. Class grading will involve interactive communication for a two-way learning experience.		
Remarks (履修上の注意)	Remarks on Attendance: Students who fail to attend the first day of class without prior notice will be dropped from the course. For maximum efficiency, course enrollment will be limited to 25 seats. Special exceptions will be given to highly motivated students who wish to take the course.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Extensive before-class preparation, in-class participation and reflection of feedbacks will be crucial to ensuring the class' success. Students will be expected to consistently submit their reports and review professors' feedbacks on KWM before attending the next lecture. Students who don't wish to use KWM will be required to submit written learning reports. (Come talk to me separately for further information.)		
Textbooks, References (教科書・参考書・資料)	Doosub Jahng, Three Fundamentals of Efficient Worklife in Team, JISHA, 2003 (Japanese)		

Language （使用言語）	English, Japanese, or a combination of the two will be used throughout the course. The students' overall language abilities will be taken into account during lectures and discussions. One exception to this policy is KWM feedback, which will be solely given in Japanese. When using Table Whiteboard during team discussion, students will be asked to write Furigana when using Kanji. International students are highly encouraged to bring Japanese/English dictionary and are welcome to write in English on whiteboards. It is hoped that these measures will facilitate mutual learning process between international students and their fellow, native colleagues.

Course Title(科目名)	Practicum in Neural Information Processing		
Lecturer(担当教員)	Kiyohisa Natsume, Satoru Ishizuka, Katsumi Tateno		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective and required course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This course has been designed to provide first year master's or doctor's students with the data analysis techniques and the computational techniques necessary to deal with brain science and to understand the applications of brain science. This course is to help to understand the human intellectual intelligence and to develop the systems inspired by the brain functions. Students learn the principle for the action of neurons. The work of the course is done via a series of exercises. The practicum consists of three parts. In the first part, you can learn the electrical induction mechanism of neurons by the practicum using electrical equivalent circuit and the experimental data. The second part of the practicum introduces three computational models of a neuron and the phase plane analysis of neural dynamics. We also introduce relevant MATLAB functions that allow you to create a computational neuron model. In the third practicum, you can learn the electroencephalogram (EEG) which the population of neurons generates and the application of it by the practicum of measuring EEG from subjects.		
Topics/Schedule (授業計画)	1. Introduction [Part1] 2. Explanation of analysis software pClamp and Origin 3. AD conversion of the neural activity recorded data and conversion of the file format 4. Smoothing and averaging processing 5. Spectrum analysis and autocorrelation analysis 6. The peak detection of action potentials and Peristimulus Time Histogram (PSTH) analysis [Part2 7. MATLAB tutorial 8. Phase plane analysis 9. Spiking neuron model 10. FitzHugh-Nagumo model 11. Hodgkin-Huxley model [Part3] 12. Electroencephalogram (EEG) and Brain Computer Interface (BCI) 13. The measurement of spontaneous EEG 14. The measurement of evoked potential 15. The measurement of motor-related potential 16. The classification of BCI		
Evaluation/Grading Policy (成績評価方法)	There are no exams, but students are required to write reports. Your final grade will be calculated dependent on the following scores; Assessment of performance score 32%, and Reports score in three parts 68%.		
Remarks (履修上の注意)	To have this class, you should take classes, Basic Brain Science 1 and 2.		
Expected preparation and review (授業外学習(予習・復習)の指示)	To prepare for the next class, please look up the meaning for unknown words. Students are expected to review what you learned in the practicum, and utilize that for the report. [Part2] We highly recommend to prepare each lecture by reading the Exercise section of the corresponding chapter in the textbook.		
Textbooks, References (教科書・参考書・資料)	[Part1] Explanatory material of the neural activity recorded data is distributed. You don't use a textbook. Reference books: Ion channels of excitable membranes, 3nd edition, Berttil Hille, Sinauer Associates, Inc. (2001) [Part2] An textbook will be distributed in the class. Reference books: Wallisch, P., Lusignan, M., Benayoun, M., Baker, T. I., Dickey, A. S., Hatsopoulos, N. G., MATLAB for Neuroscientists, Elsevier Izhikevich, E. M., Dynamical Systems in Neuroscience, The MIT Press [Part3] The work written instructions will be handed out in the class. Reference books: EEG Signal Processing, Saeis Sanei, J.A. Chambers, John Wiley & Sons, Ltd. (2007)		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Biomimetics		
Lecturer(担当教員)	Takayuki MATSUO		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Biomimetics is the imitation of the models, systems, and elements of nature for the purpose of solving complex human problems. Living organisms have evolved well-adapted structures and materials over geological time through natural selection. Biomimetics has given rise to new technologies inspired by biological solutions at macro and nanoscales. Nature has solved engineering problems such as self-healing abilities, environmental exposure tolerance and resistance, hydrophobicity, self-assembly, and harnessing solar energy.		
Topics/Schedule (授業計画)	1 Introduction to Biomimetics 2 Technology inspired by walking robot 3 Technology inspired by walking robot 4 Technology inspired by walking robot 5 Technology inspired by swimming robot 6 Technology inspired by swimming robot 7 Technology inspired by swimming robot 8 Technology inspired by snake-like robot 9 Technology inspired by snake-like robot 10 Technology inspired by snake-like robot 11 Technology inspired by flying robot 12 Technology inspired by flying robot 13 Bio-sinpired information technology 14 Bio-sinpired information technology 15 Bio-sinpired information technology		
Evaluation/Grading Policy (成績評価方法)	Evaluate by weekly reports.		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習(予習・復習)の指示)	Mathmatics of University leves is required at least.		
Textbooks, References (教科書・参考書・資料)			
Language (使用言語)	Usually lectures are given in Japanese. However we will have lecture in English if there are students who need explanation in English.		

Course Title(科目名)	Laboratory Animal Science		
Lecturer(担当教員)	Eiji SAGARA, DVM, MS, Ph.D.		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Laboratory Animal Science is a comprehensive study of the experimental animals. It is possible to know the reason for the animal experiment by learning the Laboratory Animal Science. The implementation of reproducible animal experiments, there is a need for environmental controls and genetic control and microbiological control. In particular, environmental control of the experimental animals is important, environmental controls are carried out by a variety of engineering techniques. We learn about the laboratory animal welfare, legal regulation of the animal experiment, the infectious diseases, zoonosis, and laboratory animal allergy. In addition, in this lecture we learn developmental engineering and genetic modification technique and regenerative medicine, we aim to learn of the higher level of Laboratory Animal Science.		
Topics/Schedule (授業計画)	1. Overview of Laboratory Animal Science! (Medical research, extrapolation, genome, *in vivo, in vitro*) 2. Regulations and guidelines of the relevant animal experiments(Act on Welfare and Management of Animals, etc.) 3. Ethics of animal experimentation (3Rs, pain degree classification (SCAW), humane endpoint, etc.) 4. Animal welfare (relief of pain, environmental enrichment, wellbeing, alternative methods, veterinary care) 5. Care and management of the experimental animals (feed, drinking water, cages, bedding, ILAR Guide) 6. Laboratory animals and the environment (environment control, engineering control, temperature and humidity control, lighting and air flow control, noise and vibration control) 7. Types and their characteristics of the experimental animals (mice, rats, hamsters, guinea pigs, rabbits, etc.) 8. Comparative biology (anatomy, physiology, metabolism and nutrition, clinical application, species differences, strain differences) 9. Disease model animals (spontaneous animal, genetically modified animals, etc.) 10. Infectious diseases and its prevention of the experimental animals (disinfection and sterilization, microbial monitoring, epidemiology, virus, bacteria, fungi, parasites) 11. Prevention of zoonoses (hemorrhagic fever with renal syndrome, lymphocytic choriomeningitis, etc) 12. Laboratory animal allergy (allergen, immediate hypersensitivity, sensitization, asthma, anaphylaxis, PPE, IVC, one-way air flow control) 13. Laboratory animals and developmental engineering (embryo freezing, sperm freezing, artificial insemination, genome editing, CRISPR / Cas9) 14. Experimental animal technology (appropriate anesthesia, appropriate euthanasia, accurate handling, administration, sampling) 15. Advanced medical research and experimental animal (ES cells, iPS cells, cloned animals, regenerative medicine, bioresources)		
Evaluation/Grading Policy (成績評価方法)	Grades are assessed by attendance, expected preparation and review, and assignment reports. Problems in the assignment report are announced during class.		
Remarks (履修上の注意)	At the lecture of the Laboratory Animal Science, technical words associated with medicine, veterinary medicine and biology is used. When you do not learn biology at a high school or a university, enough preparations for lectures are necessary. The attendance rate in the class will be evaluated.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Please prepare based on the keywords listed in the lesson plan. And preparation for the lecture, be submitted together in a report. If you are not familiar with the terms medical and biological, you should read the text of laboratory animal science.		
Textbooks, References (教科書・参考書・資料)	Laboratory Animal Science, edited by Shigeru Kyuwa. Asakura Publishing Co.,Ltd. 2013. ISBN978-4-254-46031-5 C3061 http://www.jalas.jp/gakkai/kanren_safety.html http://www.kokudoukyou.org/index.php?page=kisoku_index		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Visuomotor Control System		
Lecturer(担当教員)	Makoto Kato, Ph.D.		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The animal using the hand, such as a monkey and human, often uses the hand while looking with eyes. This is because an object treated by hand is present outside a body, and the information such as the position, size, and form depends on what you must get visually. In addition, the ocular movement acts to catch the outside world on retina so that these visual informations are provided appropriately. In this way, as for the sight to process space information and the exercise of hand, arm, and ocular movements, information processing is performed to work mutually all in one body as one system. The present lecture, in the first half, will give an outline mainly in a textbook-like general statement for the visual and motor system of the brain, and in the latter half, detailed explanatioin using representative treatises about the components of the system representing the visuomotor function.		
Topics/Schedule (授業計画)	1. General statement about the anatomy and the physiologic function of the brain 1.1 Processing system for visual information 1.1.1 Subcortical 1.1.2 Cerebral cortex 1.2 Control system for hand and arm movement 1.2.1 Primary motor, premotor, and supplementary-motor cortices 1.2.2 cerebellum and basal ganglia 1.3 Control system for ocular movement 2. Detailed explanation about anatomy and physiological functions of the components of the visuomotor system, using the representative treatises 2.1 Frontal eye field 2.1.1 Saccadic eye movement 2.1.2 Smooth-pursuit eye movement 2.1.3 Eye movements evoked by electrical stimulation 2.2 Supplementary eye field 2.2.1 Learning for eye movement 2.2.2 Object-centered frame of reference 2.3 Parietal eye field 2.3.1 Activity affected by eye position 2.3.2 Head-centered frame of reference 2.4 Superior colliculus 2.4.1 Saccadic eye movement 2.4.2 Eye fixation 2.5 MT and MST 3. Examination		
Evaluation/Grading Policy (成績評価方法)	Total of an attendance manner (40%) and the evaluation by the examination (60%). The examination is performed for around 30 minutes at the last lecture time. At the examination time, you may refer to any documents such as the reference book distributed in the lecture.		
Remarks (履修上の注意)	It is desirable to have a basic neurophysiological knowledge such as action potential and a synaptic potential.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Before atttending at the lecture, you should look over the text document distributed before the lecture. The reference book (see 1a below) is helpful for you to understand the lecture after having taken a look on the book as preparations for the lecture because the book has a lot of figures relatively easy understand.		
Textbooks, References (教科書・参考書・資料)	The textbook in particular is not used. The reference books are as follows; (1) Principles of neural science, 5th ed. By Kandel ER et al., McGraw-Hill Professional (2012/10/26) (1a) Essentials of Neural Science and Behavior by Eric R. Kandel et al., Appleton & Lange (1996/9/30) (2) From Neuron to Brain by John G. Nicholls and A. Robert Martin, Sinauer Associates Inc; 5th ed. (2011/11/15) (3) Fundamental Neuroscience, Fourth Edition, By Larry Squire and Darwin Berg., Academic Press (2012/11/20) (4) Neuroanatomy by P.F.A. Martinez Martinez, Philadelphia, PA : Saunders, 1982		
Language (使用言語)	Usually perform the lecture in Japanese, or explain the correspondence individually when there is a student attending a lecture needing explanation in English.		

Course Title(科目名)	Measurement of Human Brain Function		
Lecturer(担当教員)	Hiroaki Mizuhara		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Studies on the human brain function (e.g., language processing, communication, etc) are called "cognitive neuroscience." It is generally done with non-invasive brain imaging techniques. The lecture is for the introduction on these techniques in the field of the cognitive neuroscience. Actual examples will be also introduced in the lecture to understand how to use the brain imaging techniques to measure human brain function.		
Topics/Schedule (授業計画)	1 What is the "cognitive" neuroscience? 2 Basics of the brain structures -anatomy and physiology 3 Recordings of electric features of brain -EEG & MEG 4 Brain imaging -PET & fMRI 5 Investigation of brain causality -lesion studies & TMS 6 Examples of human brain recordings		
Evaluation/Grading Policy (成績評価方法)	Evaluate with technical reports/ short essays.		
Remarks (履修上の注意)	Learn basics of neuroscience prior to the lecture.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Download and read resumes prior to the lecture. Learn keywords on this syllabus prior to the lecture. Submit homework (technical report/ short essay) after the lecture.		
Textbooks, References (教科書・参考書・資料)	Reference: Ward, J. "The Student's Guide to Cognitive Neuroscience -2nd Edition-", Psychology Press (2010) Other references or papers may be introduced during the lecture.		
Language (使用言語)	The lecture will be held in Japanese. If needed, critical parts may be interpreted into English.		

Course Title(科目名)	Vision Sensing and Systems Intelligence Engineering		
Lecturer(担当教員)	Masaki Suwa and Hiroshi Nakajima		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The class includes about the basic method of algorithm development of and application studies on intelligent systems. The study aims creating the ideas used in problem solving approach and communication between human s and machines based on intelligence extracted and learned from human and nature. The essential goal of the study is to create various types of values such as for society, technology, and science. The contents are as follows; sensing, signal processing, statistics, fuzzy logic, and soft computing. Besides their basics, apllication studies of healthcare, mobility, and manufacturing. Especially, sensing design and causal analysis will be focused on.		
Topics/Schedule (授業計画)	1. Orientation – MOT seen through OMRON's technological strategy 2. Sensing Technologies 1 – Introduction of representative sensors and technology foresight of sensors 3. Sensing Technologies 2 – What is the difference between "sensor" and "sensing"? 4. Sensing Technologies 3 – Technology foresight of sensing based on recent progress of sensors Modeling method for sensing – Mathematical approaches for modeling 5. keywords: orthgonal expansion of sensor data, state space representation, Bayesian approach, pattern recognition 6. Practices of modeling for sensing 1 – state-of-the-art vision sensing technologies 7. Practices of modeling for sensing 2 – Which has more important role in modeling for sensing, human or machin 8. Epilogue – Consideration on what the R&D in Japanese company is. 9. Orientation – Abstract of Systems Intelligence. The goal and expeced effects of the technology are covered. The importance of problem definition is deeply discussed. 10. Human Intelligence – Knoledge and infrence are studied based on the expert systems, fuzzy sets, fuzzy inference. The many applications of the intelilgence will be introduced. 11. Data Intelligence (1) – The basics of statistics will be covered. Essentialn technology for knowledge discovery and algorithm development method are introduced. 12. Data Intelligence (2) – As the application of data intelligence, healthcare and medical data analysis and their algorithm delovepments will be introduce and discussed. 13. Social Intelligence and Agents (1) – The model of human and machine interaction will be investigated. The mind model is introduced and discussed to realize autonomy and emotion expression of the machine side. 14. Social Intelligence and Agents (2) – As the application studies of social intelligence, software agents, pet robot, and coraborative leaning agents will be introduced. 15. Nature Intelligence and Intelligence Integration – As intelligence learnt from nature, neural network and genetic algorithms will be briefly introduced. Intelligence integration among different intelligence studied in the class will be discussed with application studies.		
Evaluation/Grading Policy (成績評価方法)	Evaluation by mini-examination in the class and report assignments.		
Remarks (履修上の注意)	Nothing special		
Expected preparation and review (授業外学習(予習・復習)の指示)	Submissions of the report to the assignmens at the final class will be required.		
Textbooks, References (教科書・参考書・資料)	No text book will be used in the class. The materials will be delivered at each class and the reference will also be introduced if necessary.		
Language (使用言語)	Usually lectures are given in Japanese. However the teacher will explain individually to those students who need explanation in English.		

Course Title(科目名)	Neuronal mechanism for human sensory transduction		
Lecturer(担当教員)	Hidemasa FURUE		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	This lecture will summarize how sensory information is processed in higher organisms including humans, and have a discussion on its physiological roles. How sensory information, in particular, somatic sensation is modified and controlled in the central nervous system in a highly precise and dynamic manner, and plastic changes in the sensory transduction in some situations are introduced. Recent electrophysiological and neuroscientific methods for detecting neuronal and synaptic signals such as in vivo patch-clamp techniques and optogenetic approaches will be also explained. The principles and basic concepts shown in this lecture would be helpful for general understanding of sensory transduction and critical reading of the scientific literatures.		
Topics/Schedule (授業計画)	1 Sensory information and its signal transduction mechanism and physiological role 2 Somatosensory pathways 3 Sensory receptor and ion channel 4 Neuronal excitation and its propagation 5 Synapse 6 Synaptic transduction mechanism for sensory information 7 Electrophysiological recording techniques 8 Recordings of action potential and synaptic responses 9 Analysis of synaptic responses elicited by sensory stimulation 10 Slice patch-clamp recording technique 11 In vivo patch-clamp recording technique 12 Optogenetics and neuronal excitation by light stimulation 13 Central modulation of sensory information 14 Sensory transduction in pathological states 15 Plastic changes in sensory transduction		
Evaluation/Grading Policy (成績評価方法)	will be based on attendance and active perception (50%) and written reports (50%)		
Remarks (履修上の注意)			
Expected preparation and review (授業外学習 (予習・復習)の指示)	Learning the topics in particular technical terms listed above before taking, and reviewing main points shown in handouts given at this lecture are strongly recommended. Written reports should be submitted by the standard deadline.		
Textbooks, References (教科書・参考書・資料)	Textbooks and references will be introduced at the lecture.		
Language (使用言語)	This lecture will be conducted in Japanese. But if attendants need, lecturer will provide simultaneous translation service to English.		

Course Title(科目名)	Advanced Human Intelligence Systems 1		
Lecturer(担当教員)	Faculty staffs of Devision of Human Intelligence and Emergent Design		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	This course aims at acquiring a latest and wide view into human intelligence systems and foster better understanding of academic research. All the students introduce a high-quality jounal paper each other.		
Topics/Schedule (授業計画)	1-8. Presentation and Discussion		
Evaluation/Grading Policy (成績評価方法)	Submission of worksheets every class (40%), Presentation (50%), Discussion (10%)		
Remarks (履修上の注意)	Each student must receive his/her supervisor's guidance in selecting introduced paper and preparing slide in order to keep quality of the presentation.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Investigate keywords and technical terms which you cannot understand on the presentations.		
Textbooks, References (教科書・参考書・資料)	None		
Language (使用言語)	Usually lectures are given in English.		

Course Title(科目名)	Advanced Human Intelligence Systems 2		
Lecturer(担当教員)	Faculty staffs of Devision of Human Intelligence and Emergent Design		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	This course aims at acquiring a latest and wide view into human intelligence systems and foster better understanding of academic research. All the students introduce a high-quality jounal paper each other.		
Topics/Schedule (授業計画)	1-8. Presentation and Discussion		
Evaluation/Grading Policy (成績評価方法)	Submission of worksheets every class (40%), Presentation (50%), Discussion (10%)		
Remarks (履修上の注意)	Each student must receive his/her supervisor's guidance in selecting introduced paper and preparing slide in order to keep quality of the presentation.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Investigate keywords and technical terms which you cannot understand on the presentations.		
Textbooks, References (教科書・参考書・資料)	None		
Language (使用言語)	Usually lectures are given in English.		

Course Title(科目名)	Advanced Human Intelligence systems 3		
Lecturer(担当教員)	Academic staff of the Division of Human Interaction and Brain Functions		
Course intended for (対象学年)	1st year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	This course addresses research topics related to human interaction and brain science. The aim of this course is to help students acquire a better understanding of their own research by obtaining comprehensive knowledge in the division through oral presentations, discussion, and reading of research papers.		
Topics/Schedule (授業計画)	1–7. Reading exercises to improve reading skills for research papers and related academic textbooks of the Division of Human Interaction and Brain Functions. 8. Exam – Oral presentation in the presence of the professors of the division.		
Evaluation/Grading Policy (成績評価方法)	Grading will be based on the level of comprehension of the research topics, and of presentation skills including discussion. The comprehension level is evaluated by a teacher in charge. Presentation skills are evaluated by the professors who attend the oral presentation. The evaluation is classified into five grades.		
Remarks (履修上の注意)	Admission to this course will be decided by conferring with a supervisor.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Students are expected to complete all of the following: 1) conduct a preliminary investigation of research topics of a teacher in charge; 2) read related articles; and 3) consider the relation between your research and the research topics in the division.		
Textbooks, References (教科書・参考書・資料)	Research papers and/or textbooks will be provided to students by a teacher in charge.		
Language (使用言語)	This course will be taught in Japanese. Oral presentations and discussion can be conducted in English if a student wishes to do so.		

Department of Life Science and Systems Engineering
Specialized Course

Course Title(科目名)	English Technical Writing		
Lecturer(担当教員)	Hiroaki Watanabe		
Course intended for (対象学年)	1st , 2nd or 3rd year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	The ability to write technical documents and academic articles is indispensable and extremely important for highly specialized engineers and researchers. This course aims at improving students' writing skills of technical documents and academic articles by having them learn the style, logics, and the methods of argumentation, technical vocabularies and expressions. Weekly assignments are provided to translate Japanese passages into English, along with discussions in the following week. Students are to continue their study until they can create original documents to be proofread by the native speakers of English without professional knowledge. Minimum English proficiency as a doctoral student is a prerequisite.		
Topics/Schedule (授業計画)	1 Grammar and sentence review 2 Sentence and paragraph 3 Paragraph and essay 4 Structure of paragraph 5 Structure of documents 6 General documents 7 English e-mail 8 Technical documents 9 Vocabulary and expressions of technical documents 10 Style and structure of technical documents 11 Academic article 12 Style of academic article 13 Structure of academic article 14 Abstract 15 Summary		
Evaluation/Grading Policy (成績評価方法)	Assignments: 70% Improvements in the ability of technical writing: 30%		
Remarks (履修上の注意)	Translations from English to Japanese are assigned weekly. Deadlines must be met strictly. Basic English proficiency is a prerequisite.		
Expected preparation and review (授業外学習(予習・復習)の指示)	Aside from classroom lectures, weekly translation assignments from Japanese to English are to be submitted.		
Textbooks, References (教科書・参考書・資料)	Handouts and references are provided as needed.		
Language (使用言語)	Both Japanese and English are used.		

Course Title(科目名)	Research Workshop 1		
Lecturer(担当教員)	Chair of Technical Committee on Educational Affairs		
Course intended for (対象学年)	1st , 2nd or 3rd year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Students will engage in revewing resaerch or related reaserch activities about the topic, which is not directly related to their PhD work, and they will aquire the advanced skills to propose engineering problems, logically analyze and solve them.		
Topics/Schedule (授業計画)	For 60 hours or longer in total, students will engage in revewing resaerch or related reaserch activities about the topic, which is not directly related to their PhD work, and they have to .submit a report of these activities on the project after completing them, and have a presentation.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by both the quality of report and the presentation on the project.		
Remarks (履修上の注意)	Students must gain approval from their supervising professors and discuss about the topic of project.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by supervisors.		
Language (使用言語)	Students can choose Japanese or English.		

Course Title(科目名)	Research Workshop 2		
Lecturer(担当教員)	Chair of Technical Committee on Educational Affairs		
Course intended for (対象学年)	1st , 2nd or 3rd year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	2
Course Objectives/Outlines (目的・概要)	Students will engage in revewing resaerch or related reaserch activities about the topic, which is not directly related to their PhD work, and they will aquire the advanced skills to propose engineering problems, logically analyze and solve them.		
Topics/Schedule (授業計画)	For 60 hours or longer in total, students will engage in revewing resaerch or related reaserch activities about the topic, which is not directly related to their PhD work, and they have to .submit a report of these activities on the project after completing them, and have a presentation.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by both the quality of report and the presentation on the project.		
Remarks (履修上の注意)	Students must gain approval from their supervising professors and discuss about the topic of project.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by supervisors.		
Language (使用言語)	Students can choose Japanese or English.		

Course Title(科目名)	International Extra-Mural Studies 1		
Lecturer(担当教員)	Professor in charge of International Internship		
Course intended for (対象学年)	1st , 2nd or 3rd year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	In order to foster the ability to communicate in a foreign language and acquire a global perspective which are required to become global engineers, students will engage in engineering internship at overseas universities, research institutes, or companies. Students will also need to foster the ablity to propose a research project and solve problems in it.		
Topics/Schedule (授業計画)	Students must engage in resaerch work or internship at overseas universities, research institutes, or companies for 30 hours or longer in total, and submit a report of the internship activities after completing the internship. An alternative reporting assignment may be given to students from overseas who cannot engage in engineering internship.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by the quality of report.		
Remarks (履修上の注意)	All students who engage in internship must gain approval from their supervising professors. They must purchase overseas travelers' personal accident insurance and Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). They should check the website for overseas safety of MOFA (Ministry of Foreign Affairs of Japan), and fully confirm the information for local safety risks of theft, infection, etc.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students should prepare to explain their research contents and discuss it in English. They should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internships, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by internship supervisors.		
Language (使用言語)	English will be used.		

Course Title(科目名)	International Extra-Mural Studies 2		
Lecturer(担当教員)	Professor in charge of International Internship		
Course intended for (対象学年)	1st , 2nd or 3rd year student		
Credit Category(単位区分)	Elective course	Credits(単位数)	1
Course Objectives/Outlines (目的・概要)	In order to foster the ability to communicate in a foreign language and acquire a global perspective which are required to become global engineers, students will engage in engineering internship at overseas universities, research institutes, or companies. Students will also need to foster the ablity to propose a research project and solve problems in it.		
Topics/Schedule (授業計画)	Students must engage in resaerch work or internship at overseas universities, research institutes, or companies for 60 hours or longer in total, and submit a report of the internship activities after completing the internship. An alternative reporting assignment may be given to students from overseas who cannot engage in engineering internship.		
Evaluation/Grading Policy (成績評価方法)	The final grade will be determined by the quality of report.		
Remarks (履修上の注意)	All students who engage in internship must gain approval from their supervising professors. They must purchase overseas travelers' personal accident insurance and Liability Insurance coupled with PAS (Personal Accident Insurance for Students Pursuing Education and Research) of JEES (Japan Educational Exchanges and Services). They should check the website for overseas safety of MOFA (Ministry of Foreign Affairs of Japan), and fully confirm the information for local safety risks of theft, infection, etc.		
Expected preparation and review (授業外学習 (予習・復習)の指示)	Students should prepare to explain their research contents and discuss it in English. They should be familiar with the research and development activities of organizations where they engage in internship, and should research unfamiliar terms on the Internet. They should predict knowledge and skills necessary for internships, and prepare themselves using references. They should record their activities on a daily basis including reflection points and questionable points so that it can be used when making a report.		
Textbooks, References (教科書・参考書・資料)	Textbooks or references may be assigned by internship supervisors.		
Language (使用言語)	English will be used.		

※その他の専門科目のシラバスは、生体機能応用工学専攻と人間知能システム工学専攻のシラバスを参照すること。