2024-2025 Syllabus

Future University Hakodate
Graduate School of
Systems Information Science

Contents List

29　Special Topics of Interactive Systems 2 （インタラクティブシステム特論Ⅱ）

30　Advanced Topics in Information Mathematics （情報数理特論）

31　Advanced Topics in Nonlinear Mathematics （非線形数理特論）

32　Advanced Topics in System Mathematics （システム数理特論）

33　Advanced Topics in Mathematical Analysis （数理解析特論）

34　Advanced Topics in Applied Complex Systems （応用複雑系特論）

35　Advanced Topics in Complex Systems （複雑系システム特論）

36　An Introduction to Intelligent Information Science （知能情報科学通論）

37　History and Future of Intelligent Systems （知能システムの歴史と未来）

38　An Introduction to Intelligent Systems Programming （知能システムプログラミング通論）

39　Advanced Topics in Adaptive Systems （適応システム特論）

40　Advanced Topics in Autonomous System 1 （自律システム特論Ⅰ）

41　Advanced Topics in Autonomous System 2 （自律システム特論Ⅱ）

42　Advanced Topics in Intelligent Media （知能メディア特論）

43　Project Study 1 （課題研究Ⅰ）

44　Project Study 2 （課題研究Ⅱ）

45　Project Study 3 （課題研究Ⅲ）

46　System Information Science Research （システム情報科学研究）

47　Special Seminar （特別ゼミナール）

48　System Information Science Special Research （システム情報科学特別研究）

Appendix:

Dividend Year, Credits and Instruction Language of Class

（講義科目の配当年次，単位数および教授言語）

Academic Literacy in Context I(システム情報科学におけるアカデミックリテラシー I)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	TOMINAGA Atsuko

1.Course Outline

Graduate students must write theses and research papers. In this course, students will learn the academic literacy necessary to write these papers (how to collect related literatures and how to manage them, reading skills, and writing skills).
Moreover, students also learn research ethics that must be kept as researchers.
Each lesson consists of lectures, personal work, group work, and peer review.

2.Keywords

Literature review,Reading,Writing,Research Ethics

3.Course Objectives

- To read articles (about ten pages) of own research field and write the summary.
- To write own research report.
- To check each other's reports.
- To understand Research ethic and act while being conscious of it.

4.Course Schedule

Week 1: Orientation (course summary, how to study, and assessment). How to search and manage the documents related own study.
Week 2-4: Reading (speed reading and intensive reading). How to write summary. Research ethic.
Week 5-6: References and citations. Plagiarism prevention.
Week 7-15: Writing skill.

5.Prior/Post Assignment

Prior: Prepare for the peer review.
Post: Individual work.

6.Assessment

Individual work (30%),
Report 1 (10%),
Report 2 (30%),
Report 3 (30%)

7.Textbooks

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

None

Academic Literacy in Context II(システム情報科学におけるアカデミックリテラシー II)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	VALLANCE Michael

1.Course Outline

The course proceeds in a process-oriented manner in which students learn key concepts and techniques for effective academic writing.

Some of the information introduced in Academic Literacy 1 will be reinforced with additional activities and examples relevant for the purpose of this course.

The goal is to prepare students to become responsible experts in their own discipline, with integrity and attitudes that will support their future research activities in international settings.

The instructor has a doctoral qualification and significant teaching and research experience.

2.Keywords

Applying writing skills, evaluating research papers, organizing research, reflecting on learning, applying, evaluating, organizing, reflecting, researching

3.Course Objectives

Academic Literacy aims to assist beginning graduate students in implementing and writing about their research in English.

The course provides an overview of conventional research papers with a special focus on the style and organizational characteristics, as well as the rationale and reasoning behind those conventions.

4.Course Schedule

Week 1: Introduction to Academic Literacy in Context
Week 2: Research processes: scientific method and engineering design
Week 3. Research plans as flowcharts
Week 4 - 5. Literature Review and Reading
Week 6. Referencing: IEEE style
Week 7. Research method: Proposed system/ implementation
Week 8 - 9. Research method: Procedure - the 'what, how and why' of your research
Week 10. Writing: Discussion/ Evaluation/ Expected outcomes
Week 11. Writing: Conclusion
Week 12. Writing: Introduction
Week 13. Writing: Abstract
Week 14. Final assignment peer reviewing.
Week 15. Final assignment submission.

5.Prior/Post Assignment

Prior: Prepare your post-graduate research content for use throughout the course.

Post: Review the course activities and apply your learning to your post-graduate research.

6.Assessment

For the final assignment (30%), students are required to write an academic paper in English of their post-graduate research project.

Mid-term assignments (Literature Review (30%); Method (30%); Reading (10%)) consist of the sections of the final assignment that are required in the writing process.

7.Textbooks

An Academic Literacy course text in PDF format will be provided.

HOPE for e-learning activities and additional content will be used.

8.Language of Instruction

English.

9.Requirements for registration

None

10.Note

Academic Literacy is primarily an asynchronous online course with occasional face-to-face meetings.

Introduction to Basics of Systems Information Science(システム情報科学基礎概論)

Grade	M1,2
Semester	Spring, Fall
Credits	Conforming to the number of credits of the courses to take.
Instructor	Superviser Head of Graduate School

1.Course Outline
Depends on undergraduate courses to take.

2.Keywords
Systems Information Science

3.Course Objectives
- Understand the basic knowledge regarding to the research theme.
- Condunt the research theme voluntarily.

4.Course Schedule
Depends on undergraduate courses to take.

5.Prior/Post Assignment
Depends on undergraduate courses to take.

6.Assessment
Grades are evaluated by each faculty member in charge of the course.

7.Textbooks
Depends on undergraduate courses to take.

8.Language of Instruction
Depends on undergraduate courses to take.

9.Requirements for registration
Select the cource carefully according to your supervisor's instructions.

10.Note
None

Experimental Design and Data Analysis(実験ﾃﾞｻﾞｲﾝとﾃﾞｰﾀ解析)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	MIYAMOTO Edson Tadashi

1.Course Outline

This class will be meet twice a week in the 2nd Quarter.
This is a hands-on class. Students will design an experiment as part of a course project.
They will consider possible alternative scenarios, anticipating problems and finding ways around them, so that they can more clearly link later outcomes to their earlier decisions and choices.
At each step, students will be required to evaluate each other's proposals.
Students will also be required to analyze data made available during lectures.

2.Keywords

experimental design, data analysis

3.Course Objectives

This course covers experimental design and data analysis with the aim of making students more aware of the entire process of a research project. Students will plan each step of the way, so that they can consider in advance the drawbacks and tradeoffs of their decisions before collecting and analyzing data.

4.Course Schedule

Classes 1-2. Introduction to experimental design
- bottom-up or top-down: qualitative versus quantitative designs
- causality: experiments versus quasi-experiments
- independent variables, dependent variables, confounding factors

Classes 3-4. Data visualization on R
- trends, outliers, trimming

Classes 5-6. Basic modeling on R
- modeling, model-based trimming

Classes 7-12. Linear mixed-effects models on R
- random factors, model selection

Class 13. How to report results
- citing previous research: dues where dues are due

Classes 14-15. Final presentation and overall considerations
- final report
- replications and where to go from here
- tradeoffs in the decisions made during experimental design

5.Prior/Post Assignment

Read materials and answer quizzes made available online weekly.
Review materials from previous weeks and look for further readings.

6.Assessment

Grades will be based on weekly activities such as quizzes (小テスト). Quizzes will be conducted weekly, are open-book and to be answered individually, not in groups.
All students must participate in a group project and hand in regular reports.
Students will evaluate each other's reports through quizzes. The topic of the project is of students' choice.
There are no makeup tests or extra activities for those with low grades. Your final grade will be based on the weekly activities only.

7.Textbooks

Readings will be assigned weekly, including portions of the following books.
- Baayen, R. H. (2008). Analyzing Linguistic Data - A Practical Introduction to Statistics using R. (801.01 Ba, https://lib-auth.fun.ac.jp/webopac/BB00249818)
- Kirk, R. E. (2013). Experimental Design: Procedures for the Behavioral Sciences. (140.7 Ki, https://lib-auth.fun.ac.jp/webopac/BB00236911)

Go to the next page

8.Language of Instruction

English and Japanese

9.Requirements for registration

None

10.Note

- All readings and quizzes will be made available in English.
- Install the latest version of R on your computer (https://www.r-project.org).

Internship 1(インターンシップ I)

Grade	M1,2
Semester	Spring, Fall
Credits	2
Instructor	Superviser Head of Graduate School

1.Course Outline

Students participate in the research/working program provided by outside organizations including companies and research institutes for a certain period, submit the report about the result to the graduate school education affairs committee.

They earn 2 credits when the committee admit the result is equivalent to a course for 1 semester.

2.Keywords

Training,Internship for research, Outside organization

3.Course Objectives

Internships aim that students learn various viewpoints and knowledge including relationship with the society through the research/working training outside of school including companies and research institutes to develop their researches wider and deeper through the experience. (evaluated based on plan and results)

4.Course Schedule

1. (Selection and application for participating program)

Students select participating program consistent with the abovementioned contents and obtain permission of their advisors. They need to submit “internship plan” to the graduate school education affairs committee through the advisors in advance of the program.

2. (Participation in program)

Students conduct research/working activities following by the direction of the companies providing the internship program.

3. (Submission of report)

Students submit following documents to the graduate school education affairs committee through the administration bureau after the program:

(1) “Internship report” written by students (with specified format.

(2) “Internship evaluation” issued by the organization provided the program (with arbitrary format)

5.Prior/Post Assignment

Prior: Students should consult their supervisors and understand the contents and precautions of this course. Further, understand the significance of this subject and prepare internship plan.

Post: Students review the internship achievements and various other things they have learned, and prepare internship reports.

6.Assessment

Grades are determined by the graduate school education affairs committee that evaluated the contents of the submitted documents.

7.Textbooks

None

8.Language of Instruction

Depends on the plan.

9.Requirements for registration

・The research/working program is not only the one recommended by the advisors and graduate school committee meeting, but also the one students select by themselves. In either case permission of the advisors are required beforehand to participate in the program.

・The internship program must be the research/training activities consistent with the purpose of the course. The programs aiming at job and social experiences are excluded.

・The period of the program shall be more than 2 weeks including weekends and holidays in principle.There is no restriction on the timing of participation, but it is encouraged to avoid the term of classes. If the internship period and term of classes are overlapped, students need to consult with their advisors before starting the program.

10.Note

If you have any questions or concerns, please consult with the secretariat, your academic advisor, and the Chair of the Graduate School.

Internship 2(インターンシップII)

Grade	M1,2
Semester	Spring, Fall
Credits	1 or 2
Instructor	Superviser Head of Graduate School

1.Course Outline

This course aims to learn the theory and practice of advanced information technology and multicultural collaborative design, and cultivate the ability to discover and solve problems and design new social systems. For the purpose, students will stay at the laboratory of overseas universities, research institutes, or enterprises for a few weeks to half a year or more, and be engaged in the academic activities with faculty members, researchers, and/or students there.

Students will have experiences of different cultures, enhance technological and communication skills, and develop the international mind as a future global talent.

A student decides the institute to stay and an overseas supervisor (or person in charge) beforehand, submit "overseas internship plan."

If the overseas internship plan is approved by the FUN supervisor and graduate school curriculum committee, a student will conduct the internship.

Styles of activities for overseas internships include collaborative research, workshops, short-term intensive schools and the like.

During the stay, a student will report progress to the FUN supervisor.

After the end of internship, students write "overseas internship report" including the results of collaborative research, the outcome of workshop to participate in, the contents of the classes students took, etc. and present the report at a debriefing session.

2.Keywords

Advanced information technology, multicultural collaborative design, international mind

3.Course Objectives

The course objectives are as follows:

- Can carry out interdisciplinary research with a broad perspective (evaluated based on plan and results)
- Can become conscious to meta-learning and achieve self-regulated learning (evaluated by progress report)
- Can acquire an open and positive attitude towards different fields and different cultures (evaluated based on the contents of the report and the performance at the debriefing session)

4.Course Schedule

1: Briefing session
2-14: Internship activity at an overseas institute
15: Debriefing session

5.Prior/Post Assignment

Prior Assignment: Students participate in the in-campus briefing session, are interviewed with a FUN supervisor, and learn the purpose of the subject to comprehend the significance of the subject. Students make overseas internship plans.

Post Assignment: Students reflect the achievements gained through internship and various other things they learned, and write overseas internship reports. Students make presentations at a debriefing session.

6.Assessment

Based on the content of the overseas internship plan (40%), the progress report during stay (20%), the content of the outcome or the evaluation by overseas supervisor (30%), and the report after the internship and a debriefing meeting (10%), the graduate school curriculum committee makes a dicision.

7.Textbooks

8.Language of Instruction

Depends on the plan.

Go to the next page

9.Requirements for registration

Regarding the eligibility for the class, comprehensive judge is made by language proficiency, student's record, and ability to carry out research.
Regarding language proficiency, the results of TOEIC or TOEFL iBT will be taken into account.
The ability to carry out research is assessed by examining the overseas internship plan submitted.
Regarding the number of credits, it is decided according to the course content.

10.Note

Watch the schedule guide of the briefing session in the university.
Students are encouraged to take "Academic Literacy in Context 2".
For questions and consultation, please contact a FUN supervisor at any time

Overseas Course Program(海外履修科目)

Grade	M1,2
Semester	Spring, Fall
Credits	1 or 2
Instructor	Superviser Head of Graduate School

1.Course Outline

If students take a course related to their own research theme while studying abroad, the credits earned at the study abroad destination can be counted as credits for this course.
For details, please refer to the web bulletin board.

2.Keywords

3.Course Objectives

Depends on the course to take.

4.Course Schedule

Depends on the course to take.

5.Prior/Post Assignment

Prior : make a plan at study abroad destination
Post : submit transcripts and syllabus at study abroad destination

6.Assessment

The graduate school education affairs committee examines the contents of the credits acquired at an overseas university and translates them into the unit of this subject.

7.Textbooks

8.Language of Instruction

Depends on the plan.

9.Requirements for registration

Before starting to study abroad, students have to contact the office (the education affairs section).
If a student would study abroad at a sister university, a student has to check "Regulations on studying abroad of FUN students and acceptance of international students to FUN.

10.Note

None

Advanced ICT Design(ICT ﾃﾞｻﾞｲﾝ通論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	ITO Kei

1.Course Outline

This lecture deals in trends in leading technology and practical engineering by the collaboration of subject teacher and several professionals inside/outside of FUN.
In addition, basic knowledge learning by e-learning materials.

2.Keywords

Project Management, Requirements Analysis, System Design, System Architecture, System Modeling, System Management, Accessibility, Agile Development

3.Course Objectives

- Understanding some parts of practical engineering and their problems.
- Understanding practical problems engineers experienced.

4.Course Schedule

Because this lecture is handled by the cooperation with professionals outside of FUN, the detail course schedule is shown at the beginning of the lecture.
Target topics of the lecture are shown below.
- project management
- requirements acquisition, requirements analysis
- design, development of several systems
- system modeling
- system management and maintenance

5.Prior/Post Assignment

Pre: reading pre-materials and e-learning
Post: reflection of lecture contents and answering post-lecture questionnaire

6.Assessment

Quizzes for every lecture and some reports (80%), e-learning (20%)

7.Textbooks

Deliver required materials for each lecture

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

None

Advanced Topics of Information Network 1(情報ネットワーク特論I)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	INAMURA Hiroshi
	ISHIDA Shigemi

1.Course Outline

To learn the basic technologies and design principles for computer networks, in particular the optical networks. The network protection issues will also be covered in the lecture.

2.Keywords

Computer Network, Network design, Mobile Network

3.Course Objectives

To introduce the basic technologies and design principles for the construction of computer network systems, in particular the advanced mobile networks and security technologies.

4.Course Schedule

Lecture 1-3 Overview of computer network systems
Lecture 4-6 Overview of next-gen Internet systems
Lecture 7-9 Overview of next-gen wireless communication systems
Lecture 10-12 Design of network architecture and protocols
Lecture 13-15 Technologies in business on Web/Network services

5.Prior/Post Assignment

Readning course material in prior to the classes. Finishing assignments required.

6.Assessment

The course grades are basically determined by class participation and report.

7.Textbooks

The materials are specified in the course.

8.Language of Instruction

In Japanese.

9.Requirements for registration

None

10.Note

None

Advanced Topics of Information Network 2(情報ネットワーク特論II)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	JIANG Xiaohong

1.Course Outline

To learn the basic technologies and design principles for computer networks, in particular the optical networks.

The network protection issues will also be covered in the lecture. Some advanced topics of wireless networks and network security will be also introduced.

2.Keywords

Information security, Cryptosystem

3.Course Objectives

To learn the basic technologies, design principles and network protection for optical networks. Some advanced topics of wireless networks and network security will be also introduced.

4.Course Schedule

Lecture 1-2 Overview of computer network systems
Lecture 3 Overview of optical network systems
Lecture 4 Basic elements for network systems
Lecture 5-6 Design of optical networks
Lecture 7-8 Protection of optical networks
Lecture 9-15 Advanced topics on wireless networks and network security

5.Prior/Post Assignment

Prior: Read handouts.
Post: Do a task report issued in the lecture.

6.Assessment

•Class participation accounts for 60%.
•Report: One report which accounts for 40%.

7.Textbooks

Deliver required materials for each lecture

8.Language of Instruction

In Japanese and English. Course materials are provided in English. Guest speakers may talk in English and provide materials in English.

9.Requirements for registration

None

10.Note

None

Advanced Topics in Data Science(ﾃﾞｰﾀ科学特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SATO Naoyuki SATO Hideki

1.Course Outline

This course consists of two parts.

In part A: Statistical Machine Learning methods have been developing drastically in recent years and are utilized to extract information from massive data. In this course of lectures, we show the introduction as well as applications of such methods.

In Part B: Some solutions are introduced to solve the problems encountered when we handle real big data. Moreover, these solutions are applied to some machine learning methods to solve various problems in the real world.

2.Keywords

Database, Data model, Massive data processing, Machine learning, Pattern recognition

3.Course Objectives

This course introduces data store, data analysis, and data processing for understanding of basic theory of information science.The aim of the course is to learn the massive data processing technology.

4.Course Schedule

Part A:

1 Optimization problem
2 Parameter estimation
3 Clustering method
4 Classification method (Naive Bayes classifier)
5 Classification method (Support vector machine)
6 Model selection

Part B:

1. Rank of covariance matrix used for multiple regression analysis
2. Multicollinearity in multiple regression analysis
3. Sampling and aliasing
4. Linearization of nonlinear functions and curse of dimensionality
5. Machine learning

5.Prior/Post Assignment

Prior: Work on assignments given in the class.

Post: Solve the quizzes.

6.Assessment

The final score is decided by final examination and/or reports. The ratio will be informed in the class. Grades are separated Part A and Part B, and final grade is sum of them.

7.Textbooks

There are many topics in this lecture, the textbooks will be specified at the first lecture. There will be selected references each week if necessary.

- Reference book (Part A): Pattern Recognition and Machine Learning (Christopher M. Bishop) Springer, 2010
- Reference book (Part B): None

8.Language of Instruction

Lecture materials in English and Japanese, and Oral Explanation is in Japanese (or some part is in Japanese and English).

9.Requirements for registration

This course is necessary the knowledge of the undergraduate level probability theory, statistics, operations research and database engineering.

10.Note

None

Advanced Topics in Information Environmentology(情報環境学特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	TSUKADA Koji SHIRAISHI Yoh

1.Course Outline

Recently, computers and information technology became “ubiquitous” in the daily environment, such as smart phones and IoT (internet of things). This course focuses on such new information environment, and introduces fundamental technology and application through recent research projects.

2.Keywords

Ubiquitous Computing, Human Computer Interaction, Locating Technology, Activity Recognition

3.Course Objectives

Learning fundamental technology and application of recent information environment.

4.Course Schedule

The possible topics in this course are as follows:

- Ubiquitous Computing
- Human Computer Interaction
- Tangible Interface
- Augmented Reality
- Wearable Interface
- Personal Fabrication
- Advanced Sensing Technology
- Locating Technology
- Navigation
- Network and Database
- Intelligent Transport Systems
- Collective Intelligence and Open Data
- Smart City and Mobility

5.Prior/Post Assignment

Prior: Prepare the contents designated in each class.
Post: Do assignment given in class or HOPE.

6.Assessment

Presentation, Report, Attendance attitude. The ratio will be informed in the class.

7.Textbooks

None. Some books and papers might be introduced for references in the lecture.

8.Language of Instruction

Japanese only. Presentation and report are allowed both in Japanese and English.

9.Requirements for registration

None

10.Note

None

Advanced Topics in Media Information Studies(ﾒﾃﾞｨｱ情報学特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	TERASAWA Kengo

1.Course Outline

With the development of multimedia information technology, unstructured data such as images and sounds have been handled on a daily basis, and the amount of distribution has been increasing.
In this lecture, image data will be taken as an example, and the data processing, statistical processing, and classification and recognition techniques required to handle such unstructured data will be learned. In addition to explanations of the theory, the students will also conduct programming exercises to utilize them.

2.Keywords

Multimedia Information Processing, Image Processing, Computer Vision, Feature Extraction, Pattern Recognition

3.Course Objectives

- Ability to conduct image processing according to the application
- Understanding the concept of feature extraction from unstructured data
- Understanding the principle of image recognition ability to conduct simple experiments

4.Course Schedule

1. The difference of image processing and computer vision
2-3. Image formation and its mathematical models
4-5. Region-based image processing and image filtering
6. Geometric transformations
7. Binary image processing
8. Pattern detection using image features
9-10. Pattern recognition
11-12. Image Recognition using Machine Learning
13. Deep Learning
14-15. Programing practice

5.Prior/Post Assignment

Prior: Review the previous lecture and prepare for the next lecture.
Post: Review the lecture and deepen understanding. Perform the tasks presented.

6.Assessment

Small Exercises (50%)
Final Assignments (50%)

7.Textbooks

Textbook: Digital Image Processing, Okutomi, CG Arts Society
Reference: Computer Vision: Algorithms and Applications, Szeliski, Springer

8.Language of Instruction

Japanese

9.Requirements for registration

Nothing.

10.Note

Next year,
Prof. I. Sato will teach this course.
The main theme will be image processing with emphasis on computer vision.

Advanced Topics in Field Information Studies(ﾌｨｰﾙﾄﾞ情報学特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	WADA Masaaki ISHIGURE Yasuo

1.Course Outline
In this lecture, we will look into field informatics using global issues such as SDGs and carbon neutrality, as well as ICT applications in individual fields such as smart primary industries for ethical consumption and medical and health ICT for well-being.

2.Keywords
Filed informatics, Big data, SDGs, Society 5.0

3.Course Objectives
Learn about problem-solving practices in the real world and examples of social implementation from the perspective of systems information science. Also, learn the concept and process of problem-solving.

4.Course Schedule
01. Orientation
05-08. Topics of global issues and primary industries
09-15. Lectures by outside experts in various fields

5.Prior/Post Assignment
Referring to related materials such as websites introduced in class for a better understanding.

6.Assessment
Evaluation will be based on reports and presentations.

7.Textbooks

8.Language of Instruction
Japanese Only

9.Requirements for registration
None

10.Note
None

Introduction to the Sciences of the Artificial(人工物の科学通論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	NAKAKOJI Kumiyo

1.Course Outline

This course aims to construct the knowledge and skills that are essential in the studies of design as the sciences of the artificial.

Students will learn models and principles related to information artifacts, as well as the fundamentals of the cognitive and social science behind them through simple experimentation and reflections.

The course focuses on essential topics including representation, communication, interactive perception characteristics, and collective creativity & social capital.

2.Keywords

design, cognitive science, representations, communication, creativity, interaction

3.Course Objectives

Students will develop the basic understanding of the nature of design and the cognitive and social characteristics of human beings.

Students will acquire the vocabulary to express, communicate, and record the methods applied, processes managed, and phenomena observed while engaging in design.

4.Course Schedule

1. Sciences of the artificial basics:	Following the introduction of the overall course structure, the class briefly addresses the nature of design as the sciences of the artifact, and how it would be grounded in the cognitive and social aspects of human beings.
2-5. Representation and cognition:	The four classes address how representations and their interactivity influence and affect human cognitive and thought processes.
6-9. Communication and shared understanding:	The four classes describe language as design material, and how mutual and shared understanding is developed through communication.
10-12. Collective creativity and social capital:	The three classes explain the notion of social capital, which serves as a foundation in understanding how people do or do not collaborate, and the issues and challenges in balancing incentives in synchronous and asynchronous collaborative work situations.
13-14. Interactive perception and illusion:	The two classes address how controlling the temporal aspects of visual interaction affects the human perception and demonstrate haptic illusions through touch-based user interface programming.
15. Reflection and engagement:	Students will be asked to reflect on the overall course.

5.Prior/Post Assignment

Prior assignment: Students are encouraged to reflect on what has been taught and discussed after each class.

Post assignment: Some of the classes ask students to compose 1-2 page essays or give them reading assignment.

6.Assessment

- participation in class discussions (15 points)
- theme essays/compositions assigned during lectures (40 points)
- term paper in the end of the course (45 points)

Go to the next page

7.Textbooks

(not mandatory but recommended)

H. Simon, The Sciences of the Artificial

T. Winograd and F. Flores, Understanding Computers and Cognition

D.A. Schoen, the Reflective Practitioner

D.A. Norman, Psychology of Everyday Things

8.Language of Instruction

Lecture material and oral explanations will be presented both in Japanese and in English.

9.Requirements for registration

Active participation in class discussions is encouraged.

10.Note

None

Advanced Topics of Embedded Systems(組込システム特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	NAGASAKI Takeshi

1.Course Outline

This course has two components like the following to understand what kind of techniques are necessary to develop embedded systems and obtain these techniques.

(1)Enterprises developers give lectures about the business world, for example, techniques for embedded systems or recent trends.

(2)Lectures about basic techniques for embedded system by me. To be more specific, you will make an robot by Lego Mindstorms EV3 to develop an understanding about “task segmentation system on real-time control method”, “communication between tasks”, and “task scheduling” for practical training.

2.Keywords

Embedded system, Realtime system, Software Modeling

3.Course Objectives

You aim to obtain advanced techniques for embedded systems and related matters.

4.Course Schedule

(1) Lectures by enterprises developers	7 lessons
A)Practicing modeling development	2 lessons
B)Product lifecycle	1 lesson
C)Introducing examples of each area;	3 lessons
- Automobile related example	
- Industrial Equipment example	
- Consumer equipment example	
(2) Practicing embedded systems by Lego Mindstorms NXT	8 lessons
A)Introducing real-time OS, which we will use in the course,and its sample programs.	1 lesson
B)Practicing real-time processing and its programming.	3 lessons
C)Development control program.	4 lessons

Notes: Times of each lesson may be change at the developer’s convenience.

5.Prior/Post Assignment

Prior: Read lecture materials.

Post: Work on assignments given in the class.

6.Assessment

The result will be evaluated by the report.

7.Textbooks

I will give instructions in the course,
accordingly.

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

None

Advanced Open Technologies(オープン技術特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	OKUNO Taku

1.Course Outline

Present enterprise information systems are constituted by heterogeneous system that consists of many computers, which are closely coupled within an organization and are loosely coupled through the Internet, i.e., the open systems. Information engineers working in the critical uppermost phase of system development processes need to grasp the business strategy and to realize it by utilizing the information systems together with various stakeholders.

This lecture introduces constituent technologies of open systems, real-world examples of enterprise businesses that utilize information technologies and systems, and the uppermost phase of system development process. Enterprise engineers practically teach their own specialties week by week.

2.Keywords

Open System, Enterprise Information System, Business Process, Financial Information System, Business Model, Linked Open Data, AI, Big Data, Data Analysis, Innovation, Interoperability, Software, Development, Mobile Engineer

3.Course Objectives

Students will understand constituent technologies of open systems, real-world examples of enterprise businesses that utilize information systems, and the uppermost phase of system development process.

4.Course Schedule

The following is a list of lectures by company lecturers in 2023, with specific course content varying from year to year.

- Regional revitalization of new business planning case studies (lecture + practice)
- What do AI engineers do?
- Enterprise information systems and business processes
- Trends in Smartphone Development Environments, Monaca and Monaca Education Development Activities
- Trends in spoken dialogue interface technology
- Connecting learning to work
- Overview of banking system and financial solution
- How to create connected data
- The reality of data analysis and what it brings to business
- International interoperability and open technologies - date-time and characters
- DX on B2B transactions

5.Prior/Post Assignment

Prior: Do pre-learning tasks assigned by lecturers.
Post: Do feedback to lecturers (questions and comments on the lecture).

6.Assessment

Feedback to the lecturer on the content of each lecture (approx. 80%)
Assignments (reports, etc.) (approx. 20%) (if assigned by the company lecturer)

7.Textbooks

Reference books will be introduced as needed.

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

None

Advanced Topics in IT Architecture(IT アーキテクチャ特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	MATSUBARA Katsuya

1.Course Outline

The course's work is to read public documents and source code of an actual system and develop small application programs for understanding the excellent and notable architecture design corresponding to system requirements.

The teaching materials are made by an instructor who has experience in the field as a developer of system software such as Android for products.

2.Keywords

Software Architecture, System Design, Android

3.Course Objectives

- Understanding architecture design of large scale software
- Designing functionalities and API of a software system under consideration of performance, availability, extensibility, and operation cost.
- Implementing systems and applications according to design philosophy.

4.Course Schedule

This course will be divided into 9 chapters as follows:

1. Background, the latest development of the target system
2. SDK and tools
3. System architecture
4. Application model
5. Framework for application collaboration
6. Inter-process communication
7. Bootstrap
8. Framework for graphics and media processing
9. Access control and security

5.Prior/Post Assignment

Prior: Review the content of the previous lecture.

Post: Work on homework (program or report) given in the class.

6.Assessment

Grades are comprehensively assessed based on assignment (program/oral presentation/report) and participation attitude to the class. The ratio will be informed in the class.

7.Textbooks

Reference Book: Karim Yaghmour, ”Embedded Android”, O'Reilly

Reference Book: Tae Yeon Kim, Hyung Joo Song, Ji Hoon Park, Bak Lee, Ki Young Lim, ”Inside Android”, Personal Media (in Japanese)

8.Language of Instruction

Japanese

9.Requirements for registration

Students are expected to have basic knowledge and experience in programming with Java, C/C++, or other languages.

10.Note

None

Advanced Topics in Service Management(サービス・マネジメント特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	ISHIO Takashi

1.Course Outline

Traditional service research has focused on service as a business in industries such as service industry, manufacturing, and information industry.
On the other hand, any value-creating businesses are recognized as new services.
In this course, students will learn the concept of the new services, their applications, and creation, operation, and management of services through lectures and exercises.

2.Keywords

Services, Service Science, Service management, Starting a business, Entrepreneur

3.Course Objectives

This lecture is the theme of service management. Students will be able to understand what is service and how to create, operate and manage a service. Students will also be able to familiar with applications and business based on services.

4.Course Schedule

This course includes the following topics:
- What is services
- New perceptions of service
- Service-oriented project management
- Decision support and service value
- Service of to promote corporate sustainability
- Service value creation model
- Service transformation of information business by approach
- Collaboration as seen from the service point of view
- And information ideas creation method of service
- Service-oriented information element stems business of organization theory

The schedule may be adjusted according to the level of understanding of students.

5.Prior/Post Assignment

Previous learning: Prepare for the next lesson.
Follow-up learning: Submit a report assignment.

6.Assessment

Reports (80%) and presentation (20%).

7.Textbooks

Textbook:小坂満隆編「サービス志向への変革−顧客価値創造を追求する情報ビジネスの新展開−」（社会評論社）
Other reference books are instructed as appropriate at the time of lecture.

8.Language of Instruction

Japanese

9.Requirements for registration

Nothing in particular.

10.Note

Nothing in particular

Introduction to Information Design(情報ﾃﾞｻﾞｲﾝ通論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	YASUI Shigeya

1.Course Outline

In this course, students will practice information design by creating and giving a presentation of an expression that conveys the "subjective sense of the expressionist" to others.

2.Keywords

information design, embodiment, perception design

3.Course Objectives

Students will be able to practice trial and error involving embodiment in the real world.
Students will be able to communicate to others about the new framework they have created.

4.Course Schedule

01 orientation
02-10 prototyping
11-13 creating and shareing each portfolio
14,
15 presentaion an reflection

5.Prior/Post Assignment

Pre-learning:collecting materials.
Post-learning: brush up materials created in advance based on class content.

6.Assessment

Assessment will be based on the prototypes produced and their presentations.

7.Textbooks

assignment books are selected together with the students in the first lesson.

8.Language of Instruction

Japanese

9.Requirements for registration

Students may be required to pay for prototyping supplies.(If the items are inexpensive and generally available, they may be purchased in class.)

10.Note

This class is to be held in the first half of the latter term.

Introduction to Cognitive System(認知システム通論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	MIMA Noyuri

1.Course Outline

This class will focus on the uniqueness of the research methods and research contents regarding the intersection of cognitive science and information science.
It will be dealt with specific themes related to the user interface research as particular application fields such as learning environment design and artificial intelligence research based on knowledge and learning.
Cognitive science is an interdisciplinary area related to engineering, linguistics, and psychology.
Students are expected to understand the research stream related to learning and user-interface such as situated cognition and legitimate peripheral participation theory.
At the same time, cultivate the attitude of participation of graduate seminar, such as how to read technical books, how to understand, how to present, and discuss the specific application of research results.

2.Keywords

knowledge, learning, learning environment design, artificial intelligence, user interface, situated cognition

3.Course Objectives

Understand the fundamental knowledge and new direction on cognitive science research contents and research methods.
Developing skills of reading, understanding, presenting and discussing on specialized books in a postgraduate lecture (seminar).

4.Course Schedule

1-4week
Noyuri Mima "Designing Future Learning: Space, Activity, and Community" (University of Tokyo Press).
Both books are written in Japanese.
5-9week
Jean Lave and Etienne Wenger “Situated Learning: Legitimate Peripheral Participation” (Cambridge University Press).
10-14 week
Lucy Suchman “Plans and Situated Actions: The Problem of Human-machine Communication” (Cambridge University Press).
15 wrap up

5.Prior/Post Assignment

As preliminary learning, you are required to read the relevant documents every time and summarize the contents to PowerPoint.
Also, you need to think about the parts related to your research and reference parts in the textbook and summarize it in PowerPoint.
In the post learning, you need to reflect the understanding in the class in the PowerPoint which is summarized in advance.

6.Assessment

Evaluate by participation in discussion in class (70%), and term paper (report) (30%).

7.Textbooks

Noyuri Mima "Designing Future Learning: Space, Activity, and Community" (University of Tokyo Press).
Both books are written in Japanese.
Jean Lave and Etienne Wenger “Situated Learning: Legitimate Peripheral Participation” (Cambridge University Press).
Lucy Suchman “Plans and Situated Actions: The Problem of Human-machine Communication” (Cambridge University Press).

Go to the next page

8.Language of Instruction

The lecture is basically done in Japanese, but for students who need English, I prepare English texts and oral explanations with Japanese and English.

9.Requirements for registration

As for the specific contents and methods of the class and the skills to be acquired through the class, there are messages left by the seniors in the online class feedback, and I hope you will read them before participating.

10.Note

Nothing in particular

Introduction to Interactive Systems(インタラクティブシステム通論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SUMI Kaoru

1.Course Outline

In this class, students will learn about the technologies of interactive systems, their interactions, and their impact on humans through reading, discussion, and work production.

Interactive systems is a general term for systems in which computers and humans exchange information with each other. In this class, students will discover the rules of interactive design in the process of learning about the technologies of interactive systems, the interaction between a human and a computer, and their impact on humans, and summarize those rules in a guidebook. Finally, we will have our own exhibition.

2.Keywords

Non-verbal communication
Affective computing
Human computer interaction
Psychology

3.Course Objectives

The goal is for students to learn about the technologies, interactions of interactive systems and their impact on humans through round-reading and understand how they can be used to build system designs.

4.Course Schedule

Students will present and explain the contents of the designated textbook in a round-reading format, and deepen their knowledge by discussing questions and impressions about it.
In addition, a weekly report will be submitted that describes what was found in the class and any remaining questions, and the professor will explain them.
The knowledge gained through commentary and discussion is summarized as a form, and the found design rule collection is completed as a design guidebook for undergraduate students.

Schedules:

1	Orientation
2-7	"More than words"
8-12	"Telling Lies"
13	Making a Guide Book
14	Exhibition rehearsal
15	Setting up an exhibition

5.Prior/Post Assignment

Read the chapter of the book before class.
Complete any reports or assignments you may have.

6.Assessment

Excises, report, and presentation.

7.Textbooks

1) More than words : the power of nonverbal communication, Miles L. Patterson(Author), Editorial Aresta

2) Telling Lies: Clues to Deceit in the Marketplace, Politics, and Marriage, Paul Ekman(Author), W. W. Norton & Company

8.Language of Instruction

Japanese / English

9.Requirements for registration

The class will be conducted on the premise that you are preparing, so be sure to read the textbook as a preparation.

Go to the next page

10.Note

Basically, this class is conducted in Japanese.
If international students attend, the class will be conducted in English and the materials will be changed to English if necessary.

Field Research Methods for Design Work(ﾃﾞｻﾞｲﾝのためのﾌｨｰﾙﾄﾞ調査法)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SAKAIDA Rui NAMBU Misako

1.Course Outline

Learn the methods of field research, which is the foundation of design work, including the knowledge of anthropology and sociology.

Plan and implement field research based on their own interests, and design a media to communicate the results.

This course is designed by two faculty members with practical experience in field research and qualitative analysis.

2.Keywords

Field Research, Participant Observation, Interview, Ethnography, Interaction Analysis

3.Course Objectives

Acquire basic knowledge of field research methods, practice them appropriately, and publish the results in some media. Work independently on this series of activities.

4.Course Schedule

1-5. Overview of field research methods: history, background, disciplines, theory, methods, description, data, tools, ethics, etc.

6-10. Practice of field research: planning, implementation, reporting, analysis, etc.

7-15. Production based on research results: paper, report, booklet, poster, website, exhibition, etc.

5.Prior/Post Assignment

Prepare for and reflect on class, and produce own work based on the instructions and discussions in class.

6.Assessment

Attendance and active involvement in class, and the quality of submitted productions.

7.Textbooks

TBA

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

Required to conduct field research and produce work outside of class hours.

Special Topics of Information Design 1(情報ﾃﾞｻﾞｲﾝ特論I)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	OSADA Junichi

1.Course Outline

In this course, for systems that behave intelligently, such as AI, we will design how the system should interact with humans.

Implement the designed system, create a working prototype, and present it as a state where you can actually experience the interaction.

Furthermore, by looking back on the design process, the purpose is to search for intentions and finally to verbalize one's own view of design.

In the process of putting together the final deliverable, emphasis is placed on repeated presentations and discussions.

2.Keywords

UIUX design

3.Course Objectives

- Experience a series of UIUX design processes for systems that behave intelligently, such as AI
- Implement your own designed UX as a system that can be experienced
- Look back on your own manufacturing experience and verbalize it

4.Course Schedule

1. Orientation
2-6. Observation and Prototyping
7. Midterm-presentation
8-13. Observation and Prototyping
14.Pre-presentaition
15. Final presentation

5.Prior/Post Assignment

Pre: reading papers and books
Post-lecture: Writing Reports

6.Assessment

Evaluated by class participation, reports, presentations, exercises, and final exhibition

7.Textbooks

8.Language of Instruction

Lecture: Japanese
Lecture materials: Japanese

9.Requirements for registration

Messages to students: Let's communicate closely and make lively discussions.

10.Note

In addition to preparatory work, students may be required to do some production work outside the class.

Special Topics of Information Design 2(情報ﾃﾞｻﾞｲﾝ特論II)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	MOTOKI Tamaki

1.Course Outline

This course will deepen your understanding of the methods that can be used in design practice research.
We will understand several design research methods through reading reference materials, researching previous research, research case studies, etc.
We will discuss and exchange ideas with each other in class, and each student will create a report and poster on their own.
This year, we aim to present our work at a design conference scheduled to be held at Future University in late summer.

2.Keywords

Research on design practice, information design, design research methods

3.Course Objectives

- To Understand the outline and characteristics of the design research methods adopted in your own research, and be able to explain their validity.
- To explain your own research by positioning it within design research.
- To plan your own information design research. (To be able to feedback for own design practice.)

4.Course Schedule

1) Orientation
2-3) Presentation of own research outline and research plan.
4-7) own research on references, precedent cases, and research cases related to your own research.
8-13) Writing reports and make these slides or posters.
14-15) Presentation using slides or posters.

5.Prior/Post Assignment

None.

6.Assessment

Classroom attitude (40 %)
Quality of assignment (40%)
Quality of assignment presentation (20%)

7.Textbooks

Donald A. Norman ” Design for a Better World: Meaningful, Sustainable, Humanity Centered”（Japanese Version)

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

This course will be held during the second quarter.(6/12-)
No exam will be conducted

Special Topics of Cognitive System 1(認知システム特論I)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	NAKATA Takayuki

1.Course Outline

We will critically examine cognitive and socio-emotional aspects of music based on both behavioral and neuroscientific studies on music perception and production.
Readings assignments are academic papers or book chapters written in English.
Students will lead course discussion and all students are expected to read assigned papers before class and to participate in class discussion.
Based on own hypothesis presented in class, students write a research proposal and present in class.

2.Keywords

cognitive system, music perception and production, psychological research methods, statistical analysis

3.Course Objectives

Students in this lecture will gain knowledge on cognitive and socio-emotional aspects of music perception and production based on both behavioral and neuroscientific studies.
Students also learn about psychological research methods and statistical analysis for psychological data.

4.Course Schedule

1. Organizational meeting
2. Discussion: Musical development
3. Discussion: Music perception
4. Discussion: Music and social behavior
5. Discussion: Responses to music
6. Discussion: Music and the brain
7. Discussion: Musical development
8. Tools for designing experiments and analyzing data
9-10. Experimental design
11-13. Analysis of variance and other statistical methods
14-15. Presentation of research plan

5.Prior/Post Assignment

Prior: Read assigned papers for class discussion, when assign to lead the topic, prepare for discussion, work on assignments.
Post: Review course contents and work on assignments.

6.Assessment

Final grades are computed from evaluations on class presentation, class discussion, and research method paper.

7.Textbooks

Readings will be assigned weekly, including chapters of the following books.
Hallam, S., & Cross, I., & Thaut, M. (2018). The Oxford Handbook of Music Psychology. Oxford University Press.

8.Language of Instruction

Japanese.
Handouts in both English and Japanese will be provided in this class. Students can make presentations in either English or Japanese.

9.Requirements for registration

None.

10.Note

None

Special Topics of Cognitive System 2(認知システム特論II)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	ITO Kiyohide

1.Course Outline

This course will focus on ecopsychology, especially sound perception, through books, papers, and experiments.

In the lecture, students will read books and papers related to auditory and visual affordance perception, and conduct simple experiments.

Students will practice sound recording.

2.Keywords

Ecological psychology, Acoustics music perception,musical instrument performance,pysiology

3.Course Objectives

To acquire basic knowledge of pysical influence of event sound and music perception and action through reading in a circle and exercises.

4.Course Schedule

reading of papers

5.Prior/Post Assignment

Prior Assignment: Summarize the assigned books/articles in a resume

Post Assignment: Find and read papers that interest you. Relate your research to the content of lectures and exercises.

6.Assessment

1. participation in discussions
2. assignments

7.Textbooks

Explain at the first meeting.

8.Language of Instruction

Japanese

9.Requirements for registration

Students interested in auditory media such as hearing and recording are welcome.

Please note that the content of the lecture may be subject to change depending on the infection status of COVID-19.

10.Note

None

Special Topics of Interactive Systems 1(インタラクティブシステム特論I)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	MUKAIYAMA Kazushi

1.Course Outline

Interactive systems are various because they need total perspective of academic researches.
Therefore, it's difficult to understand it in general situation.
Then, in this class each stundent sets their own puspose him/herself, and check latest researches and activeties of intercative system.
Finally, every students share thier report and understand the cutting-edge of interactive system history.
This is designed by a professor who has the professional experience in Art and Design

2.Keywords

Interaction, Interactive System

3.Course Objectives

* Survey: read academic published papers.
* Discussion: report one paper and discussing about it with others.
* Practices: understand some system pragmatically in some case.

4.Course Schedule

1. Orientation
2-5. Lecture: Recent trends in interactive systems
6-9. Lecture: History of interactive system
10-11. Survey: Trends and understanding of interactive systems
12-13. Exercise: Practice to make a model of the system
14. Oral Presentation
15. Final discussion and report submission

5.Prior/Post Assignment

Before: To prepare the contents instructed in each time.
After: To do homework instructed in each time.

6.Assessment

evaluated by an oral presentation and a report

7.Textbooks

depending on online articles on every classes

8.Language of Instruction

Japanese, English

9.Requirements for registration

You must attend the first time to know the important information in this class.

10.Note

To learn cutting-edge research topic, it is possible to have flexible events for the benefit of students.

Special Topics of Interactive Systems 2(インタラクティブシステム特論II)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	TAKEGAWA Yoshinari

1.Course Outline

Creating an attractive demo movie is one important research activity.
In this lecture, each student will create a demo movie of their own research achievements, utilizing every kind of interactive technology, such as the widely applicable JavaScript, digital machine tools, electronic kits, video-editing software (Premiere etc.), 3D modelling software (MAYA etc.), 3D CAD software (Inventor etc.) and digital signage software.
Regarding the content of each lecture, students will first independently assign roles and conduct investigation, and the class will be continued in the form of conducting lectures to share information between all participants.

2.Keywords

HCI, Information design, Prototyping, Communication

3.Course Objectives

The learning of interactive technology and expression methods to explain each student's research theme and achievements effectively; creation of a research demo movie.

4.Course Schedule

Lecture 1: Explanation of lecture policy/outline
Lectures 2 and 3: Analyisis of research demo movies
Lectures 4 and 5: Conception of research demo movie
Lecture 6: Evaluation of research demo movie (mid-term presentations)
Lectures 7-9: Investigation of underlying technology necessary for research demo movie
Lecture 10: Report of investigation results (mid-term presentations)
Lectures 11-14: Creation of research demo movie
Lecture 15: Final presentation of created research demo movie

5.Prior/Post Assignment

Prior: Work on the assignments given in the class
Post: Revise the assignments given in the class

6.Assessment

Grades are based on degree of completion of created research achievement demo movie, and students' peer evaluation.

7.Textbooks

There is no specified textbook. Reference materials will be specified during lectures.

8.Language of Instruction

Japanese, English

9.Requirements for registration

There is no specified.

10.Note

A quarter system has been introduced for this class, which will be conducted twice a week starting in the second half of the second semester.

Advanced Topics in Information Mathematics(情報数理特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	KURIKAWA Tomoki

1.Course Outline

Neural systems are ones that “adequately” respond to various inputs.
How do such systems represent the inputs? In this course, a class attendee can study the classical and advanced views of the representations in the neural systems with two approaches; the experimental data (and analysis methods) and the model studies such as simple differential equation models and neural network models.

2.Keywords

Computational neuroscience, neural networks, differential equations

3.Course Objectives

The goal of this course is understanding the representation of the external stimuli in the neural systems with the experimental and theoretical approaches.

4.Course Schedule

1. The role and structure of the neural system
2. How can we measure the information in the neural system?: stimulus selective firing patterns
3-4. The classical information coding in sensory cortices and feed-forward network models
5-6. Information coding in the higher cortical areas: dimension reduction of the high-dimensional neural data.
7. Generalized linear model
8. Neural activities and recurrent neural network models
9-10. Information encoding in the recurrent neural networks
11-12. Dynamic neural patterns: transitions among attractors and hidden markov model
13. Neural information coding in the complex tasks
14-15. Data-driven neural network models

5.Prior/Post Assignment

(prior) Download and read the documents indicated in the class. (30,min)
(post) Make a report about the topics indicated in the class (1hour)

6.Assessment

Rating several reports
Attendance of at least 2/3 of all class sessions is mandatory for credit

7.Textbooks

No textbook designated.

8.Language of Instruction

Japanese

9.Requirements for registration

The class attendee is supposed to be the elementary level of ordinary differential equations and non-linear dynamics.

10.Note

None

Advanced Topics in Nonlinear Mathematics(非線形数理特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	RIABOV B Volodymyr

1.Course Outline

Some mathematical models used in physics, chemistry, biology, and other disciplines are introduced.
Key concepts of nonlinear dynamics, such as phase portraits, fixed points and stability, bifurcations, and attractors are discussed starting from a very basic level.
The emphasis is made on the study of harmonic oscillator and Duffing equation.
Two analytic approaches are described in detail: Hamiltonian formalism and asymptotic methods.
The first one allows visualizing possible types of motion in dynamical systems without friction, whereas the second one can be used for more complex dissipative cases.
The phenomenon of nonlinear resonance accompanied by hysteresis and amplitude jumps is described in both Hamiltonian and dissipative cases.
Finally, several strongly nonlinear effects, such as period doubling bifurcations and chaos are studied numerically.

2.Keywords

Nonlinear oscillator, period doubling bifurcation, saddle-node bifurcation, chaos

3.Course Objectives

- learn about nonlinear models of physical systems.
- apply multiple scales method to Duffing equation as a typical example.
- calculate bifurcation diagrams for Duffing equation.

4.Course Schedule

1. Differential equations as real world models. Linear and nonlinear oscillators.
2. Linear oscillator with harmonic excitation. Frequency response curve. Resonance.
3. Hamiltonian formalism in mechanics. Applications to other disciplines, like electronic circuits or electromagnetic field theory.
4. Phase portrait, fixed points and separatrix.
5. Stability of fixed points.
6.Multiple scales method applied to the Duffing oscillator with harmonic excitation. Part 1.
7.Multiple scales method applied to the Duffing oscillator with harmonic excitation. Part 2.
8. Principal resonance. Frequency response curve of Duffing oscillator.
9. Jump phenomenon as an example of saddle-node bifurcation.
10. Period doubling cascade as a typical route to a chaotic attractor.
11. Bifurcation diagram: an illustration of transitions between different attractors.
12-14. Numerical experiments with Duffing oscillator.

5.Prior/Post Assignment

Read any book about Duffing oscillator.
Learn how to make numerical experiments with differential equations

6.Assessment

Homework reports 50%, Attendance 50%

7.Textbooks

1. J. M. T. Thompson and H. B. Stewart. Nonlinear Dynamics and Chaos. John Wiley and Sons, Chichester (1986).
2. A. H. Nayfeh and D. T. Mook. Nonlinear Oscillations. John Wiley and Sons, New York (1979, 1995)

8.Language of Instruction

Everything is in English with some explanation in Japanese if students ask questions

9.Requirements for registration

None

10.Note

Basic knowledge of Microsoft Windows OS and Notebook PC are required.

Advanced Topics in System Mathematics(システム数理特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SAITO Asaki

1.Course Outline

This course surveys advanced topics of neural networks that are frequently used for making a model from observed data.

The student can acquire a wide knowledge of neural networks, ranging from basic roblems of learning to practical applications.

2.Keywords

モデル化/modeling

学習/learning

3.Course Objectives

To learn a wide knowledge of neural networks

4.Course Schedule

1. Models of a neuron (3 weeks)
2. Neural networks and chaos (2 weeks)
3. Learning algorithms other than Back Propagation (2 weeks)
4. Boltzmann Machine (Gibbs Sampler) (2 weeks)
5. Optimization (1 week)
6. Learning theory of Back Propagation (1 week)
7. Generalization (2 weeks)
8. Application to some problems in cognitive science (1 week)
9. Control (1 week)

5.Prior/Post Assignment

What to be learned is indicated every week.

6.Assessment

Some reports

7.Textbooks

Reference book: S. Haykin, Neural Networks, 2d ed. Prentice-Hall.

Other reference books will be introduced during class time.

8.Language of Instruction

Lecture materials in English and Japanese, and Oral Explanation in Japanese.

9.Requirements for registration

It is desirable to have taken "Neurocomputing".

10.Note

None

Advanced Topics in Mathematical Analysis(数理解析特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	KAWAGUCHI Satoshi

1.Course Outline

In this year, we treat statistical physics and solid state physics.
Semiconductor and solid state physics are based on statistical physics and quantum mechanics.
In the field of Neural network, machine learning, Boltzman machine is often used. In order to understand well, we study statistical physics and solid state physics.

2.Keywords

Bose distribution, Fermi distribution, lattice vibration, specific heat

3.Course Objectives

- Understanding of basic concepts of statistical physics
- Application of statistical average of physical quantities

4.Course Schedule

1. Introduction
2.-8. Basics of statistical physics (distribution functions, lattices vibrations, specific heat, absorption, quantum correction of ideal gas)
9.-15. Basics of semiconductors and solid state physics (band structure of solid, conductivity, magnetics properties of magnetic materials, models of crystals)

5.Prior/Post Assignment

(Prior) Read the text book or references if necessarily
(Post) Review what you learned in the lectures

6.Assessment

Assessment is based on the reports and final test

7.Textbooks

I will introduce several text books in the class.
For exsmples,
統計力学（岡部 著）
物性物理学（永田 著）
固体物理学（鹿児島 著）
published by 裳華房

8.Language of Instruction

Japanese

9.Requirements for registration

Students have to attend all lectures in general. Lectures will be given by putting emphasis on mathematical understanding.

10.Note

Prior knowledge: Linear algebra, analysis, probability theory and statistics

Advanced Topics in Applied Complex Systems(応用複雑系特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	TANAKA Yoshitaro

1.Course Outline

By using the basic partial differential equations of second order that are typically used in physical, chemical and biological phenomena, the way of analysis and mathematical modeling will be explained.

2.Keywords

Mathematical analysis, Mathematical modeling, Numerical simulation, Reaction-diffusion equation, Traveling wave solution

3.Course Objectives

Understanding the way of analysis and mathematical modeling for the partial differential equations of second order.

4.Course Schedule

1-2.Partial differential equation and related phenomena
3.Derivation of the diffusion equation
4-5.Mathematical modelings by reaction diffusion equation
6-7.Stability analysis of equilibrium point
8-9.Phase plane analysis for nonlinear reaction diffusion equation
10-11.Traveling wave solution for reaction diffusion equations
12.Energy method
13.Application of the nonlinear problem
14.Singular limit analysis
15.Summary

5.Prior/Post Assignment

Prior: Read a part of textbooks and articles assigned
Post: Summarize the important points addresssed in the class in your notebook.

6.Assessment

By the reports.

7.Textbooks

Textbook:
Hirokazu Ninomiya, Invasion, propagation, and diffusion equation, kyoritsu, 2014,
ISBN: 978-4-320-11003-8
Reference:
Haruo Murakami, Differential equation, Shinyosya, 1997,
ISBN:4-7885-0617-3

8.Language of Instruction

Japanese

9.Requirements for registration

None

10.Note

None

Advanced Topics in Complex Systems(複雑系システム特論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SAKURAZAWA Shigeru

1.Course Outline

Complex systems, which exhibit emergence due to interactions between a large number of subsystems, can be analyzed from the perspective of systems science.
In this course, students will learn several mathematical frameworks for the analysis and control of complex systems based on the concepts of physics as well as systems and control.
We will introduce the analysis and control of physical systems, particularly focusing on synchronization analysis based on reduction theory and fundamental concepts of modern control theory.
Moreover, the fundamental mathematical framework of quantum systems which describes the micro- and-nanoscale systems will be introduced.
The course consists of three main parts, 1.synchronization analysis, 2.modern control theory, and 3. mathematics of quantum systems, each of which is introduced comprehensively from basic to advanced topics.
The course will be given by a faculty member with experience working in a private company.

2.Keywords

complex systems,systems and control,nonlinear oscillations and synchronization,control theory,quantum mechanics

3.Course Objectives

The student will be expected to
- understand the concept of the reduction theory via synchronization analysis
- understand the fundamental concepts of modern control theory
- understand the fundamental concepts of quantum systems

4.Course Schedule

1. Synchronization analysis
- Introduction
- Nonlinear oscillations, phase reduction theory
- Synchronization of an oscillator with periodic forcing and of two coupled oscillators
- Kuramoto model, synchronization of globally coupled oscillators
- Synchronization of noisy oscillators
- Other advanced topics

2. Modern control theory
- Introduction
- Systems modeling, stability analysis
- Controllability and observability
- Regulators and observers
- Optimal control and Kalman filter
- Other advanced topics

3. Mathematics of quantum systems
- Introduction
- Pure states, mixed states, density matrix
- Bloch sphere, uncertainty principle
- Quantum dynamics, quantum measurement
- Composed systems, quantum entanglement
- Other advanced topics

5.Prior/Post Assignment

Research for related topics

Go to the next page

6.Assessment

Students will be evaluated only by the final report. There will be no final exam.

7.Textbooks

Nothing

8.Language of Instruction

Japanese. English explanation will be included if necessary.

9.Requirements for registration

Nothing

10.Note

Nothing

An Introduction to Intelligent Information Science(知能情報科学通論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	MURAI Hajime TERAI Asuka

1.Course Outline

This lecture presents the fundamental concepts of the recent artificial intelligence research.
You can learn how the recent AI ideas such as partiality of information, embodiment, real-time algorithms so on become more important than physical symbol system hypothesis.
And we study how the important concepts are implemented in the real world systems by some examples.
In this lecture, the instructors are researchers in artificial intelligence field, and the instructors explain about actual utilization and application in research and development based on their experiences.

2.Keywords

Artificial intelligence, behavior-based intelligence, frame problem, symbol grounding problem

3.Course Objectives

The object is to study the philosophy of artificial intelligence, and to become possible to understand and explain papers about artificial intelligence.

4.Course Schedule

The lecture is designed to learn basic concepts underlying intelligence information science.
Aiming to touch on latest researches, presentation and discussions will be held after reading papers. The contents of the lecture are the following:
1 Introduction for AI
2 History of AI researches
3 Knowledge representation
4 Brain and AI
5 Natural language
6 Intelligence based on embodiment
7 Creativity
8 Development of future artificial intelligence
9-15 Presentation and discussions about research paper

5.Prior/Post Assignment

Before: To search related research papers and to understand these papers
After: To do an assignment on the websites

6.Assessment

The exercises (presentation and report) 80% and the learning attitude 20%.

7.Textbooks

References are introduced in the lecture.

8.Language of Instruction

Japanese, handouts are both English and Japanese

9.Requirements for registration

None.

10.Note

None.

History and Future of Intelligent Systems(知能システムの歴史と未来)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	FRANK Ian

1.Course Outline

The history of intelligent systems is long and fascinating. A steam-powered "pigeon" is said to have been created around 400 to 350 BCE by Archytas (who was maybe one model for Plato's philosopher king), and the word “automaton” is from the ancient Greek “acting of one’s own will.” In the present, we seem to be living through a time of significant change, which makes it even more important to appreciate the field from a broad perspective. The future of artificial intelligence is the subject of much discussion, with some predicting a "singularity" and others considering the idea of an "inflection point."

The class is delivered as a mix of "streaming" online lectures and face-to-face workshops. Both styles of class make use of video resources, captioned in English and Japanese, making the core contents approachable from diverse linguistic backgrounds. The video contents offer the opportunity to delve into the history of intelligent systems, to follow the latest advancements and technologies, and to explore what thought-leaders are projecting about the future.

Contents will also address the ethical and societal implications of artificial intelligence and consider what it means to be human in the age of AI. This is especially a theme of the workshops, where we explore "intelligence" as it relates to our own activities.

The class is suitable for students from all disciplines who aim to build their knowledge and expand their perspectives.

The speed of technological progress means that tracking "news" is a major part of this course, including issues such as morals and ethics. Each year, students are tasked with finding and sharing related stories that they find of interest.

2.Keywords

Algorithms, Historical Perspectives, AI in Society, Advancements in Technology, Constraints, Intelligence Augmentation, Big Data, Quantum Computing, Ethics of AI, Free will, Stories, Perspective, Prediction

3.Course Objectives

Students will be expected to:

- gain a perspective on historical development of ideas
- gain knowledge of notable figures in the past and present
- improve the granularity of their understanding of the current speed of technological progress
- consider ethical and moral issues
- participate in a forward-thinking class project

4.Course Schedule

The first ten weeks of the class alternate between "online" and then face-to-face "workshop" style. Students should bring their "open mind" to the workshops, and be prepared to actively participate. The final weeks in December and January are online classes and project work.

It is important to attend this class from Week#1. Students joining late are required to email the instructor to explain their situation.

Class Policy: Through learning, students are encouraged to build a deeper understanding of the world, to look for relationships and patterns of connection, and to strive to find their own "voice" that may help them succeed in their personal and professional lives.

The following are outlined in more detail on the class pages:

- We try our best
- We challenge the new world
- We trust each other
- We are a team
- We learn from mistakes
- We declare our sources

Go to the next page

AI Policy: This class assume that students will use AI tools. Some assignments may require it. Understanding and skilful use of things like ChatGPT is important, and the class will provide instruction and pointers. For example, "prompt engineering" is the practice of refining your prompts in order to get good outcomes. You will need to experiment.

Be careful when using LLMs:
- Don't trust any output. AI tools work best in conjunction with your own understanding. RLHF and other language agents can "hallucinate", so assume numbers, facts, or programs are wrong unless you either know the answer or can check. You are responsible for any errors or omissions.
- Declare. For assignments where you use AI, you must describe what you did, and the prompts you used. Sharing ideas, results, and experiences helps us to learn as a community. Failure to declare is a violation of academic honesty policies.

5.Prior/Post Assignment
Prepare by reading and watching videos about research in intelligent systems, and becoming attuned to future trends.
Follow-up by reading and watching videos about research in intelligent systems, and becoming attuned to future trends.

6.Assessment
Individual homeworks, such as writing reviews of specific videos, and submitting at least one news article each month. There is also a final project related to video creation (probably, making Japanese subtitles for an existing video). To get attendance credit, students need to submit Popup and Feedback Form each class. There is no graded exam (one question we sometimes examine in the course is 'Can intelligence be measured by a test?')

7.Textbooks
There are no particular course textbooks. There may be reading assignments modified to meet the interests of the students.

8.Language of Instruction
Japanese for spoken class content. Class web pages and other materials usually based on English. Student comments in live chat are also expected to be in English, but other written student feedback can be in English or Japanese.

9.Requirements for registration
None

10.Note
This course will have significant video content, both original and "curated". Students watch videos and share their reviews within the class. Communication is promoted with "Popup" comments that encourage students to share their ideas on each week's them

An Introduction to Intelligent Systems Programming(知能ｼｽﾃﾑﾌﾟﾛｸﾞﾗﾐﾝｸﾞ通論)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	KATO Koji

1.Course Outline

In the research, it is important to verifying the methods as well as theoretical learning.
Therefore, in this lecture, students program several kinds of basic machine learning methods and verify the differences of those methods.

2.Keywords

Programming, Machine learning, Presentation

3.Course Objectives

This lecture introduces the programming methods using machine learning.

4.Course Schedule

This course make use of following methods.
1. Support vector machine
2. IoT devices or Deep Learning
Finally an applied problem using these methods.

5.Prior/Post Assignment

Pre-learning is not necessary. However you must read related papers and consider how to realize the learning contents.

6.Assessment

Attendances and Reports.

7.Textbooks

8.Language of Instruction

Basically use Japanese language. Some documents may use English.

9.Requirements for registration

Programming language is not specified. However it is necessary to have at least a basic knowledge of C language and Java language.

10.Note

None

Advanced Topics in Adaptive Systems(適応システム特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	MIKAMI Sadayoshi TAKAGI Seiji

1.Course Outline

To make a robot or an autonomous software/hardware agent, it is essential to have a functionality that responds properly to its environment.
This lecture introduces some basic methods of optimization from two different viewpoints.
One is a class of Bio-Inspired Computing methods, which solves optimisation and adaptation by the interaction of massive elements through underlying simple dynamics (part I).
The other is a class of feedback control methods (modern control systems), which calculates feasible control values by using a model of control target (part II).

2.Keywords

Ant Colony Optimisation, Bio Inspired Computation, Particle swarm optimization, Modern control systems, State feedback, Observer

3.Course Objectives

This lecture aims at understanding the basics of adaptive systes.
By this lecture, students will be able to choose appropriate adaptive methods to a given problem.
The methods includes Bio-Inspired Computing and state feedback methods.

4.Course Schedule

1: A short guidance
Part-I
2: System dynamics and differential equations
3: Environmental adaptation system of microorganisms
4: Synchronization, entrainment and movement of swarm
5: BOID, Particle Swarm Optimization (PSO)
6: Amoeboid algorithm for network optimization
7: Ant Colony Optimization (AOC)
Part-II
8: Overview of the control systems
9: Modelling dynamical systems
10: (Workshop) Maglev system assemble
11: Basics of state feedback
12-13: State feedback with observer
14-15: Various state space models and their stabilities

5.Prior/Post Assignment

Prior: Read the handout of the next lecture posted on the HOPE.
Posterior: Read the handout of the lecture to develop an understanding.

6.Assessment

Final report (Part-I, 50%, Part-II, 50%).

7.Textbooks

(Part-I, reference) Biologically Inspired Optimization Methods, Mattias Wahde, WIT Press, 2009.
(Part-II, reference) Modern Control Systems, Richard Dorf and Robert Bishop, ISBN-13 : 978-0134407623 (about 800 pages)

8.Language of Instruction

Lecture materials in English and Japanese and Oral Explanation in Japanese

9.Requirements for registration

Bring your PC that is accessible to HOPE system. Students may be required to install Scilab/Xcos control simulation software in their PCs.

10.Note

None

Advanced Topics in Autonomous System 1(自律システム特論I)

Grade	M1,2
Semester	Spring
Credits	2
Instructor	YAMAUCHI Sho

1.Course Outline

This lecture covers various theories of agent and multiagent systems. Agent is an intelligent and autonomous entity, and multiagent systems consists of multiple agents. These theories include practical reasoning, interaction among agents, design methodology, and applications.

2.Keywords

Agent, multiagent, practical reasoning, communication, reactive agent, collaboration.

3.Course Objectives

Several well known agent and multiagent theories and systems are introduced. Also,
we discuss design of agent systems and application of agent systems.

4.Course Schedule

1. Introduction
2. Intelligent agents
3. Agent oriented programming
4. Multi-agent system
5-6. Practical agent programming
7-8. Multi-agent interaction
9-10. Reaching agreements
11-12. Communication
13. Experiment and evaluation with agent simulation
14-15. Presentation

5.Prior/Post Assignment

Prior: The main points of each lecture will be published in advance on the website of the lecture, so each student will prepare for the lecture using the website.

Post: Each student is assigned a task concerning the important items to be dealt with in the lecture, so they review and confirm the contents of the lecture by tackling the task, and they also learn in an advanced way.

6.Assessment

Assessment will be done based on presentation and programming assignment.

7.Textbooks

8.Language of Instruction

Japanese and English

9.Requirements for registration

A basic knowledge of "Algorithms and Data Structures" is desirable.

10.Note

None

Advanced Topics in Autonomous System 2(自律システム特論II)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	SUMI Yasuyuki SUZUKI Sho'ji

1.Course Outline

For realizing autonomous intelligent systems, it is indispensable to understand and utilize the theory and method to select appropriate behaviors according to self/environmental situation.
This course focuses on location estimation (localization) by robot and human activity estimation.
Topics include robot navigation, Kalman filter, activity recognition by accelerometer data, situation estimation of human sorial interactions, and so on.

2.Keywords

robot, localization, Kalman filter, multimodal data, situation understanding

3.Course Objectives

The aim of this course is to provide the fundamental knowledge for realizing autonomous and intelligent systems.

4.Course Schedule

1. Introduction

2-8. Localization of the robot
- Navigation Technology
- Localization by Sensing
- Kalman Filter

9-15. Human behavior understanding
- Estimation of Human Behavior by Multimodal Sensed Data
- Estimation of Social Intraction of Human
- Conversational Analysis by Nonverbal Behaviors

5.Prior/Post Assignment

Prior: Prepare the contents designated in each class.
Post: Review after the class.

6.Assessment

We evaluate based on homework reports and in-class practice.

7.Textbooks

8.Language of Instruction

Lecture materials in English and Japanese, Oral Explanation in Japanese and English

9.Requirements for registration

None

10.Note

None

Advanced Topics in Intelligent Media(知能ﾒﾃﾞｨｱ特論)

Grade	M1,2
Semester	Fall
Credits	2
Instructor	KANO Takeshi

1.Course Outline

We often feel 'intelligence' in various phenomena existing in the natural world and artificial entities such as robots.

Where is the source of this intelligence? What is the medium that generates intelligence?

In this lecture, insights into concepts such as 'understanding,' 'perspective,' 'mathematical modeling,' 'reverse control theory,' and others will be discussed.

While introducing examples of systems that evoke a sense of intelligence, we will engage in a discussion about the source of intelligence.

The lecture is conducted by an instructor with practical experience in the engineering application of intelligent behavior in living organisms, drawing on insights gained through his previous researches and discussions with his collaborative researchers.

2.Keywords

Intelligence, Perspective, Mathematical modeling, Reverse control theory

3.Course Objectives

・Students will learn the perspective that "the medium that generates intelligence is the environment."

・Through deep reflection by students and discussions between instructors and students, students will gain a convincing understanding of the source of intelligence.

4.Course Schedule

Session 1: Introduction

Session 2: What does “understanding” mean? Perspectives and mathematical models

Sessions 3-4: Physical perspective: Mathematical aspects of self-organization

Sessions 5-7: Control perspective: Forward control, reverse control, yin-yang control

Session 8: The source of intelligence demonstrated by a centipede robot

Sessions 9-13: Autonomous decentralized control and swarm intelligence

Sessions 14-15: Discussion and conclusion

5.Prior/Post Assignment

Prior: Read the textbook in accordance with the progress of the class.

Post: Organize your thoughts based on the lecture content and describe them in the assignment report.

6.Assessment

I will comprehensively evaluate the attendance attitude in the lecture and the submission status and content of assignment reports. The specific proportions of these factors will be announced during the lecture.

7.Textbooks

Koichi Osuka,Where Does Intelligence Come From? - Search for the 'Hidden Brain" with Centipede Robot - Lecture materials will be distributed during the class.

8.Language of Instruction

Lecture materials will be provided in both Japanese and English (if there is a preference for English), and oral explanations will be conducted in Japanese.

9.Requirements for registration

None

10.Note

None

Project Study 1(課題研究I)

Grade	M1
Semester	Spring, Fall
Credits	2
Instructor	Superviser Head of Graduate School

1.Course Outline

Students mainly work on practical research promotion process, acquire research methodology and research techniques, and study basic theory and skills required to achieve the research for the master's thesis.
In Project Study 1, it aims at acquiring basic theory and skills.
First, students set the contents to study and goal for half year, and set appropriate studying materials and topics.
Students present the studied contents from time to time in the classes, write comprehensive report in the end of the semester, and give presentation.

2.Keywords

Information Architecture, Media Design, Complex Science, Intelligence Science, literature Survey, Case Study

3.Course Objectives

The aims of the course are that students experience practical research promotion process and acquire research methodology, research techniques, basic theory and skills.

4.Course Schedule

Study and research plan are made after consulting with advisors.

5.Prior/Post Assignment

Prior Assignment: We'll conduct literature surveys of relevant fields.
Post Assignment: We'll set up research tasks.

6.Assessment

Grades are based on performance, presentation, and report.

7.Textbooks

References are decided after consulting with advisors.

8.Language of Instruction

The language of the instruction depends on the professor.

9.Requirements for registration

Special Research students are not allowed to take this course.

10.Note

None

Project Study 2(課題研究II)

Grade	M1
Semester	Spring, Fall
Credits	2
Instructor	Superviser Head of Graduate School

1.Course Outline

In Project Study 2, students develop the contents achieved in the Project Study 1, set study theme which is closer to the research theme for master's thesis, investigate related research fields, investigate research promotion process with conducting case-study.
Students write the report about the studied contents in the end of the semester, and give presentation

2.Keywords

Information Architecture, Media Design, Complex Science, Intelligence Science, literature Survey, Case Study

3.Course Objectives

The aims of the course are that students experience practical research promotion process and acquire research methodology, research techniques, basic theory and skills.

4.Course Schedule

Study and research plan are made after consulting with advisors.

5.Prior/Post Assignment

Prior Assignment: We'll also conduct case studies as well as literature surveys on relevant fields.
Post Assignment: We'll plan the research promotion procedure.

6.Assessment

Grades are based on performance, presentation, and report.

7.Textbooks

References are decided after consulting with advisors.

8.Language of Instruction

The language of the instruction depends on the professor.

9.Requirements for registration

Special Research students are not allowed to take this course.

10.Note

None

Project Study 3(課題研究III)

Grade	M2
Semester	Spring, Fall
Credits	2
Instructor	Superviser Head of Graduate School

1.Course Outline
In Project 3, students investigate, develop, construct the research themes continuing from Project Study 2, write the report about the research themes and give presentation about the research result.

2.Keywords
Information Architecture, Media Design, Complex Science, Intelligence Science, literature Survey, Case Study

3.Course Objectives
The aims of the course are that students experience practical research promotion process and acquire research methodology, research techniques, basic theory and skills.

4.Course Schedule
Study and research plan are made after consulting with advisors.

5.Prior/Post Assignment
Prior Assignment: We'll prepare for the report and presentation on research contents.
Post Assignment: We'll consideration the results of the research.

6.Assessment
Grades are based on performance, presentation, and report.

7.Textbooks
References are decided after consulting with advisors.

8.Language of Instruction
The language of the instruction depends on the professor.

9.Requirements for registration
Special Research students are not allowed to take this course.

10.Note
None

System Information Science Research(システム情報科学研究)

Grade	M1,2
Semester	All
Credits	4
Instructor	Superviser Head of Graduate School

1.Course Outline

Students set their own research themes from the wide-ranging areas of Systems Information Science, conduct research under the direction of advisors, write master's thesis, and give presentation.
They acquire skills to extract problems to study, make research process, describe the research results with sentences, and give presentation through the research experience.

2.Keywords

Science of complex systems, information science, science of design, and cognitive science

3.Course Objectives

The course improves the capability as engineers and researchers through the research.

4.Course Schedule

Research plan are made after consulting with advisors.
Submission of research plan, participation in interim presentation session, and submission of master's thesis are required.

5.Prior/Post Assignment

6.Assessment

Grades are based on screening master's thesis or specific theme according to the school rules.

7.Textbooks

8.Language of Instruction

The language that a supervisor ordered.

9.Requirements for registration

Special Research students are not allowed to take this course.

10.Note

None

Special Seminar(特別ゼミナール)

Grade	D
Semester	Spring, Fall
Credits	
Instructor	Superviser Head of Graduate School

1.Course Outline

This course aims at developing specialized knowledge and research methodology to pursue the student's research in Systems Information Science.
It will be achieved by investigating related areas, learning the methodologies of related areas, observing real-world problems, and self-development by resolving these problems.

2.Keywords

Systems Information Science, Creation of New Results, Doctoral Thesis

3.Course Objectives

1.Students will be able to systematically understand the field of Systems Information Science, contribute to the development of academia and industries, and develop specialized knowledge and research methodology that contain open-minded advanced academic achievements for creating new results.
2.Students will be able to pursue new principles and new methods. They will be able to write a doctoral thesis through the research processes including research theme setting, research plan making, research evaluation, presentations in academic conferences, and paper writings.

4.Course Schedule

The first-fifteenth session: Discussion with the advisor. The number of times will vary by the instructions given by the advisor.

5.Prior/Post Assignment

Prior: Prepare reports of research progress, research survey, and experimental results. Make the necessary preparations for the meeting with the advisor.
Post: Conduct research, considerations, experiments, etc. on the content of the guidance received from the advisor, and proceed with the research for the doctoral dissertation.

6.Assessment

Not applicable

7.Textbooks

Follow the instructions of the advisor.

8.Language of Instruction

The language specified by the advisor

9.Requirements for registration

None

10.Note

An interim report on doctoral research (public on campus) is conducted at the end of each semester as a result of the special seminar.

Systems Information Science Special Research(システム情報科学特別研究)

Grade	D
Semester	Spring, Fall
Credits	
Instructor	Superviser Head of Graduate School

1.Course Outline
Students will write their doctoral thesis through research process such as research theme setting, research plan, research evaluation, research presentation at academic conferences, preparation of research papers etc., with the aim of pursuing new principles and new methods under the research guidance of academic advisors. In addition, they cultivate their abilities as advanced engineers and researchers.

2.Keywords
It depends on students.

3.Course Objectives
Students will proactively conduct their research and prepare their doctoral thesis, thereby acquiring independent research capabilities under the guidance of academic advisors.

4.Course Schedule
Develop a research plan in consultation with the advisor.

5.Prior/Post Assignment
Study according to their own research plan.

6.Assessment
Grades are evaluated by interim presentation, preliminary doctoral thesis examination, and final examination.

7.Textbooks
None

8.Language of Instruction
The language specified by the advisor

9.Requirements for registration
None

10.Note
None

Appendix: Dividend Year, Credits and Instruction Language of Class

Program		Category		Subject Names	Dividend Years	Semester	Credits		Instruction Language	
							Compulsory	Elective	Oral	Handout
Program	Master's Program	Specialized Subjects	Common subjects for graduate school	Academic Literacy in Context 1	1	Spring	(2)		J	J
				Academic Literacy in Context 2	1	Fall	(2)		E	E
				Introduction to Basics of Systems Information Science	1,2	Spring/Fall		*	-	-
				Experimental Design and Data Analysis	1,2	Spring		2	JE	JE
				Internship 1	1,2	Spring/Fall		2	-	-
				Internship 2	1,2	Spring/Fall		1,2	-	-
				Overseas Course Program	1,2	Spring/Fall		1,2	-	-
			Media Architecture Field	Advanced ICT Design	1,2	Spring		2	J	J
				Advanced Topics of Information Network 1	1,2	Fall		2	J	J
				Advanced Topics of Information Network 2	1,2	Spring		2	JE	JE
				Advanced Topics in Data Science	1,2	Spring		2	JE	JE
				Advanced Topics in Information Environmentology	1,2	Spring		2	J	J
				Advanced Topics in Media Information Studies	1,2	Fall		2	J	J
				Advanced Topics in Field Information Studies	1,2	Spring		2	J	J
				Introduction to the Science of the Artificial	1,2	Fall		2	JE	JE
			Advanced ICT Field	Advanced ICT Design	1,2	Spring		2	J	J
				Advanced Topics of Embedded Systems	1,2	Fall		2	J	J
				Advanced Open Technologies	1,2	Fall		2	J	J
				Advanced Topics in IT Architecture	1,2	Fall		2	J	J
				Advanced Topics in Service Management	1,2	Fall		2	J	J
			Media Design Field	Introduction to Information Design	1,2	Fall		2	J	J
				Introduction to Cognitive System	1,2	Spring		2	JE	JE
				Introduction to Interactive Systems	1,2	Spring		2	JE	JE
				Field Research Methods for Design Work	1,2	Spring		2	J	J
				Special Topics of Information Design 1	1,2	Fall		2	J	J
				Special Topics of Information Design 2	1,2	Spring		2	J	J
				Special Topics of Cognitive System 1	1,2	Spring		2	J	E
				Special Topics of Cognitive System 2	1,2	Fall		2	J	J
				Special Topics of Interactive Systems 1	1,2	Fall		2	JE	JE
				Special Topics of Interactive Systems 2	1,2	Fall		2	JE	JE
			Complex Information Science Field	Advanced Topics in Information Mathematics	1,2	Spring		2	J	J
				Advanced Topics in Nonlinear Mathematics	1,2	Spring		2	E	E
				Advanced Topics in System Mathematics	1,2	Spring		2	J	JE
				Advanced Topics in Data Science	1,2	Spring		2	JE	JE
				Advanced Topics in Mathematical Analysis	1,2	Fall		2	J	J
				Advanced Topics in Applied Complex Systems	1,2	Fall		2	J	J
				Advanced Topics in Complex Systems	1,2	Spring		2	JE	JE
			Intellectual Information Science Field	An Introduction to Intelligent Information Science	1,2	Spring		2	J	JE
				History and Future of Intelligent Systems	1,2	Fall		2	J	E
				An Introduction to Intelligent Systems Programming	1,2	Spring		2	J	JE
				Advanced Topics in Adaptive System	1,2	Fall		2	J	JE
				Advanced Topics in Autonomous System 1	1,2	Spring		2	JE	JE
				Advanced Topics in Autonomous System 2	1,2	Fall		2	JE	JE
				Advanced Topics in Intelligent Media	1,2	Fall		2	J	JE
		Research Guidance Subjects		Project Study 1	1	Spring/Fall	2		-	-
				Project Study 2	1	Spring/Fall	2		-	-
				Project Study 3	2	Spring/Fall	2		-	-
				System Information Science Research	1,2	All	4		-	-
	Doctoral Program	Specialized Subjects		Internship 2	1,2,3	Spring/Fall		1,2	-	-
				Overseas Course Program	1,2,3	Spring/Fall		1,2	-	-
		Research Guidance Subjects		Special Seminar	1-3	All			-	-
				Research on Systems Information Science	1-3	All			-	-

Notes

- Completion requirements: For master course students, acquire 30+ credits (20+ credits for specialized subjects and 10+ credits for research guidance subjects) and pass thesis examination.

- Mandatory subjects: Students must acquire 2+ credits of parenthesized subjects, "Academic Literacy in Context I" and "Academic Literacy in Context II."

-Surroage project: Students may be allowed to complete the program, after their research outcome is reviewed and considered it appropriate to the purpose of their master's study.

- Instruction language: J: Japanese only, E: English only, and JE: For details, see the instruction language section of the syllabus.

- The number of credits for "Introduction to Basics of System Information Science" marked * conforms to the number of credits of the courses to take.