2026-2027 Syllabus

Future University Hakodate
Graduate School of
Systems Information Science

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

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List of Courses -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		0*	-	-
				Experimental Design and Data Analysis	1,2	Fall		2	J	J
				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	J	E
				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	3Q		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	3Q		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	4Q		2	J	J
				Special Topics of Information Design 2	1,2	2Q		2	J	J
				Special Topics of Cognitive System 1	1,2	2Q		2	J	J
				Special Topics of Cognitive System 2	1,2	3Q		2	J	JE
				Special Topics of Interactive Systems 1	1,2	4Q		2	J	J
				Special Topics of Interactive Systems 2	1,2	4Q		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	JE	JE
				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	JE	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	J	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. (Applicable only to students who enrolled in or before AY 2025.)

- For Doctoral Program, students must complete at least 12 credits (including 12 credits from Research Guidance Subjects) and pass both the thesis examination and the final examination. Students who enrolled in or before AY 2025 must pass both the thesis examination and the final examination.

- The number of credits for research supervision courses marked with an asterisk (※) is as follows:
  Students who enrolled in or before AY 2025: 0 credits
  Students who enrolled in or after AY 2026: 6 credits each

Academic Literacy in Context I

Grade	M1,2
Semester	Spring
Credits	2
Instructor	NAMBU Misako
Alignment with Diploma Policy	DP2,DP4

1. Course Outline

This course develops the academic literacy required for writing conference papers and a master's thesis. Students learn how to search for and manage literature, read research papers effectively, organize key points, and write academic texts. The course also covers basic research ethics. Each class includes lectures, individual work, group work, and peer review. Practical instruction will be provided with concrete examples based on the instructor's research experience.

2. Keywords

literature search and management, skimming and close reading, summarizing and key-point extraction, citation and referencing, peer review, academic writing skills, research ethics

3. Course Objectives

By the end of the course, students will be able to:

1. read a paper in their own field, extract necessary information, and cite it appropriately.
2. explain their own research clearly in writing.
3. read and comment appropriately on each other's writing.
4. understand the basics of research ethics and apply them in research settings.

4. Course Schedule

Over the course of 15 classes, students will learn literature search and management, reading research papers, summarizing key points, citation and referencing, academic writing, peer review, and research ethics. Each class includes lectures, individual work, group work, and peer review.

5. Prior/Post Assignment

Prior assignment: Students should prepare for peer review by reading the materials posted on HOPE.
Post assignment: Students are required to complete and submit individual work, report assignments, and quizzes by the deadlines.

6. Assessment

Report assignments: 60%
Individual work: 30%
Quizzes: 10%

7. Textbooks

Handouts and materials will be provided in each class.

8. Language of Instruction

Japanese

9. Requirements for registration

None

Academic Literacy in Context II

Grade	M1,2
Semester	Fall
Credits	2
Instructor	RIVERS Damian

1. Course Outline

Effective communication is a core competency for graduate students, particularly in the context of presenting research and producing academic papers. This course is designed for students in the field of Systems Information Science and supports literacy development in two major areas: research presentations and academic writing. Students will learn how to design and deliver well-structured academic presentations using clear logic and appropriate academic language, while also developing the ability to respond effectively to audience questions. In parallel, students will strengthen their academic writing skills through the process of producing a coherent research report, including literature integration, argument development, and revision practices aligned with IEEE standards. Learning methods in this course include guided instruction, example-based modeling, iterative drafting and revision, peer review, and reflective learning activities. The course places strong emphasis on research ethics and social responsibility, encouraging students to reflect on the broader implications of academic work. Learning activities and feedback are conducted primarily through the HOPE platform, enabling iterative improvement through instructor guidance. The instructor is qualified with a PhD and over 20 years of university research and publication experience, and provides structured guidance grounded in academic standards and practical experience. By the end of the course, students will be better equipped to communicate research effectively across academic formats and contexts using English as the language of communication.

2. Keywords

Academic Communication, Academic Writing (Scholarly Writing), Discussion and Engagement, Research Ethics, Research Presentation Skills

Alignment with Diploma Policy: DP2,DP4

3. Course Objectives

Goal 1 (Research Presentation): Students will be able to design and deliver a research presentation that clearly communicates research content based on logical structure and appropriate academic English expression. Students will also be able to accurately interpret the intent of audience questions during the Q&A session and respond appropriately by providing relevant evidence and reasoning.
Goal 2 (Academic Writing): Students will be able to critically organize and synthesize prior research and construct an academic argument with a clear relationship among claims, evidence, and conclusions. In addition, students will be able to produce a coherent research report in accordance with academic conventions (e.g., IEEE style) and engage in multiple rounds of revision and improvement based on peer review and instructor feedback.

4. Course Schedule

Weeks 1–5: Academic Research Presentation
Designing and delivering well-structured academic presentations (purpose, structure, flow)
Clarity and logical organization of research content
Academic English expression, audience engagement, and effective Q&A strategies
Visual design for academic slides (figures, tables, readability) and appropriate source attribution

Weeks 6–10: Academic Research Report (IEEE Style)
Research report structure and coherence; introduction to IEEE-style academic conventions
Developing and integrating a literature review (synthesis, citation practices)
Constructing a logical academic argument (claims, evidence, reasoning)
Academic tone and technical writing accuracy; improvement through peer review and instructor feedback (via HOPE)

Weeks 11–13: Revision and Refinement
Identifying strengths and weaknesses in academic writing and presentations
Iterative revision for clarity, coherence, accuracy, and academic quality
Incorporating feedback strategically (peer + instructor) and strengthening overall argumentation

Weeks 14–15: Final Outputs
Final academic research presentation
Final submission of the research report (IEEE-compliant format)

5. Prior/Post Assignment

Complete required preparation tasks via HOPE

Apply acquired information toward satisfying course objectives

6. Assessment

Goal 1 (50%: Research Presentation): Assessment will be based on the overall quality of the presentation, including logical organization and appropriateness of content, clarity and academic delivery (including effective use of English), the design and effective use of visual materials (e.g., slides), and accuracy and effectiveness of comprehension and responses during the Q&A session.

Goal 2 (50%: Academic Writing): Assessment will be based on the overall quality of the research report, including structure and coherence, integration of prior research and logical development of the argument, appropriate use of academic conventions (style, citations, reference formatting, including IEEE compliance), and the quality of revision and improvement based on peer review and instructor feedback.

7. Textbooks

Distributed via HOPE

8. Language of Instruction

English

Introduction to Basics of System Information Science

Grade	M1,2
Semester	Spring / Fall
Credits	0
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP3

1. Course Outline

Depends on undergraduate courses to take. This course is supplementary lessons to acquire expert knowledges.

2. Keywords

System 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

The course should be selected from specialized subjects of the Dept. of Media Architecture and the Dept. of Complex and Intelligent Systems except Virtural English Program, Enteprise Intership, System Information Science Practice, and Graduation Study.
Select the cource carefully according to your supervisor's instructions.

10. Note

Students enrolled before 2025 will receive credits for this course equivalent to the credits for the undergraduate course they take.
Students enrolled in 2026 or later cannot earn credits for this course.

Experimental Design and Data Analysis

Grade	M1,2
Semester	Fall
Credits	2
Instructor	TSUJI Yoshihito
Alignment with Diploma Policy	DP1,DP4

1. Course Outline

This course aims to develop a practical understanding of fundamental statistical methods and to cultivate statistical literacy through hands-on research experience.

Although graduate students are expected to have prior experience with quantitative data analysis, many have limited experience in formulating hypotheses, designing experiments, collecting data, and conducting analyses in a coherent research framework.

Based on the framework of classical statistical methods in hypothesis-testing research, this course provides an integrated experience from experimental design to data interpretation.

The course focuses on descriptive statistics, group comparisons (e.g., t-tests and ANOVA), and regression analysis. Rather than emphasizing advanced mathematical proofs or cutting-edge techniques, the course prioritizes the logical structure of hypothesis testing, appropriate interpretation of statistical output, and responsible use of statistical methods.

Students will design and conduct a small-scale experiment or survey, analyze the collected data, and prepare a research report. The course aims to foster both technical competence and ethical awareness in the use of statistical analysis.

2. Keywords

Experimental design, Hypothesis testing, Descriptive statistics, Group comparison, Regression analysis, Statistical literacy, Research ethics

3. Course Objectives

By the end of this course, students will be able to:

1. Formulate clear research hypotheses and appropriately define independent and dependent variables.
2. Design experiments or surveys suitable for specific research objectives.
3. Select and conduct appropriate statistical analyses, including descriptive statistics, group comparisons, and regression analysis.
4. Interpret statistical output (e.g., effect sizes, regression coefficients, confidence intervals) appropriately.
5. Critically evaluate results regardless of statistical significance.
6. Communicate research findings in a logical and academically appropriate manner.

4. Course Schedule

Session 1: Orientation
Sessions 2–3: Descriptive Statistics(Central tendency, distributions, standardization, treatment of outliers)
Sessions 4–5: Group Comparisons(t-tests, analysis of variance (ANOVA), effect sizes, interaction effects)
Sessions 6–7: Regression Analysis(Correlation, simple and multiple regression, multicollinearity, model interpretation)
Session 8: Midterm Examination
Sessions 9–10: Scales and Structure(Factor analysis and principal component analysis)
Sessions 11–12: Data Classification(Cluster analysis)
Sessions 13–14: Research Design Development and Practice
Session 15: Final Examination

Note:
The course schedule may be adjusted based on students' level of understanding and course needs.

5. Assessment

Grades will be based on the following components:
Weekly mini-reports (40%)
Midterm examination (30%)
Final examination (30%)

Weekly mini-reports emphasize continuous engagement and reflection on research design and statistical interpretation.

The midterm examination will require students to analyze a given dataset and interpret the results within a hypothetical research scenario.
The final examination will consist of a research project in which students design a study, collect data, conduct statistical analyses, and submit a written report.

6. Textbooks

Tomokazu Haebara (南風原朝和) (2002). Foundations of Psychological Statistics: Toward an Integrated Understanding. Yuhikaku Alma. ISBN 4-641-12160-5.

Although this textbook is written for psychology students, it provides a systematic explanation of classical statistical methods that form the theoretical foundation of hypothesis-testing research. It serves as the theoretical basis for the statistical concepts addressed in this course.

7. Language of Instruction

Japanese

8. Note

In conducting statistical analyses, students will use statistical software packages such as R, SPSS, and JASP.

Internship 1

Grade	M1,2
Semester	Spring/Fall
Credits	2
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP3,DP4

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 evaluates 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 Dean of the Graduate School.

Internship 2

Grade	M1,2
Semester	Spring/Fall
Credits	1,2
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP3,DP4

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. Language of Instruction

Depends on the plan.

8. 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.

9. 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

Grade	M1,2
Semester	Spring/Fall
Credits	1,2
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. Course Objectives

Depends on the course to take.

3. Course Schedule

Depends on the course to take.

4. Prior/Post Assignment

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

5. 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.

6. Language of Instruction

Depends on the plan.

Alignment with Diploma Policy	DP1,DP2

7. 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.

Advanced ICT Design

Grade	M1,2
Semester	Spring
Credits	2
Instructor	ITO Kei
Alignment with Diploma Policy	DP1,DP2,DP4

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

Advanced Topics of Information Network 1

Grade	M1,2
Semester	Fall
Credits	2
Instructor	INAMURA Hiroshi
Alignment with Diploma Policy	DP1,DP2

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. In this course, several faculty members, including those with practical experience in the development and standardization of Internet protocols, jointly design the course and create lecture materials based on their knowledge and insight into network technology.

2. Keywords

Computer Network, Network design, Mobile Network

3. Course Objectives

Students are expected to acquire the following:
1. Ability to understand and discuss fundamental technologies for constructing computer networks, particularly for various advanced topics in such as the next-generation Internet technologies.
2. Ability to read the research papers and discuss on the advanced topics in computer networks.

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 will be evaluated comprehensively based on presentations summarizing research in the field of networks and participation in discussions (~80%), submitted reports (~20%). (Evaluation targets 1 and 2).

7. Textbooks

The materials are specified in the course.

8. Language of Instruction

In Japanese.

9. Requirements for registration

None

Advanced Topics of Information Network 2

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

Computer networks, optical network design, optical network protection, wireless networks, network security

3. Course Objectives

1. To learn the basic technologies, design principles and network protection for optical networks.
2. To learn some advanced topics of wireless networks and network security.

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

Alignment with Diploma Policy: DP1

5. Prior/Post Assignment

Prior: Read the distributed materials.
Post: Complete the assignments given in the lecture.

6. Assessment

Attitude for lecture and Lecture Reports (Achievement objectives 1,2 to be evaluated)
Details will be announced in lecture.

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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SATO Naoyuki
Alignment with Diploma Policy	DP1,DP3

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

1. This course introduces data store, data analysis, and data processing for understanding of basic theory of information science.
2. 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 (Goal 1, 2 to be evaluated).

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.

Advanced Topics in Information Environmentology

Grade	M1,2
Semester	Spring
Credits	2
Instructor	TSUKADA Koji
Alignment with Diploma Policy	DP1,DP2

1. Course Outline

Recently, computers and information technology have become “ubiquitous” in the daily environment, such as smartphones and IoT (internet of things). This course focuses on such new information environments, and introduces fundamental technology and applications through recent research projects.

2. Keywords

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

3. Course Objectives

1. Understanding fundamental technology and application of information environment through various research and projects.
2. Understanding advanced technology of information environment through latest international conferences.

4. Course Schedule

1. Orientation
2. Overview of International Conferences/Journals
3-5. Research Examples in Ubiquitous Computing/Human-Computer Interaction, etc.
6-7. Presentation 1 (e.g., Survey Presentation on Familiar Research)
8-12. Research Examples: Location-Based Technology / Navigation Technology / Traffic Information Systems / Smart Cities, etc.
13-15. Presentation 2 (e.g., Presentation on Survey of Cutting-Edge Research)

*Note: Lecture schedules may change because of the professors' schedules.

5. Prior/Post Assignment

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

6. Assessment

Presentation, Report, Attendance attitude. The details 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.

Advanced Topics in Media Information Studies

Grade	M1,2
Semester	Fall
Credits	2
Instructor	TERASAWA Kengo
Alignment with Diploma Policy	DP1

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, Deep Learning.

3. Course Objectives

In this course, students will learn the fundamental principles and practical applications of multimedia information processing techniques, with a focus on image-based methods, for designing intelligent and interactive information systems. The specific learning objectives are as follows:

1. Develop the ability to process image data according to its intended application.
2. Understand the concept of feature extraction from unstructured data.
3. Comprehend the principles of image recognition and gain an understanding of image recognition methods utilizing machine learning and deep learning.
4. Acquire the skills to develop software that implements basic image recognition algorithms as well as machine learning- and deep learning-based image recognition techniques.

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

The evaluation will be based on the minor assignment (report) (50 points) and the final assignment (program + report) (50 points) (objectives 1-4).

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

Undergraduate level knowledge of image engineering and basic programming is desirable.

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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	ISHIGURE Yasuo
Alignment with Diploma Policy	DP1,DP3

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.

Students major in school of systems information science and will acquire the basic knowledge necessary to solve various social issues in the future through the lectures that utilize the practical experience of faculty members, presentations of the latest trends by external lecturers, and report assignments, which will enable them to gain the ability to grasp the current situation and issues in individual fields. Faculty members have practical experience in private companies, mainly in the fields of smart fisheries and digital health.

2. Keywords

Filed informatics, Big data, SDGs, Well-being

3. Course Objectives

1. Understand what field informatics is, and examples of problem-solving practices and social implementation in the real world.
2. Learn the concept and process for solving problems in systems informatics.

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

Every week, read through the materials on the lecture site and spend the equivalent of the lecture time to keep up with trends in the field. / Each week, you will be required to spend the equivalent of the lecture time working on the assignments listed on the lecture site.

6. Assessment

Evaluation will be based on reports and presentations.

7. Language of Instruction

Japanese Only

8. Requirements for registration

Understand the basic structure of information systems.

Introduction to the Sciences of the Artificial

Grade	M1,2
Semester	3Q
Credits	2
Instructor	NAKAKOJI Kumiyo
Alignment with Diploma Policy	DP1,DP2,DP4

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

1. Students will develop the basic understanding of the nature of design and the cognitive and social characteristics of human beings.
2. Students will learn the methods applied, processes managed, and phenomena observed while engaging in design.
3. Students will acquire the vocabulary to express the above and communicate with others about them.

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 (course objectives: 1, 2 and 3)
- theme essays/compositions assigned during lectures: 40 points (course objectives: 1, 2 and 3)
- term paper in the end of the course: 45 points (course objectives: 1, 2 and 3)

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.

Advanced Topics of Embedded Systems

Grade	M1,2
Semester	Fall
Credits	2
Instructor	NAGASAKI Takeshi
Alignment with Diploma Policy	DP1,DP3,DP4

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 embedded developers 9 lessons

A) Practicing modeling development 2 lessons

B) Product lifecycle 1 lesson

C) Introducing examples of each area; 6 lessons

- Automobile related example
- Industrial Equipment example
- Consumer equipment example

(2) Practicing embedded systems by Lego Mindstorms EV3 6 lessons

A) Introducing real-time OS, which we will use in the course, and its sample programs. 2 lesson

B) Practicing real-time processing and its programming / 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

Advanced Open Technologies

Grade	M1,2
Semester	Fall
Credits	2
Instructor	OKUNO Taku
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

1. Course Outline

Recent enterprise information systems are constituted by heterogeneous systems composed of numerous computers, ranging from tightly coupled systems within organizations to loosely coupled systems over the Internet—that is, open systems. In the uppermost phase of system development, which plays a critical role in project success, information engineers are required to understand business strategies and collaboratively realize them through the effective use of information systems with various stakeholders. Therefore, it is essential for practitioners to understand the characteristics of the constituent and standard technologies of open systems, as well as the actual practices of information system utilization in enterprises.
This course introduces the constituent technologies of open systems and real-world examples of enterprise businesses that utilize information technologies and systems. Engineers from industry are invited as guest lecturers to provide practical, experience-based instruction.
The instructor has professional experience in system development within industry. Based on this experience, the course themes and invited lecturers are selected from a practical perspective.

2. Keywords

Open System, Enterprise Information System, Business Process, Financial Information System, Business Model, Linked Open Data, AI, Big Data, Data Analysis, I

3. Course Objectives

1. Students will be able to explain the constituent technologies of open systems and real-world examples of enterprise businesses that utilize information technologies and systems.
2. Students will be able to identify and organize the technical characteristics, advantages, and challenges of open systems, and explain their significance.
3. Students will be able to examine case studies of enterprise information system utilization and discuss appropriate technology selection and utilization strategies.

4. Course Schedule

The following is a record of lectures delivered by company lecturers through the 2025 academic year. The specific course content may vary from year to year.

1. Guidance and course introduction
2. The reality of data analysis and its impact on business
3-4. Case studies of new business planning for regional revitalization (lecture + practice)
5. Enterprise information systems and business processes
6. Trends in spoken dialogue interface technologies
7. What do AI engineers do?
8. Connecting learning to professional work
9. International interoperability and open technologies — date, time, and character standards —
10. Trends in smartphone development environments: Monaca and Monaca Education initiatives
11. Overview of banking systems and financial solutions
12. How to create connected data
13. Ophthalmic imaging and machine learning — an example of medical–engineering collaboration —
14. Team development methodologies
15. Statistics and its relationship to big data

5. Prior/Post Assignment

Prior:
If instructed by the lecturer, students are required to complete pre-learning tasks, such as reviewing designated materials in preparation for the class (approximately 30–60 minutes).

Post:
After each class, students are required to submit a course survey as feedback, including questions and comments regarding the lecture (approximately 15–30 minutes).

6. Assessment

Assignments (paper) (100%) (Goal 1, 2, 3 to be evaluated)

7. Textbooks

Reference books will be introduced as needed.

8. Language of Instruction

Japanese

9. Requirements for registration

None.

Advanced Topics in IT Architecture

Grade	M1,2
Semester	Fall
Credits	2
Instructor	MATSUBARA Katsuya
Alignment with Diploma Policy	DP1,DP3

1. Course Outline

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

The teaching materials are created by an instructor who has experience as a developer of system software, such as Android, for products.

2. Keywords

Android, Software Architecture, System Design

3. Course Objectives

1. Can understand the architecture design of large-scale software
2. Can design functionalities and API of a software system under consideration of performance, availability, extensibility, and operation cost.
3. Can implement systems and applications according to design philosophy.

4. Course Schedule

This course will be divided into nine 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) (achievement objectives 1, 2, and 3 to be assessed) and attitude to class participation. The ratio will be informed in 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.

Advanced Topics in Service Management

Grade	M1,2
Semester	Fall
Credits	2
Instructor	ISHIO Takashi
Alignment with Diploma Policy	DP1,DP2,DP4

1. Course Outline

Services are essential mechanisms that support human activities in modern society. Understanding the relationship between information systems and the value of services is important for comprehending how information technology professionals interact with society and for creating new services.
In this course, students will learn fundamental perspectives on services and their applications, as well as management approaches for designing, creating, and operating services. The course content will be delivered through the study of various publicly available case studies, examples based on the instructor's professional experience in software development, and guest lectures by industry professionals.

2. Keywords

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

3. Course Objectives

1. Students will be able to analyze existing services using theoretical frameworks.
2. Students will gain familiarity with applications and business models based on services.
3. Students will develop the ability to extract and interpret key information from terms of service agreements.

4. Course Schedule

The course content is as follows. Since the order of topics may change depending on the availability of guest lecturers, students should check the latest schedule on HOPE.

1. Definition of Services
2. Service Quality
3. Handling Service Failures

4–7. Analysis Reports on Service Case Studies (Student Presentations)

8. Review of Service Case Studies

9–14. Introduction of Service Case Studies by Guest Lecturers from Industry

15. Overall Course Review

5. Prior/Post Assignment

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

6. Assessment

Goal 1: Students will write a report analyzing existing services using theoretical frameworks and present their findings in class (50%).
Goal 2: Students will submit reports summarizing insights from guest lectures by industry professionals (25%).
Goal 3: Students will complete in-class exercises focused on reading terms of service agreements (25%).

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

Grade	M1,2
Semester	3Q
Credits	2
Instructor	YASUI Shigeya
Alignment with Diploma Policy	DP1,DP2

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

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

4. Course Schedule

01 orientation
02-05 prototyping
06 creating and shareing each portfolio
07 presentaion and 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(60%) and their presentations(40%).

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.(Q3)

Introduction to Cognitive System

Grade	M1,2
Semester	Spring
Credits	2
Instructor	Harald Michael Kümmerle
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

1. Course Outline

Cognitive science is an interdisciplinary field that has developed perspectives for understanding human intellectual activity not merely as an individual's internal process but as embedded in interactions with tools, environments, and other agents. Research on "situated action" and "situated cognition," in particular, has provided important insights for the design, evaluation, and operation of technological systems.

This course extends these cognitive-scientific questions further by examining how technological artifacts are constituted and stabilized through social processes, using the analytical frameworks of Science and Technology Studies (STS). Starting from the analysis of human-machine interaction, the course investigates how scientific knowledge and technology come to be established as "facts," drawing on historical case studies.

The course centers on close reading of two foundational texts and discussion among all participants. In each session, students identify the problem formulation, analytical methods, and modes of description employed in the texts, and critically examine their assumptions and scope. Students are also encouraged to re-examine experiences such as undergraduate projects through the analytical perspectives gained in the course, thereby connecting theory and practice. Through this process, students develop the foundational skills required for graduate-level seminars: the ability to read specialized texts with precision, to participate in academic discussion, and to describe and analyze their own experiences and research subjects from new perspectives.

2. Keywords

situated cognition, situated action, cognitive science, actor-network theory, science and technology studies, human-machine communication

3. Course Objectives

1. Understand the fundamental concepts and theoretical frameworks of situated cognition and actor-network theory.
2. Read specialized texts closely, reconstruct their logical structure, and present one's own interpretation in oral presentations and discussions.
3. Using the theoretical concepts covered in the course, describe and examine one's own research topic or a concrete case.

4. Course Schedule

1. Course overview
2. Questions in cognitive science and the scope of this course
3. Suchman, Plans and Situated Actions: Translator's afterword, Introduction, Chapters 1–2
4. Suchman, Plans and Situated Actions: Chapters 3–4
5. Suchman, Plans and Situated Actions: Chapters 5–6
6. Suchman, Plans and Situated Actions: Chapter 7
7. Suchman, Plans and Situated Actions: Chapter 8, Supplement (Human/Machine Reconsidered), Translator's afterword
8. Latour, The Pasteurization of France, Part I: Translator's explanatory notes + Materials and Methods
9. Latour, Chapter 1, first half
10. Latour, Chapter 1, second half
11. Latour, Chapter 2, first half
12. Latour, Chapter 2, second half
13. Latour, Chapter 3, first half
14. Latour, Chapter 3, second half + Transition
15. Summary

5. Prior/Post Assignment

Prior: Students are required to read the relevant texts each week and summarize the content in PowerPoint, noting points they found particularly important or questions that arose.

6. Assessment

Discussion and presentations (60%) (Goals 1, 2), and term paper (report) (40%) (Goals 1, 3).

7. Textbooks

Required texts:

Lucy Suchman, Plans and Situated Actions: The Problem of Human-Machine Communication (Cambridge University Press, 1987). Japanese translation available (Sangyō Tosho, 1999).

Bruno Latour, The Pasteurization of France (Harvard University Press, 1988). Japanese translation by Arakane Naoto (Ibunsha, 2023). Only Part I is used.

Further readings:

Jean Lave and Etienne Wenger, Situated Learning: Legitimate Peripheral Participation (Cambridge University Press, 1991). Japanese translation available (Sangyō Tosho, 1993).

Noyuri Mima and Yūhei Yamauchi, Designing Future Learning: Space, Activity, and Community, revised edition (University of Tokyo Press, 2021).

Akinori Kubo, A User's Guide to Bruno Latour (Getsuyōsha, 2019).

8. Language of Instruction

The course is conducted primarily in Japanese, but for students who need English, English texts are available and oral explanations are given in a mixture of Japanese and English.

Introduction to Interactive Systems

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SUMI Kaoru
Alignment with Diploma Policy	DP1,DP2,DP3

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

Mind and Machine, Predictive Mind, Constructed Reality, Embodied Intelligence, Artificial Minds
Human–AI Coexistence

3. Course Objectives

(1) Understand the technologies, interactions, and human impact of interactive systems.
(2) Apply this knowledge to build system designs.
(3) Summarize the learned design rules into a guidebook.
(4) Present the results in an exhibition and deepen understanding through discussion.

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
2-5	Reading Book1
6-7	Reading Book2
8-12	Reading Book3
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

- Exercises and reports (30%) → Evaluates objectives (1)(2)
- Class discussions (20%) → Evaluates objectives (1)(2)
- Final work (30%) → Evaluates objective (3)
- Exhibition presentation (20%) → Evaluates objective (4)

7. Textbooks

1)Machines That Think: How Artificial Intelligence Works and What It Means For Us, Inga Strümke Rheinwerk Publishing(2024)
2)The Experience Machine: How Our Minds Predict and Shape Reality, Andy Clark Pantheon Books(2023)
3)The Mechanical Mind: A Philosophical Introduction to Minds, Machines and Mental Representation, Tim Crane, Routledge(2015)

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.

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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SAKAIDA Rui
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

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 a faculty member with practical experience in field research and qualitative analysis.

2. Keywords

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

3. Course Objectives

1. Acquire basic knowledge of field research (history, techniques, analysis, ethics, etc.)
2. Practice a research appropriately based on their own interests
3. Publish the results in some form of media
4. Engage in this series of activities with a proactive attitude

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

1. Active involvement and motivated attitude in the class (attainment targets 1, 3 and 4): 30%
2. Progress reports on research, analysis, production, etc. (attainment targets 2, 3, 4): 30%
3. Quality of the final designed media (attainment targets 3,4): 40%

7. Textbooks

TBA

8. Language of Instruction

Japanese

9. Requirements for registration

This course may have enrollment restrictions. As it is designed to equip students with the knowledge, skills, and attitudes necessary for learning and research in the Media Design field, priority will be given to students enrolled in the Media Design field. Details will be explained during the first class session; therefore, prospective students must attend the first class session.

10. Note

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

Special Topics of Information Design 1

Grade	M1,2
Semester	4Q
Credits	2
Instructor	OSADA Junichi
Alignment with Diploma Policy	DP1,DP2

1. Course Outline

In this class, students will learn vision design techniques to depict the ideal future, using uncertain and complex local social issues as a subject. As the scope of design expands today, designers are also being asked to depict a sustainable future society. In this class, students will combine "scenario planning," a method from the marketing field, with UI/UX design techniques to depict the lifestyle of their hometown, Hakodate, 30 years from now.

2. Keywords

UI/UX design, scenario planning, vision design

3. Course Objectives

1. Experience interviewing local stakeholders and extracting latent needs
2. Acquire the skills to classify and structure the various opinions heard based on PEST
3. Acquire scenario planning techniques and concretely depict possible futures using Hakodate as an example
4. Embody a symbolic consumer in a possible future as a persona
5. Express the life of the persona in the future as a story
6. Make a presentation about the depicted future life and present it to a third party

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

Grades will be determined based on "Class Objectives 1-6," with 30% based on participation in exercises and 70% based on the exercise assignment (work).
Students will be tasked with creating an assignment (work), which will be graded comprehensively with 20% for concept design, 30% for production and implementation, and 20% for presentation.
Total marks are out of 100, with a score of 60 or above being the pass mark.

7. Language of Instruction

Lecture: Japanese
Lecture materials: Japanese

8. Requirements for registration

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

9. Note

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

Special Topics of Information Design 2

Grade	M1,2
Semester	2Q
Credits	2
Instructor	MOTOKI Tamaki
Alignment with Diploma Policy	DP1,DP2,DP3

1. Course Outline

This course aims to deepen understanding of methods applicable to design practice research, and for each student to consider the appropriateness of selecting and using research methods in their own design research.

We will strive to understand the characteristics of each method by reading reference materials, conducting prior research, and examining research case studies.

We will engage in discussions and exchanges of opinions among students, and based on the knowledge gained, we will create and present reports and other deliverables as information design research.

2. Keywords

Practical Design Research, Information Design Research, 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（Study on your own）

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 presentation slides.

14-15) Presentation using slides or posters.

5. Prior/Post Assignment

None/Complete the assignments given in class.

6. Assessment

Classroom attitude (30 %)

Quality of assignment (30%)

Quality of assignment presentation (40%)

7. Textbooks

Introduced as appropriate during class

8. Language of Instruction

Japanese

9. Requirements for registration

None

10. Note

This course will be held during the second quarter.(6/10-)

Special Topics of Cognitive System 1

Grade	M1,2
Semester	2Q
Credits	2
Instructor	NAKATA Takayuki
Alignment with Diploma Policy	DP2,DP3,DP4

1. Course Outline

This course critically examines human Cognitive Systems through research in cognitive psychology and cognitive neuroscience related to music and speech. Students develop a structured understanding of cognitive functions through theoretical, empirical, and applied approaches.

Instruction is based on student-led discussions of English academic literature, combined with training in experimental design and data analysis. Students develop original research proposals grounded in systematic literature review and present them in written and oral formats, cultivating research competence, academic communication skills, and professional research practice.

2. Keywords

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

3. Course Objectives

Critically read, synthesize, and integrate prior research in cognitive psychology and cognitive neuroscience—particularly in the domains of music and speech—to develop a theoretical and systematic understanding of human cognitive systems, and to autonomously formulate and investigate research questions based on a rigorous research-oriented mindset.

Through English academic readings, student-led discussions, and research presentations, construct and communicate specialized knowledge in cognitive systems research in a logical and coherent manner, and engage in constructive scholarly debate and academic communication within both domestic and international academic contexts.

Formulate original research questions grounded in systematic literature review, and design and present research proposals employing appropriate research methodologies and statistical analysis techniques, thereby developing research competence and practical research skills that contribute to both real-world societal issues and academic advancement.

Develop an understanding of the diversity of human cognitive characteristics, and acquire the cognitive foundations necessary for mutual understanding and dialogue with individuals from diverse disciplines, cultures, and social positions, while cultivating a commitment to scientific integrity, ethical responsibility, and responsible research practice.

4. Course Schedule

1. Organizational meeting
2-3. Discussion: Musical and speech development
4-5. Discussion: Music and social behavior, Music and emotion
6-7. Discussion: Neuroscience of music and speech
8-9. Discussion: Music in medical and rehabilitation settings, Relationship between music and language
10-11. Experimental design
12-13. Analysis of variance and other statistical methods
14-15. Presentation of research plan

5. Prior/Post Assignment

Prior assignment:
Discussion leaders: 1–2 topics (due 3 days before class) and slides.
Other students: readings and response to discussion topics.
Research design/statistics: problem sets (3–5 questions/session).
Final project: research proposal (10-20 papegs, A4) + slides (10–15) + oral presentation.
Post Assignment:
Review materials covered in the class.
Estimated time: 30–60 min/class.

6. Assessment

Students will be evaluated comprehensively based on the preparation of discussion topics, leadership in discussions and participation in class debates, critical contributions to peers' presentations, assignments related to research design and statistics, oral presentations, and the content and quality of the research proposal report.

The specific evaluation criteria and the weighting of each assessment component will be announced and explained in class.

7. Textbooks

No designated textbook.

Selected excerpts from relevant academic reference books will be provided as course materials.

8. Language of Instruction

Classes will be conducted in Japanese.

Students may deliver their oral presentations in either English or Japanese.

9. Requirements for registration

None

10. Note

None

Special Topics of Cognitive System 2

Grade	M1,2
Semester	3Q
Credits	2
Instructor	ITO Kiyohide

1. Course Outline

By reading and discussing books or papers related to ecological psychology and acoustic perception, students will get specialized knowledge and learn about ecological realism. During each reading session, one faculty member involved in ecological psychology and acoustic perception research will provide guidance on key points for discussion.

2. Keywords

Ecological psychology, Affordances, Acoustic perception, Music perception

3. Course Objectives

1. To acquire professional practical skills, students will summarize the contents of the book or paper they are reading and create a resume.
2. To acquire academic communication and expression skills, students will create and present slides about the book or paper they are reading.
3. To develop the ability to learn independently, students will critically read and discuss the material.

4. Course Schedule

The planned course will include the following:
1. Group reading of books or papers on ecological realism.
2. Group reading of books or papers on research into perception and behavior on natural sound and music.

Alignment with Diploma Policy: DP2,DP3,DP4

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

Grading will be based on participation in discussions and submission of a resume and presentation slides (100%) (assessment goals 1, 2, and 3).

7. Textbooks

This will be explained the first meeting.

8. Language of Instruction

The course will be conducted in Japanese.

9. Requirements for registration

Students with an interest in perceptual psychology are welcome.
Ability to present and discuss in Japanese.

Special Topics of Interactive Systems 1

Grade	M1,2
Semester	4Q
Credits	2
Instructor	SHIMAKAGE Keisuke
Alignment with Diploma Policy	DP1,DP2

1. Course Outline

In this course, students will learn through hands-on practice how to prototype interactive systems and access open-source culture through acts of creation and modification, using the PHOTON GLASS—a glasses-type device that interacts with users via feedback such as sound, based on images captured by a first-person camera—as a toolkit. Students will first understand the component technologies that make up PHOTON GLASS. Next, they will generate ideas for what they wish to achieve with PHOTON GLASS, implement those ideas, and finally compile their insights to open-source their own creations. This course is designed by instructors with practical experience in interactive system prototyping.

2. Keywords

Interaction, Interactive System, Prototyping

3. Course Objectives

1. Understand the core technologies comprising 〈PHOTON GLASS〉: Raspberry Pi, cloud services for machine learning, 3D modeling, and 3D printers.
2. Master prototyping approaches for information technology using 〈PHOTON GLASS〉 as a case study.
3. Acquire editing techniques for open-sourcing modified versions of 〈PHOTON GLASS〉 to enable others to create and modify their own versions.

4. Course Schedule

Sessions 1-2: Introduction, Understanding 〈PHOTON GLASS〉
Sessions 3-4: Understanding 〈PHOTON GLASS〉
Sessions 5-6: Idea Generation
Sessions 7-8: Development
Sessions 9-10: Development
Sessions 10-11: Development, Open Sourcing
Sessions 12-13: Development, Open Sourcing, Presentation Preparation
Sessions 14-15: Presentation of Developed Work and Its Open-Sourced Version
*Subject to change depending on circumstances

5. Prior/Post Assignment

Before: It is recommended that you read the designated reference materials in advance. Additionally, please prepare the content assigned during class beforehand.
After: Complete the assignments assigned during class.

6. Assessment

Evaluation will be based on participation in class (30%) + deliverables (modified 〈PHOTON GLASS〉 + its open-sourced version) (70%) (assessing achievement goals 1, 2, 3).

7. Textbooks

The class will be conducted using a wiki or similar platform prepared for this course.

8. Language of Instruction

Japanese

9. Note

It is desirable to possess basic knowledge and skills related to the core technologies comprising 〈PHOTON GLASS〉, such as Raspberry Pi, cloud services for handling machine learning technologies, 3D modeling, and 3D printers.

Special Topics of Interactive Systems 2

Grade	M1,2
Semester	4Q
Credits	
Instructor	竹川　佳成

1. Course Outline

Creating an attractive demo movie is an important research activity. In this course, each student will create a demo movie of their own research achievements by utilizing a variety of interactive technologies such as JavaScript, digital fabrication tools, electronics prototyping, video-editing software (e.g., Premiere), 3D modeling software (e.g., MAYA), 3D CAD software (e.g., Inventor), and digital signage software.
Based on the instructor's research experience in interactive systems/HCI, the course provides guidance on how to communicate research outcomes effectively (clarifying goals, audience, and usage scenarios), interaction design, prototyping, shooting/editing, and presentations/peer review.
Each session also includes student-led mini-lectures to share investigated techniques and references with the class.

2. Keywords

HCI, Information design, Prototyping, Communication

3. Course Objectives

Course Objectives (numbers correspond to assessment)
1. Students will be able to clarify the goal, audience, and usage scenario of their research demo.
2. Students will be able to select appropriate interactive technologies/tools and build prototypes.
3. Students will be able to design and produce a research demo movie with clear storytelling and adequate quality.
4. Students will be able to improve their work based on feedback and evaluation criteria.

Alignment with Diploma Policy: DP1,DP2

4. Course Schedule

Lecture 1: Guidance (goals, workflow, rubric; examples)
Lecture 2: Demo movie analysis I (structure/story)
Lecture 3: Demo movie analysis II (shooting/editing/captions/audio)
Lecture 4: Planning I (message, audience)
Lecture 5: Planning II (storyboard, tool selection)
Lecture 6: Mid-term presentation I (plan/prototype review)
Lecture 7: Technical investigation I (student-led sharing)
Lecture 8: Technical investigation II (student-led sharing)
Lecture 9: Technical investigation III (student-led sharing)
Lecture 10: Mid-term presentation II (report of investigation)
Lecture 11: Production I (shooting/recording/editing)
Lecture 12: Production II (editing/visual effects)
Lecture 13: Production III (captions/narration/audio)
Lecture 14: Production IV (final tuning, rehearsal, peer review)
Lecture 15: Final presentation (screening, peer evaluation, reflection)

5. Prior/Post Assignment

Prior: Review assigned materials/tutorials and sample videos (approx. 60 minutes per lecture; watch 2–3 videos and take brief notes).
Post: Work on prototyping/shooting/editing and revise deliverables based on feedback (approx. 60–120 minutes per lecture; additional 3–5 hours before mid/final presentations).

6. Assessment

Assessment (linked to Course Objectives)
(1) Final research demo movie: 50% [Obj. 1–3]
(2) Mid-term presentation (plan/prototype & Q&A): 20% [Obj. 1,2,4]
(3) Technical investigation mini-lecture/materials: 15% [Obj. 2,4]
(4) Participation & peer review: 15% [Obj. 4]
Note: The above weighting is the baseline; any adjustment will be announced in class.

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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	KURIKAWA Tomoki
Alignment with Diploma Policy	DP1,DP3

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.
On-site lecture.

2. Keywords

Computational neuroscience, neural networks, differential equations

3. Course Objectives

(Learning Goal 1) Understand how external stimuli and memories are represented in biological nervous systems.
(Learning Goal 2) Understand the implementation and mechanisms of models corresponding to Goal 1.

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 (achievement objectives 1,2 to be assessed)
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, non-linear dynamics.

Advanced Topics in Nonlinear Mathematics

Grade	M1,2
Semester	Spring
Credits	2
Instructor	Riabov Volodymyr
Alignment with Diploma Policy	DP1,DP2,DP3

1. Course Outline

Some mathematical models used in physics, chemistry, biology, and other disciplines are introduced. Several key concepts necessary for the study of nonlinear dynamics, chaos and fractals, such as phase portraits, fixed points and stability, bifurcations and attractors are explained 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.

The teacher has an experience working with nonlinear models and mathematical models of nonlinear oscillators. The teacher works in the field of numerical analysis of bifurcations and chaos will be utilized in this course.

2. Keywords

Nonlinear oscillator, period doubling bifurcation, saddle-node bifurcation, hysteresis, 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 2-5 pages of materials provided via HOPE system.
Prepare numerical experiments with Runge-Kutta method
Run some numerical experiments with Duffing oscillator

6. Assessment

The grading and evaluation is beased on the assignment reports.
The results of reports are discussed during the class.

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)

Advanced Topics in System Mathematics

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SAITO Asaki
Alignment with Diploma Policy	DP1

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 problems of learning to practical applications.

2. Keywords

modeling, 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

Prior Assignment: Review the contents of the previous lectures.

Post Assignment: Students are expected to organize the contents of the oral explanation in their notebooks.

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".

Advanced Topics in Mathematical Analysis

Grade	M1,2
Semester	Fall
Credits	2
Instructor	KAWAGUCHI Satoshi
Alignment with Diploma Policy	DP1,DP3

1. Course Outline

This year, I will give a lecture on vector analysis. Starting from basics of differentiation and integral of vectors, we study mathematical formulas of divergence and rotation. Additionally, we study several theorems of differention. As the application of them, we introduce the electromagnetism and fluid mechanics.

Regarding to the integrals, we study the line and surface integrals. If we have time to study, we treat the differentiation in the curved coordinate sysytem.

2. Keywords

gradient, divergence, rotation, Gauss's divergence theorem, Stokes' theorem

3. Course Objectives

1-3: Divergence and rotation of vector and their formalas
4-6: Line ingegral and surface integral
7-9: Gauss' divergence theorem, Stokes' theorem, Green's theorem
10-12: transformation to the curved coordinate system, gradient, divergence, rotation in the curved coordinate system
13-15: Application to the electromagnetism and fluid mechanics

Students learn the aboves and can handle analytical calculations by him(her)self.

4. Course Schedule

1-3: Divergence and rotation of vector and their formalas
4-6: Line ingegral and surface integral
7-9: Gauss' divergence theorem, Stokes' theorem, Green's theorem
10-12: transformation to the curved coordinate system, gradient, divergence, rotation in the curved coordinate system
13-15: Application to the electromagnetism and fluid mechanics

5. Prior/Post Assignment

(Prior) Review the material from previous lectures before class and organize it in your own way.
(Post) Work on the assignments given during the lecture.

6. Assessment

Grades will be based entirely (100%) final examination.

7. Textbooks

[1] ベクトル解析（安達 忠次 著、培風館）

8. Language of Instruction

Japanese

9. Note

Review the linear algebra and analysis you learned as an undergraduate.

Advanced Topics in Applied Complex Systems

Grade	M1,2
Semester	Fall
Credits	2
Instructor	TANAKA Yoshitaro
Alignment with Diploma Policy	DP1,DP3

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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	SAKURAZAWA Shigeru
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

1. Course Outline

Complex systems, which exhibit emergent behavior due to interactions among a large number of subsystems, can be analyzed from the perspective of systems science. In this course, students will learn several mathematical frameworks for analyzing and controlling complex systems, incorporating concepts from physics, systems theory, and control theory. The course introduces the analysis and control of physical systems, with a particular focus on synchronization analysis based on reduction theory and fundamental concepts from modern control theory. Additionally, the fundamental mathematical framework of quantum systems, which describes micro- and nanoscale systems, will be covered. The course consists of three main parts: 1. Synchronization analysis, 2. Modern control theory, 3. Mathematics of quantum systems. Each topic will be introduced comprehensively, progressing from basic to advanced concepts. The course will be taught by a faculty member with industry experience 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
1. understand the concept of the reduction theory through synchronization analysis
2. understand the fundamental concepts of modern control theory
3. 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

6. Assessment

Students will be evaluated only by the final report, which is evaluated based on "Course Objectives 1, 2, 3". 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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	MURAI Hajime
Alignment with Diploma Policy	DP1,DP3

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 (from 1st to 8th)

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

Grade	M1,2
Semester	Fall
Credits	2
Instructor	Ian Frank
Alignment with Diploma Policy	DP1,DP3,DP4

1. Course Outline

The history of intelligent systems is long and fascinating. A steam-powered “pigeon” is said to have been created around 400–350 BCE by Archytas (who may have been one model for Plato’s philosopher king), and the word automaton comes from the ancient Greek for the “acting of one’s own will.” From early mechanical devices to modern computational systems, ideas about intelligence have always been closely tied to how humans understand agency, purpose, and themselves.

A broad historical perspective is a powerful intellectual tool, especially in times of technological and societal change. Contemporary discussions of artificial intelligence invite reflection on the nature of change itself: what distinguishes fast or slow take-offs, tipping points, or singularity-like disruptions? By placing present developments in a longer historical context, this course aims to help students better assess what is genuinely new, what has deep precedents, and how past ideas continue to shape expectations about the future.

The class, delivered as a dynamic mixture of face-to-face workshops and online participation, offers students the opportunity to delve into the history of intelligent systems, learn about recent advances and emerging technologies, and engage in discussion about possible futures of the field. Students are also encouraged to explore the ethical and societal implications of artificial intelligence, and to reflect on what it means to be human in an age increasingly shaped by intelligent systems. This reflection on humanity is emphasised in particular in the workshop sessions, which use interactive and sometimes deliberately unconventional activities to prompt direct experience, discussion, and insight into the strengths—and limits—of human thinking.

Because the speed of technological progress makes “news” itself an important object of study, tracking and discussing current developments is a core part of the course, including issues of ethics and responsibility. Each year, topics and questions are shaped in part by student interests, and students are encouraged to express their views and contribute actively to the direction of class discussions.

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
- deepen knowledge of notable figures in the past and present
- improve the granularity of their understanding of the current speed of technological progress
- acquire insights on possible futures for intelligent systems
- introspect on human intelligence, and its relationship with the technologies around us
- consider ethical and moral issues
- participate in a forward-thinking class project

4. Course Schedule

The first 10 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 month of the course is slated for online classes and project work, but if circumstances allow, the face-to-face aspect of the course may be expanded through the design of more workshop-style experiences.

To prevent the class being over-subscribed, there is a selection process that limits the number of participating students to 25. 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. Learning here is not just about knowledge for its own sake; it's about preparing to adapt and reinvent oneself for the fast-paced shifts of the digital world. While primary subject matter usually focuses on technological and data literacy, we also prioritise

“human literacy”, for which one of the keys can be experiential learning, such as the “humanics” approach of Joseph E. Aoun, president of Northeastern University.
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

AI Policy: AI tools are increasingly a part of the world, and students are encouraged—and sometimes required—to use them. Understanding and skilfully combining options is an integral part of developing digital literacy and professional competence, together with the ability to critically assess the future pathways that are unfolding. Classes include examples and encourage students to experiment and to learn effective ways to interact with AI, emphasising how tools can think with us rather than for us.
Be careful when using AI:
Don't trust outputs blindly. AI tools work best in conjunction with your own understanding and verification. Errors may arise from system limitations, training data, or optimisation methods, so assume that facts, numbers, interpretations, or generated programs may be incorrect unless you either know the answer or can independently check it. You are responsible for any errors or omissions in your work.
Declare your process. For assignments that involve AI, clearly describe how it was used, including relevant instructions or intermediate steps where appropriate. Sharing methods, results, and experiences is part of learning from each other and applying human-centred skills. Failure to declare AI use is a violation of academic honesty policies. By integrating AI thoughtfully into our learning aspirations, we aim to create an environment where new tools can be leveraged while simultaneously strengthening the human judgement and responsibility that help define us in a rapidly changing world.

5. Prior/Post Assignment

Teams are formed for watching weekly videos and working on Popups, and experience shows that students can benefit from starting the class with some idea of the peers they want to work with.
Follow-up by reading and watching videos about research in intelligent systems, and becoming attuned to future trends. Most students find that an hour each week covers assignments and self-learning.
Other than this, prepare by reading and watching videos about research in intelligent systems, and becoming attuned to future trends.

6. Assessment

Overall course goals are addressed through regular homework, including critical reviews of selected videos and the submission of at least one news article per month. A final project, likely focused on creating Japanese subtitles for an existing video, further reinforces key themes. These assignments collectively account for approximately 65% of the grade, with specific breakdowns available on the course web pages.
The remaining portion of the grade is based on active participation, including engagement with weekly Popups and Feedback Forms and recording SRs (self-reflections) on videos.
Beyond these formal requirements, this course sometimes visits as a topic of study the history of how education has used numbers to represent learning. As part of the broader goal of introspecting on human intelligence, students are encouraged to think critically about grading itself as a technology. Instead of a graded exam, this course emphasises deeper engagement, inviting students to consider a fundamental question in both education and AI: Can thinking skills truly 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

In principle, Japanese is used for spoken class content, but if significant numbers of overseas students enrol there may be classes in English that use technology such as live captions to provide Japanese subtitles. Class web pages and other materials ar

9. Requirements for registration

Check the class pages for details of the process that limits the participating student numbers to 25. In general, places will be offered first to Master's students, with 4th year students accepted if there is capacity remaining.

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

Grade	M1,2
Semester	Spring
Credits	2
Instructor	KATO Koji
Alignment with Diploma Policy	DP1,DP2

1. Course Outline

In research, learning theory alone is insufficient for conducting verification and experimentation. By actually implementing theories through programming, it becomes easier to observe their behavior and understand their internal mechanisms.

Particularly in the field of machine learning, understanding mathematical formulas and algorithms alone is not enough; their characteristics and limitations can only be accurately understood through implementation, experimentation, and evaluation. Learning by iterating between theory and implementation is essential for developing the fundamental skills required to conduct research. Furthermore, the ability to appropriately select models and evaluate their performance is an important competency not only in academic research but also in real-world data analysis and applied studies.

Therefore, in this course, students will implement several fundamental machine learning methods used in research and examine the differences in their learning mechanisms and application domains. Through this process, students will develop an integrated understanding of both the theoretical foundations and practical characteristics of these methods, and acquire the implementation and analytical skills necessary for research and professional practice. This course is designed and supported with instructional materials prepared by a faculty member specializing in information systems research.

2. Keywords

Programming, Machine learning, Presentation

3. Course Objectives

1. Students will understand the theoretical foundations of fundamental machine learning algorithms and be able to explain the characteristics, assumptions, and applicable conditions of each method.
2. Students will implement representative machine learning methods, conduct training and evaluation experiments, and analyze and interpret the results.
3. Students will compare and evaluate multiple machine learning methods, select appropriate approaches according to specific problems and data characteristics, and logically justify the validity of their choices.

4. Course Schedule

The basic structure of this course consists of short lectures on machine learning methods combined with programming exercises, culminating in a final presentation. However, depending on the number of students and other circumstances, the specific topics addressed may be subject to change. In addition, for applied assignments, students may be organized into groups and work collaboratively. The course will proceed as follows:

1. An overview of the course will be provided, after which each student will select a social issue of interest and define a specific problem to be addressed. Students will also consider the necessary data and appropriate machine learning methods for their chosen topic.
2. Students will select suitable machine learning methods for their defined problem and review their theoretical background. They will perform data preprocessing and carry out basic implementation and operational testing.
3. Students will train and evaluate their models, analyze the results, and, if necessary, refine parameters or improve their methods in order to enhance performance and examine remaining issues.
4. Students will organize their problem formulation, rationale for method selection, experimental results, and discussion, and deliver a presentation. Through questions, discussion, and peer evaluation, they will deepen their understanding.

5. Prior/Post Assignment

For each class session, students are expected to study in advance the relevant theories and algorithmic implementation methods required for system development, organize the processing procedures and program structure, and prepare for implementation accordingly.

Students will organize the content learned during the lecture in their notes and review the correspondence between theory and implementation. In addition, they will correct unfinished or erroneous parts of their implementation and re-examine the behavior of the algorithms in order to deepen their understanding.

6. Assessment

Participation in practical exercises (assessing Learning Outcomes 1, 2, and 3)
Programming report (assessing Learning Outcome 2)
Presentation (assessing Learning Outcome 3)

Students will be evaluated comprehensively based on the above components. The weighting of each component will be announced during the course.

7. Language of Instruction

Basically use Japanese language. Some documents may use English.

8. 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.

Advanced Topics in Adaptive Systems

Grade	M1,2
Semester	Fall
Credits	2
Instructor	MIKAMI Sadayoshi
Alignment with Diploma Policy	DP1,DP2

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.

8. Language of Instruction

The lectures are delivered mainly in Japanese with several keywords introduced in English. All the printed and presetation materials are in English.

9. Requirements for registration

The students are expected to have basic knowledge in the fields of differential equations, chaos and fractals, and elementary physics.

10. Note

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

Advanced Topics in Autonomous System 1

Grade	M1,2
Semester	Spring
Credits	2
Instructor	YAMAUCHI Sho
Alignment with Diploma Policy	DP1,DP2

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. Language of Instruction

Japanese and English

8. Requirements for registration

Advanced Topics in Autonomous System 2

Grade	M1,2
Semester	Fall
Credits	2
Instructor	SUMI Yasuyuki
Alignment with Diploma Policy	DP1,DP2

1. Course Outline

This course focuses on estimation based on interpretation of observed data, which is important in the control of autonomous systems.

As representative examples of such estimation, we will focus on position estimation and map generation for robot movement to deepen our understanding of estimation methods based on time series data.

1) Position estimation is essential for a robot to safely and efficiently move from its current position to its target position. In this lecture, basic concepts and applications of methods for position estimation based on probabilistic handling of time-series data of position and environmental observations will be lectured.

2) To deepen the understanding of the theory learned in the first half of the lecture, students will learn specific methods for estimating the robot's self-position and generating a map of its movement based on simulations using Python.

2. Keywords

robot, localization, Kalman filter, SLAM

3. Course Objectives

Goal 1. Understanding of the basic theory for localization of mobile robots

Goal 2. Understanding algorithms for self-position estimation and map generation for mobile robots through simulations

4. Course Schedule

1. Introduction

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

9-15. Mobile Robot Simulation in Python
- Fundamentals of probabilistic robotics
- Estimation of position for movement
- Simultaneous localization and mapping

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.
- homework report (50%) (Goal 1 to be evaluated)
- presentation and participation in discussion of assigned reading of texts (50%) (Goal 2 to be evaluated)

7. Language of Instruction

Handouts in English and Japanese, and Oral Explanation in Japanese

Advanced Topics in Intelligent Media

Grade	M1,2
Semester	Fall
Credits	
Instructor	KANO Takeshi
Alignment with Diploma Policy	DP1,DP2

1. Course Outline

We often perceive intelligence in a wide variety of natural phenomena and artificial systems such as robots. Where, then, does this intelligence come from? What is the underlying medium that gives rise to intelligence? In this course, we explore the sources of intelligence through discussions and case studies of systems that inevitably evoke a sense of intelligence. The lectures provide insights into key concepts such as understanding, perspective, mathematical modeling, and inverse control, while examining concrete examples of intelligent behavior. This course is taught by an instructor with practical experience in the engineering applications of biological intelligence, and is based on insights gained through past research and extensive discussions with collaborators. The course offers students an opportunity to think deeply about the nature of intelligent systems.

2. Keywords

Intelligence, Perspective, Mathematical modeling, Reverse control theory

3. Course Objectives

1. Students will learn the perspective that "the medium that generates intelligence is the environment."
2. 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

Week 1: Introduction
Weeks 2–4: What Does It Mean to "Understand"? Perspectives and Mathematical Models
Weeks 5–8: Perspectives on Control: Forward Control Theory, Inverse Control Theory, and Yin-Yang Control
Week 9: The Source of Intelligence as Seen in Centipede Robots
Weeks 10–12: Decentralized Autonomous Control and Swarm Intelligence
Weeks 13–15: Discussions and Conclusion

5. Prior/Post Assignment

Prior: Review the lecture materials uploaded in advance and try to understand their content.
Post: Organize your thoughts, impressions, and opinions on the lecture, and submit them via a direct message on Slack.

6. Assessment

Evaluation will be based on students' class participation (e.g., activeness in discussions) and the depth of insight demonstrated in the reflections and opinions submitted at the end of each class (70%) (Course Objectives 1 and 2).
In addition, evaluation will be based on the depth of insight demonstrated in the final summary report submitted after the completion of all classes (30%) (Course Objective 2).

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 upon request. Slack messages and oral explanations will be conducted in Japanese, with support from Slack's built-in translation features and Zoom's interpretation/translation functions.

9. Requirements for registration

The number of students enrolled is capped. If the number of applicants exceeds the limit, enrollment will be determined during the first class session.

Project Study 1

Grade	M1
Semester	Spring/Fall
Credits	2
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP1,DP2

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.

Project Study 2

Grade	M1
Semester	Fall / Spring
Credits	2
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP1,DP2

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.

Project Study 3

Grade	M2
Semester	Spring / Fall
Credits	2
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP1,DP2

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.

System Information Science Research

Grade	M1,2
Semester	All
Credits	4
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

1. Course Outline

Students set their own research themes from the wide-ranging areas of System 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, 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. Assessment

A comprehensive evaluation will be made based on the research plan and interim report, the attitude toward daily research activities, the progress of the research, and the dissemination of research results both inside and outside the university. The assessment will determine whether the research content meets an adequate standard, whether the student has acquired the ability to act and make judgments grounded in scientific integrity and a high sense of ethics, and whether the student demonstrates the capacity to continuously update and deepen their own learning.

6. Language of Instruction

The language that a supervisor ordered.

7. Requirements for registration

Special Research students are not allowed to take this course.

Special Seminar

Grade	D
Semester	All
Credits	6
Instructor	Superviser Head of Graduate School
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

1. Course Outline

Through the investigation of related research, acquisition of methodologies in relevant fields, and the discovery and resolution of real-world problems, students will engage in self-directed learning and deepen their specialized knowledge and research methodologies necessary for the smooth progress of Advanced Research in System Information Science. Furthermore, students will enhance their understanding of the social and international context of their own research and the contribution of its outcomes to society through discussions with their academic advisor.

2. Keywords

System Information Science, Creation of New Results, Doctoral Thesis

3. Course Objectives

Students will develop the ability for continuous self-improvement, enabling them to autonomously reconstruct their own area of expertise within social and international contexts and to persistently update and deepen their knowledge. They will also acquire professional competence to carry out research activities with an awareness of social responsibility.

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, Q&A sessions during the presentation, etc. on the content of the guidance received from the advisor, and proceed with the research for the doctoral dissertation.

6. Assessment

A comprehensive evaluation will be made based on the student's attitude toward daily research activities, the completeness and quality of presentation materials and presentation skills at the interim report session, as well as their approach to questions and answers. The assessment will determine whether the student has developed the attitude and ability to autonomously and continuously update and deepen their knowledge in their area of expertise, while maintaining an awareness of social responsibility.

7. Textbooks

Follow the instructions of the advisor.

8. Language of Instruction

The language specified by the advisor

9. Requirements for registration

10. Note

As a result of the special seminar, a progress report or interim report on doctoral research is presented(public on campus) in each academic year.

Students enrolled in 2026 or later earn 6 credits for this course.

System Information Science Special Research

Grade	D
Semester	6
Credits	Superviser Head
Instructor	of Graduate School
Alignment with Diploma Policy	DP1,DP2,DP3,DP4

1. Course Outline

Through repeated discussions with their academic advisor and engagement in research processes such as setting research themes, developing research plans, conducting evaluations, presenting at conferences, and writing papers, students will cultivate the capabilities required of advanced engineers and researchers who aim to explore new principles and methods. In addition, by participating in academic and social communities both domestically and internationally, students will learn research ethics and public responsibility and deepen their understanding of the co-creation process that connects academia and society.

2. Keywords

It depends on students.

3. Course Objectives

Students will acquire independent research capabilities that enable them to explore new principles and methods and to pioneer novel methodologies and academic domains in the field of System Information Science. They will also develop the ability to disseminate their research outcomes at an international standard and strengthen communication and presentation skills that allow them to collaborate effectively with researchers and practitioners from diverse disciplines and cultural backgrounds.

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

A comprehensive evaluation will be made based on the progress of research in accordance with the research plan, the dissemination of research results both domestically and internationally, and the student’s engagement in academic and social communities. The assessment will determine whether the research has achieved sufficient outcomes and whether the student has developed the attitude and ability to act as a responsible member of the community, with a clear awareness of their mission as a researcher contributing to the sound development of society, and to participate proactively and continuously in community activities.

7. Textbooks

None

8. Language of Instruction

The language specified by the advisor

9. Requirements for registration

None

10. Note

Students enrolled in 2026 or later earn 6 credits for this course.