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Graduate Major in Super Smart Society

Modern society is faced with numerous issues, including declining birthrates, aging populations, global warming, global division, and food security. In order to ensure a sustainable future for humanity, the need for a super-smart society that effectively integrates both cyberspace and physical technology has been recognized as essential by the international community, including the Japanese government. Various measures are currently being implemented to bring this vision to life.

The goal of the Graduate Major in Super Smart Society (SSS) is to produce individuals who can practice convergence science and create new fields through the integration of different disciplines, with the larger aim of realizing a super-smart society. Specifically, we aim to cultivate the following four skills:

1. The ability to analyze and solve societal issues from a creative and multifaceted perspective, drawing on outstanding specialist skills.
2. The ability to comprehensively view and logically analyze different phenomena, creating new knowledge.
3. The ability to practice convergence science necessary for realizing a super-smart society.
4. The ability to understand issues from a global perspective, take concrete actions, and be a leader within society.

To achieve this goal, talent will be developed in this graduate major through socially cooperative education and interdisciplinary research, carried out in co-creation with industry and other sectors. Specifically, students will cultivate a specialized academic proficiency necessary for the implementation of convergence science by taking core courses, such as SSS Innovation, designed in collaboration with the SSS Promotion Consortium, which includes companies, government ministries, and national research institutes. In addition, through collaboration with society by way of diverse off-campus projects that may be recognized as entrepreneurship courses, students will cultivate the ability to take a comprehensive view of various phenomena. Through required courses such as SSS Design Workshop, students will cultivate problem-solving skills through integration and synthesis of knowledge from different fields. They will also cultivate leadership skills in a global context through Global Off-Campus Projects and Global Research Activities.

【Doctoral Degree Program】

1.Outline

The goal of the Graduate Major in Super Smart Society is to produce individuals who can practice convergence science and create new fields through the integration of different disciplines, with the larger aim of realizing a super-smart society. To achieve this goal, talent will be developed in this graduate major through socially cooperative education and interdisciplinary research, carried out in co-creation with industry and other sectors. Specifically, students will cultivate a specialized academic proficiency necessary for the implementation of convergence science by taking core courses, such as SSS Innovation, designed in collaboration with the SSS Promotion Consortium, which includes companies, government ministries, and national research institutes. In addition, through collaboration with society by way of diverse off-campus projects that may be recognized as entrepreneurship courses, students will cultivate the ability to take a comprehensive view of various phenomena. Through required courses such as SSS Design Workshop, students will cultivate problem-solving skills through integration and synthesis of knowledge from different fields. They will also cultivate leadership skills in a global context through Global Off-Campus Projects and Global Research Activities.

2. Competencies Developed

In this program, students will aim to acquire the following competencies in order to achieve the above goals.

- The ability to analyze and solve societal issues from a creative and multifaceted perspective, drawing on outstanding specialist skills.
- The ability to comprehensively view and logically analyze different phenomena, creating new knowledge.
- The ability to practice convergence science necessary for realizing a super-smart society.
- The ability to understand issues from a global perspective, take concrete actions, and be a leader within society.

3. Learning Goals

In this program, students will study the following content in order to obtain the competencies mentioned above.

- A) Specialized academic proficiency necessary for the implementation of convergence science.
- B) The ability to take a comprehensive perspective on various phenomena through collaboration with society.
- C) Problem-solving skills through integration and synthesis of knowledge from different fields.
- D) Leadership skills in a global context.

4. Completion Requirements

The following requirements must be met to complete the Doctoral Degree Program of this major.

1. Attain a total of 24 credits or more from 600-level courses.
2. From the courses specified in the Graduate Major in Super Smart Society curriculum,
 - 12 credits or more acquired from Research Seminars.
 - 18 credits or more acquired from the graduate major's standard curriculum (Research Seminars, Research-related Courses, Major Courses).
 - 2 credits acquired from the specified Major Courses.
 - 2 credits or more acquired from the Humanities and Social Science Courses.
 - 4 credits or more acquired from the Entrepreneurship Courses.
3. Pass the doctor's thesis review and final defense.

Table D1 shows course categories and the number of credits required to complete the Doctoral Degree Program of this major. It also shows the required minimum credits in each course category and points to be noted when selecting the required courses and electives.

The learning goals to be obtained by students through courses are listed as "associated learning goals". Prior to registering courses, students need to fully understand the course goals.

Table D1. Graduate Major in Super Smart Society Completion Requirements

Course category		<Required courses> Required credits	<Electives> Minimum credits required	Minimum credits required	Associated learning goals	Comments
Liberal Arts and Basic Science Courses	Humanities and Social Science Courses		2 credits	6 credits	B, D	
	Entrepreneurship Courses		4 credits		B, D	All Graduate Attributes (GA) should be acquired. (Refer to Section 6 for the definition of GA.)
	Other courses					
Core Courses	Research Seminars	Seminar S3 on Super Smart Society Seminar F3 on Super Smart Society Seminar S4 on Super Smart Society Seminar F4 on Super Smart Society Seminar S5 on Super Smart Society Seminar F5 on Super Smart Society A total of 12 credits, 2 credits each from the above courses.		18 credits	A	
	Research-Related Courses				D	
	Major Courses	Super Smart Society Design Workshop Super Smart Society Research Presentation A total of 2 credits			A, B, C, D	To register for the SSS Design Workshop, participation in at least one SSS Matching Workshop is required. Master's students preparing to advance to this graduate major are strongly encouraged to participate in an SSS Matching Workshop during their time in the master's program.
	Major Courses and Research-Related Courses outside the Graduate Major in Systems and Control Engineering standard curriculum					
Total required credits		A minimum of 24 credits including those attained according to the above conditions				
Note		• Japanese Language and Culture Courses offered to international students can be recognized as equivalent to the Humanities and Social Science Courses of the corresponding course level. • For details of the Liberal Arts and Basic Science Courses, please refer to the relevant sections.				

5. Courses

Table D2 shows the Core Courses of the Doctoral Degree Program of this major. Graduate Majors listed in the Comments column offer core courses that are recognized as equivalent to the corresponding Major Courses or Research-related Courses in the standard curriculum of this major.

Table D2. Core Courses of the Graduate Major in Super Smart Society

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Research seminars	600 level 1	SMT.Z601.R	◎		Seminar S3 on Super Smart Society	0-2-0	1	A	Language used in Seminar is Laboratory own.
		SMT.Z602.R	◎		Seminar F3 on Super Smart Society	0-2-0	1	A	Language used in Seminar is Laboratory own.
		SMT.Z603.R	◎		Seminar S4 on Super Smart Society	0-2-0	1	A	Language used in Seminar is Laboratory own.
		SMT.Z604.R	◎		Seminar F4 on Super Smart Society	0-2-0	1	A	Language used in Seminar is Laboratory own.
		SMT.Z605.R	◎		Seminar S5 on Super Smart Society	0-2-0	1	A	Language used in Seminar is Laboratory own.
		SMT.Z606.R	◎		Seminar F5 on Super Smart Society	0-2-0	1	A	Language used in Seminar is Laboratory own.
Research-Related Courses	600 level 1	SMT.D601.L		★	Global Research Activities 1	0-0-1	1,2,3	D	
		SMT.D602.L		★	Global Research Activities 2	0-0-1	1,2,3	D	
Major courses	600 level 1	SMT.A611.R	◎	★	Super Smart Society Research Presentation	0-0.5-0.5	2,3,4,5	A, C	
		SMT.B601.L		★	Introduction to Convergence Science: Quantum Science	1-0-0	2,4,5	B, C	
		SMT. B602.L		★	Introduction to Convergence Science: Smart Healthcare	1-0-0	2,4,5	B, C	
		SMT. B603.L		★	Introduction to Convergence Science: Smart Agriculture	1-0-0	2,4,5	B, C	
		SMT. B604.L		★	Introduction to Convergence Science: Smart Workplaces	1-0-0	2,4,5	B, C	
		SMT. B605.L		★	Introduction to Convergence Science: Smart Production	1-0-0	2,4,5	B, C	
		SMT. B606.L		★	Introduction to Convergence Science: Smart Ocean	1-0-0	2,4,5	B, C	
		SMT.B631.L		★	Super Smart Society Off-Campus Project 1	0-0-2	3,4,5	B, C	
		SMT.B632.L		★	Super Smart Society Off-Campus Project 2	0-0-4	3,4,5	B, C	
		SMT.B633.L		★	Super Smart Society Off-Campus Project for Career Development 1	0-0-2	3,4,5	B, C	
		SMT.B634.L		★	Super Smart Society Off-Campus Project for Career Development 2)	0-0-4	3,4,5	B, C	

		SMT.B635.L			Ota City Start-up Practical Off-Campus Project	0.5-0-1.5	3,4,5	B, C	
		SMT.C601.R	◎	★	Super Smart Society Design Workshop	0.5-0-0.5	2,3,4,5	A, C	Participation in at least one SSS Matching Workshop required.
		SMT.D611.L		★	Super Smart Society Global Off-Campus Project 1	0-0-2	3,4,5	B, C	
		SMT.D612.L		★	Super Smart Society Global Off-Campus Project 2	0-0-4	3,4,5	B, C	
		SMT.A631.L		★	Quantum Information Processing	2-0-0	1	A	【Information and Communications Engineering】(ICT.C601)
		SMT.A632.L		★	Fundamentals of Progressive Data Science	1-0-0	1	A	【School of Computing】(XCO.T677)
		SMT.A633.L		★	Fundamentals of Progressive Artificial Intelligence	1-0-0	1	A	【School of Computing】(XCO.T679)
		SMT.A634.L		★	Exercises in Fundamentals of Progressive Artificial Intelligence	0-1-0	1	A	【School of Computing】(XCO.T680)
		SMT.A635.L		★	Progressive Advanced Data Science and Artificial Intelligence 1	1-0-0	1	A	【Center for Data Science and Artificial Intelligence Education】(DSA.A601)
		SMT.A636.L		★	Progressive Advanced Data Science and Artificial Intelligence 2	1-0-0	1	A	【Center for Data Science and Artificial Intelligence Education】(DSA.A602)
		SMT.A637.L		★	Progressive Advanced Data Science and Artificial Intelligence 3	1-0-0	1	A	【Center for Data Science and Artificial Intelligence Education】(DSA.A603)
		SMT.B640.L			Cooperative Education through Research Internships of Super Smart Society	0-0-4	1,3,4,5	B	
Note : • ◎ : Required course, ○ : Restricted elective, ★ : Classes in English • Competencies: 1 = Specialist skills, 2 = Liberal arts skills, 3 = Communication skills, 4 = Applied skills (inquisitive thinking and/or problem finding skills), 5 = Applied skills (practical and/or problem-solving skills) • The character preceding the three digits in the course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D600.R): A: Specialization-related Course B: Perspective-related Course C: Interdisciplinary Skills-related Course D: Global Competencies-related Course Z: Research Seminar									

6. Entrepreneurship Courses and Courses That Can Be Counted as Entrepreneurship Courses

In order to fulfill the completion requirements for the doctoral degree program, students must attain at least four credits in Entrepreneurship Courses, and should satisfy all of the Graduate Attributes (GAs) specified in Table D-1 of the “Entrepreneurship Courses” listed as “Liberal Arts and Basic Science Courses” in the Guide to Graduate Education and International Graduate Program, as well as shown below. Students will be evaluated in regards to GA achievements at the time of their degree completion.

For courses with two GAs, both GAs stipulated for the courses are considered to be acquired if students attain the corresponding credits for those courses.

Entrepreneurship Courses and Major Courses that enable students to acquire GAs and are recognized as equivalent to Entrepreneurship Courses, offered by the Graduate Major, are listed in Table D3 below. Students can also acquire GAs and credits by taking the Entrepreneurship Courses offered by the Center for Entrepreneurship Education (CEE) listed as “Liberal Arts and Basic Science Courses” in the Guide to Graduate Education and International Graduate Program.

As there are some Entrepreneurship Courses without GAs, please check carefully before registering for them.

However, it must be noted that credits attained from courses that are recognized as Entrepreneurship Courses can be counted towards the completion requirements of the doctoral degree program, either for Major Courses or for Entrepreneurship Courses (not for both). Nevertheless, even in cases where credits pertaining to courses that are not considered as Entrepreneurship Courses are attained, the associated GAs may be considered by the Graduate Major to have been acquired.

For Graduate Attributes, refer to the Guide to Entrepreneurship Courses.

The Graduate Attributes of the Doctoral Degree Program are listed in Table D-1 as follows:

GA0D: You can clearly design your own career and contribute to realizing scientific, technological, or social innovation through a comprehensive understanding of the knowledge, skills, social responsibilities and ethics required to become an active member of academia and/or industry.

GA1D: You can lead in realizing scientific, technological, or social innovation by acquiring advanced leadership skills, entrepreneurship, knowledge and expertise, and by developing social responsibility necessary for materializing your designed career.

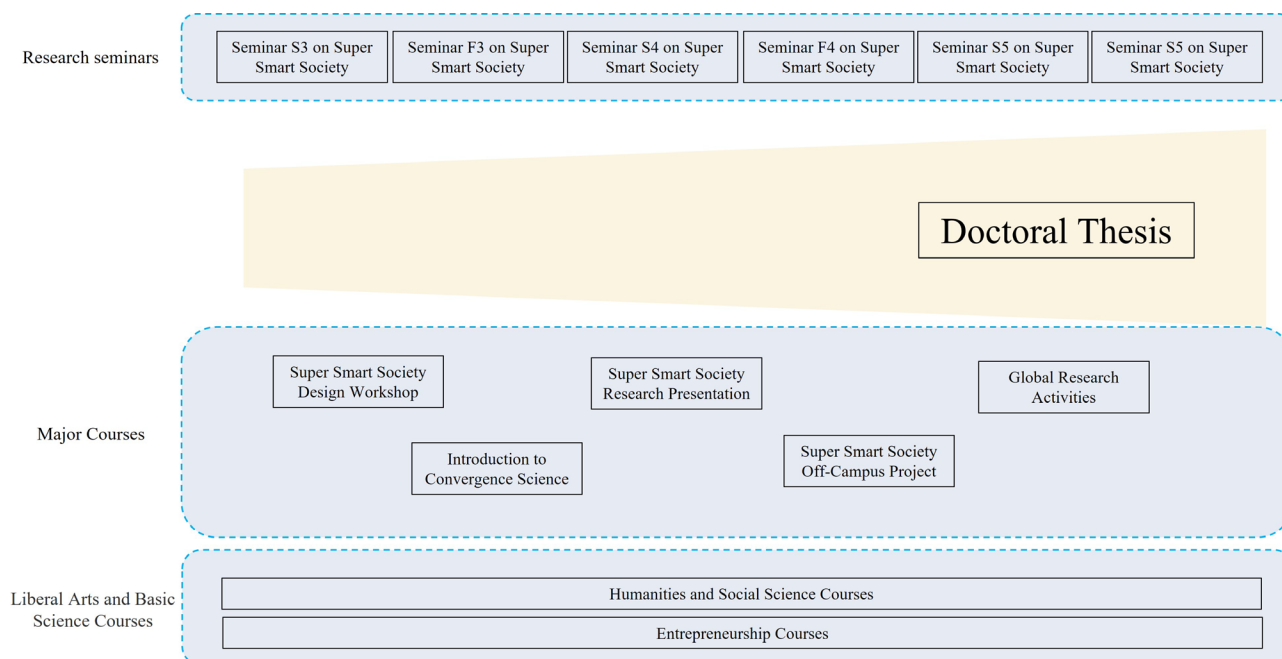
Table D3. Courses of the Graduate Major in Super Smart Society recognized as equivalent to Entrepreneurship Courses, and Entrepreneurship Courses

Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Entrepreneurship Courses	SMT.B601.L		★	Introduction to Convergence Science: Quantum Science	1-0-0	GA1D	B, C	
	SMT. B602.L		★	Introduction to Convergence Science: Smart Healthcare	1-0-0	GA0D	B, C	
	SMT. B603.L		★	Introduction to Convergence Science: Smart Agriculture	1-0-0	GA0D	B, C	
	SMT. B604.L		★	Introduction to Convergence Science: Smart Workplaces	1-0-0	GA1D	B, C	
	SMT. B605.L		★	Introduction to Convergence Science: Smart Production	1-0-0	GA1D	B, C	
	SMT. B606.L		★	Introduction to Convergence Science: Smart Ocean	1-0-0	GA0D	B, C	
	SMT.B631.L		★	Super Smart Society Global Off-Campus Project 1	0-0-2	GA0D /GA1D	B, C	
	SMT.B632.L		★	Super Smart Society Global Off-Campus Project 2	0-0-4	GA0D /GA1D	B, C	
	SMT.B633.L		★	Super Smart Society Off-Campus Project for Career Development 1	0-0-2	GA0D /GA1D	B, C	
	SMT.B634.L		★	Super Smart Society Off-Campus Project for Career Development 2	0-0-4	GA0D /GA1D	B, C	
	SMT.B635.L			Ota City Start-up Practical Off-Campus Project	0.5-0-1.5	GA0D	B, C	
	SMT.B640.L			Cooperative Education through Research Internships of Super Smart Society	0-0-4	GA1D	B	

Entrepreneurship Courses	SMT.R611.L			Doctorial Recurrent Program of Super Smart Society	0-0-4	GA0D GA1D		Entrepreneurship Course offered by the Graduate Major in Super Smart Society. (Cannot be counted for Major Courses)
★ : Classes in English Credits in Entrepreneurship Courses must be attained from among the above-listed courses and those listed as such in the Liberal Arts and Basic Science Courses Guide. *GA: Graduate Attributes								

The Center for Data Science and Artificial Intelligence Education may offer courses that are recognized as equivalent to Entrepreneurship Courses in addition to those listed as such under “Liberal Arts and Basic Science Courses” in the Guide to Graduate Education and International Graduate Program. For details about available courses or completion requirements, please refer to the study guide of the center that offers the relevant program.

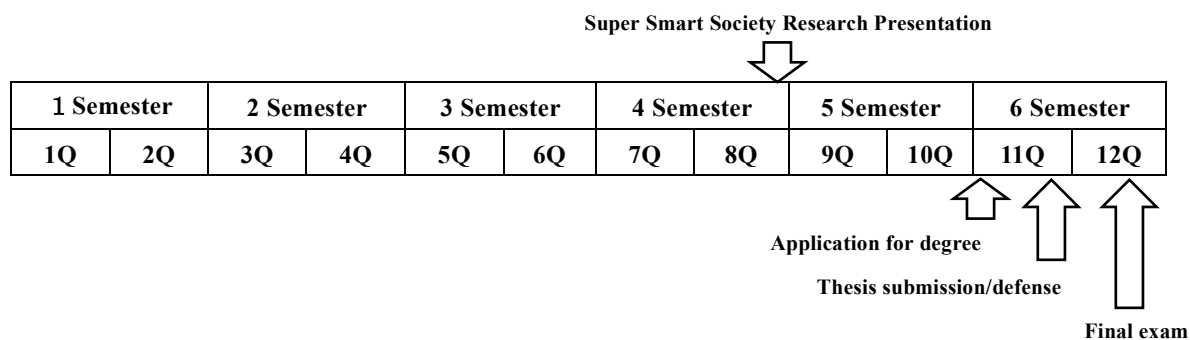
7. Overview of Curriculum System



9. Research Related to the Completion of Doctoral Thesis

During the doctoral thesis research, students develop their own skills in setting up the subjects of significant importance and abilities to solve them. At the same time, communication skills in English are acquired.

In order to obtain the doctors degree, the thesis presentation and the final exam are required and are to be reviewed by referees.



Super Smart Society Research Presentation

As a general rule, students will complete the relevant courses by one year before completion, at which point they will give a presentation on their research progress and undergo an oral examination.

Doctoral thesis review preparation

The doctoral thesis must be an original paper authored by the student that demonstrates sufficient academic merit and novelty in a field related to the Super Smart Society. The main portion of the thesis needs to have been published in an international academic journal or meet the standard for publication in one. The doctoral dissertation may be written in Japanese or English.

Doctoral thesis review method

The screening committee will consist of five or more examiners. After passing the review of the SSS Research Presentation, the thesis will be submitted. Following an oral presentation, the examiners will conduct a preliminary review, which is followed by a final review and evaluation. In the final review, the student's understanding of the relevant field will be confirmed via oral examination.