Graduate Major in Computer Science

【Master's Degree Program】

1. Outline

We cultivate individuals who have broad expertise in advanced theories and technologies relating to information infrastructure, information systems, and information services that are indispensable to modern society. Our students will become individuals who use this knowledge to contribute to the world by not only presenting solutions to problems that have given due consideration to the impact they will have on people and society, but also by developing and implementing these solutions.

2. Competencies Developed

After completing the program, students will acquire the following competencies:
- ・ Deep expertise in cutting-edge hardware and software necessary for information infrastructure, information systems, and information services as well as logical reasoning skills
- ・ Extensive education and ethical values for building systems useful to society with a firm understanding of what is required by people and society
- ・ Ability to grasp the essence of problems and solve these with a flexible mindset based on expertise
- ・ Communication and leadership skills for making international contributions

3. Learning Goals

- A) Advanced courses in computer science
- B) Applied courses in computer science
- C) Courses for developing broad perspectives and self-determination
- D) Courses for learning social relations and science and engineering ethics
- E) Courses for improving communicative competence

4. IGP Completion Requirements

The following requirements must be met to complete the Master's Degree Program of this major.

1. Attain a total of 30 credits or more from 400- and 500-level courses.

2. From the courses specified in the Graduate Major in Computer Science curriculum,

   - ・ eight credits acquired from Research Seminars;

   - ・ a minimum of eight credits acquired from Major Courses; and

   - ・ a minimum of five credits acquired from Liberal Arts and Basic Science Courses (Three credits from Humanities and Social Science Courses of which two credits must be from 400-level courses and one credit from 500-level

courses, and two credits from Entrepreneurship Courses).

3. Pass the master's thesis review and defense.

Table M1 shows course categories and the number of credits required to complete the Master's 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 M1. Completion Requirements of the Graduate Major in Computer Science

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 from 400-level •1 credit from 500-level	5 credits	C	
	Entrepreneurship Courses		2 credits		C,D	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses					
Core courses	Research seminars	Seminar on Computer Science S1 Seminar on Computer Science F1 Seminar on Computer Science S2 Seminar on Computer Science F2 A total of 8 credits, 2 credits each from the above courses.		18 credits	C,D,E	
	Research-related courses					
	Major courses		8 credits from Major Courses		A,B,C,D,E	
	Major courses and Research-related courses <u>outside</u> the Graduate Major in Computer Science standard curriculum					
Total required credits		**A minimum of 30 credits including those attained according to the above conditions**				
Note		• **For further details of the completion requirements, ask Head of Graduate Studies in Computer Science.** • **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. IGP Courses

Table M2 shows the Core Courses of the Master's Degree Program in 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 M2. Core Courses of the Graduate Major in Computer Science

Course category		Course number			Course title	Credits	Competencies	Learning goals	Comments
Research seminars	400 level	CSC.Z491.R	◎		Seminar on Computer Science S1	0-2-0	1,3,4,5	E	
		CSC.Z492.R	◎		Seminar on Computer Science F1	0-2-0	1,3,4,5	E	
	500 level	CSC.Z591.R	◎		Seminar on Computer Science S2	0-2-0	1,3,4,5	E	
		CSC.Z592.R	◎		Seminar on Computer Science F2	0-2-0	1,3,4,5	E	
Research-related courses	400 level	CSC.U471.L			Internship A (Computing)	0-0-2	3,4,5	C,D,E	【School of Computing】(XCO.U471) Available to School of Computing students only
		CSC.U481.L			Workshop on Computer Science I	0-0-1	1,5	B,E	
		CSC.U482.L			Workshop on Computer Science II	0-0-1	1,5	B,E	
	500 level	CSC.U571.L			Internship B (Computing)	0-0-2	3,4,5	C,D,E	【School of Computing】(XCO.U571) Available to School of Computing students only
Major courses	400 level	CSC.T405.L		O	Theory of Algorithms	2-0-0	1	A	【Mathematical and Computing Science】(MCS.T405)
		CSC.T416.L		E	Logic and Computation	2-0-0	1	A	【Mathematical and Computing Science】(MCS.T416)
		CSC.T418.L		O	Practical Parallel Computing	2-0-0	1,5	A,B	Mathematical and Computing Science】(MCS.T418)
		CSC.T421.L		O	Human Computer Interaction	2-0-0	1,4,5	A	
		CSC.T422.L		E	Mathematical Theory of Programs	2-0-0	1,5	A	
		CSC.T426.L			Software Development Methodology	2-0-0	1,3,4,5	A	
		CSC.T431.L			Cyber-Physical Systems	2-0-0	1	A	
		CSC.T433.L			Advanced Computer Architecture	2-0-0	1	A	Only available for students who have taken this course during their bachelor's program
		CSC.T440.L			Computer Organization and Architecture	1-0-0	1	A	
		CSC.T435.L			Practical Software Engineering	2-0-0	1, 3, 5	A	

CSC.T438.L			Distributed Algorithms	2-0-0	1,5	A	
CSC.T441.L			Internet Infrastructure	2-0-0	1,3,4,5	A	Only available for students who have taken this course during their bachelor's program
CSC.T442.L			Internet Applications	2-0-0	1,2,3,4,5	A	Only available for students who have taken this course during their bachelor's program
CSC.T454.L			Advanced Topics in Artificial Intelligence S	2-0-0	1,4	A,D	【Artificial Intelligence】 (ART.T454)
CSC.T458.L			Advanced Machine Learning	2-0-0	1	A	【Artificial Intelligence】 (ART.T458) Priority for students in Graduate Majors in Computer Science and Artificial Intelligence
CSC.T459.L			Natural Language Processing	2-0-0	1	A	【Artificial Intelligence】 (ART.T459)
CSC.T462.L			Complex Networks	2-0-0	1,5	A	【Artificial Intelligence】 (ART.T462)
CSC.T463.L			Computer Graphics	2-0-0	1	A	【Artificial Intelligence】 (ART.T463)
CSC.U472.L			English Presentation Skills A (Computing)	2-0-0	3	E	【School of Computing】 (XCO.U472)
CSC.T473.L			Materials Simulation	2-0-0	1	A, B	【School of Materials and Chemical Technology】 (XMC.A402.L)
CSC.T474.L			Materials Informatics	2.0-0	1	A, B	【School of Materials and Chemical Technology】 (XMC.A404.L) See note below
CSC.T496.L		E	Advanced Topics in Computing AE	1-0-0	1,2	B	【School of Computing】 (XCO.T496)
CSC.T497.L		O	Advanced Topics in Computing AO	1-0-0	1,2	B	【School of Computing】 (XCO.T497)
CSC.T498.L		E	Advanced Topics in Computing BE	1-0-0	1,2	B	【School of Computing】 (XCO.T498)

		O	Advanced Topics in Computing BO	1-0-0	1,2	B	【School of Computing】(XCO.T499)
	CSC.T503.L	O	Programming Language Design	2-0-0	1,3	A	【Mathematical and Computing Science】(MCS.T503)
	CSC.T521.L		Advanced Data Management	2-0-0	1	A	
	CSC.T524.L		Dependable System	1-0-0	1	A	
	CSC.T526.L	E	High Performance Scientific Computing	2-0-0	1,5	A	
	CSC.T527.L		Fault Tolerant Distributed Algorithms	2-0-0	1	A	
500 level	CSC.T528.L		Self-adaptive Systems	1-1-0	1,4,5	A	
	CSC.T543.L		Bioinformatics	2-0-0	1,4	A	【Artificial Intelligence】(ART.T543)
	CSC.T547.L		Multimedia Information Processing	2-0-0	1	A	【Artificial Intelligence】(ART.T547)
	CSC.T548.L		Advanced Artificial Intelligence	2-0-0	1	A	【Artificial Intelligence】(ART.T548) Priority for students in Graduate Majors in Computer Science and Artificial Intelligence

Note :
• ◎ : Required course, ○ : Restricted elective, O : odd academic years, E : even academic years

• 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)
• 【   】Course offered by another graduate major
• Note on CSC.T474.L (Meterials Informatics): Students who have completed XCO.T487 (Fundamentals of Data Science) and XCO.T488 (Exercises in Fundamentals of Data Science) are not eligible to enroll in this course, and vice versa.

6. IGP Courses That Can Be Counted as Humanities and Social Science Courses

None

7. IGP Entrepreneurship Courses and IGP Courses That Can Be Counted as Entrepreneurship Courses

In order to fulfill the completion requirements for the master's degree program, students must attain at least two credits in Entrepreneurship Courses, and should satisfy all of the Graduate Attributes (GAs) specified in Table M-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 M3 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 equivalent to Entrepreneurship Courses can be counted towards the completion requirements of the master's 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 Master's Degree Program are listed in Table M-1 as follows:

GA0M: You can clearly plan your own career and recognize the abilities necessary for realizing it while considering ethics and relevance to societal problems.

GA1M: You can acquire the knowledge, skills, ethics and entrepreneurship necessary for realizing your planned career and contribute to societal problem-solving while collaborating with other experts

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Table M3. Courses of the Graduate Major in Computer Science 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	CSC.U471.L			Internship A (Computing)	0-0-2	GA0M GA1M	C,D,E	【School of Computing】 (XCO.U471) Available to School of Computing students only
	CSC.U472.L			English Presentation Skills A (Computing)	2-0-0	GA0M GA1M	E	【School of Computing】 (XCO.U472)
	CSC.U481.L			Workshop on Computer Science I	0-0-1	GA0M	B,E	Available to Computer Science graduate major students only
	CSC.U482.L			Workshop on Computer Science II	0-0-1	GA1M	B,E	Available to Computer Science graduate major students only
	CSC.U571.L			Internship B (Computing)	0-0-2	GA0M GA1M	C,D,E	【School of Computing】 (XCO.U571) Available to School of Computing students only
Entrepreneurship Courses	XCO.U480			Master's Recurrent Program 1 of school of computing	0-0-1	GA0M GA1M		Entrepreneurship Course offered by School of Computing. (Cannot be counted for Major Courses).

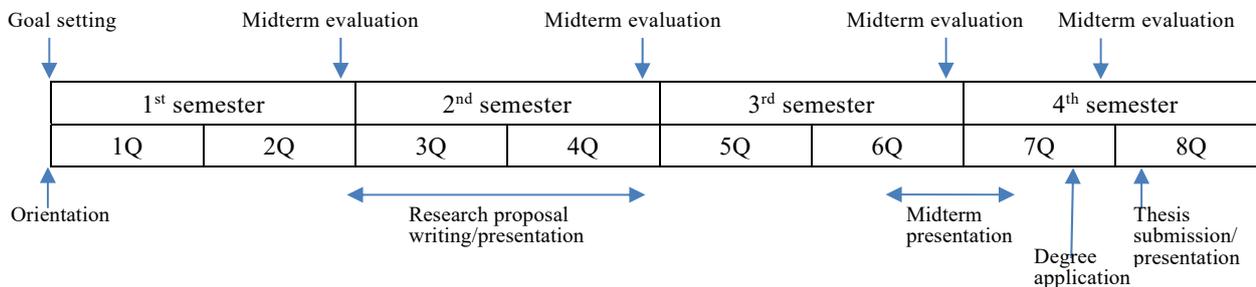| XCO.U479			Master's Recurrent Program 2 of school of computing	0-0-2	GA0M GA1M		Entrepreneurship Course offered by School of Computing. (Cannot be counted for Major Courses)
			- 8 -				

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.

8. Research Related to the Completion of Master's Theses

The students acquire abilities for setting and solving problems, and improve their communication skills through accomplishing their Master's thesis. A rough schedule to take their Master's degree is shown in the figure below.

Goal setting		Midterm evaluation		Midterm evaluation		Midterm evaluation	Midterm evaluation
1st semester		2nd semester		3rd semester		4th semester	
1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q

Orientation — Research proposal writing/presentation — Midterm presentation — Degree application — Thesis submission/presentation

• **Research proposal writing and presentation**
To clarify the background and objectives of their research topic, the students are required to write a research proposal during 3Q~4Q, then are required to give a presentation of their proposals. Those who have finished their proposal and have taken more than or equal to 8 credits from the core courses of their major are allowed to take 600-level major courses. Note that, however, those credits of 600-level courses are not considered for the completion requirements of Master's degree.

• **Qualification of Master's theses**
Master's theses must be written by the students themselves and contain an original new idea contributing to advances in computer science or technology in computer engineering.

• **Judging procedure of Master's theses**
The judging committee of Master's theses consists of at least three professors. The submitted theses are evaluated by the committee members before the defense presentation. The final decision is made after the defense presentation. The judgement is done by more than or equal to five members of the committee for the students who continue their study in the Doctoral degree program.

【Doctoral Degree Program】

1. Outline

We cultivate individuals who have broad expertise in advanced theories and technologies relating to information infrastructure, information systems, and information services that are indispensable to modern society. Our students will become individuals who use this knowledge to contribute to the world by not only presenting solutions to problems that have given due consideration to the impact they will have on people and society, but also by developing and implementing these solutions.

2. Competencies Developed

After completing the program, students will acquire the following competencies:
- Ability to pioneer new fields of learning based on broad, deep expertise in information infrastructure, information systems, and information services
- Ability to discover new problems
- Ability to objectively evaluate the situation in one's own field of expertise from both a technical perspective as well as a broad social perspective
- Strong leadership skills necessary to successfully conduct international joint research and development

3. Learning Goals

A) Courses for developing ability to find and solve problems

B) Courses for developing creativity and communicative competence

C) Courses for developing leadership ability

D) Courses for developing entrepreneurship

E) Courses for developing negotiation ability

4. IGP 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 Computer Science curriculum,

    • Twelve credits acquired from Research Seminars;

    • a minimum of six credits acquired from Liberal Arts and Basic Science Courses

      (Two credits from Humanities and Social Science Courses, and four credits from Entrepreneurship Courses).

3. Pass the PhD dissertation review and 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. Completion Requirements of the Graduate Major in Computer Science

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	
	Entrepreneurship Courses		4 credits		C,D	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses					
Core courses	Research seminars	Seminar on Computer Science S3 Seminar on Computer Science F3 Seminar on Computer Science S4 Seminar on Computer Science F4 Seminar on Computer Science S5 Seminar on Computer Science F5 A total of twelve credits, two credits each from the above courses.		12 credits	A,B,C,D,E	
	Research-related courses					
	Major courses					
	Major courses and Research-related courses <u>outside</u> the Graduate Major in Computer Science standard curriculum					
Total required credits		**A minimum of 24 credits including those attained according to the above conditions**				
Note		・**For further details of the completion requirements, ask Head of Graduate Studies in Computer Science.** ・**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. IGP 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 Computer Science

Course category		Course number			Course title	Credits	Competencies	Learning goals	Comments
Research seminars	600 level	CSC.Z691.R	◎		Seminar on Computer Science S3	0-2-0	1,3,4,5	A,B	
		CSC.Z692.R	◎		Seminar on Computer Science F3	0-2-0	1,3,4,5	A,B	
		CSC.Z693.R	◎		Seminar on Computer Science S4	0-2-0	1,3,4,5	A,B	
		CSC.Z694.R	◎		Seminar on Computer Science F4	0-2-0	1,3,4,5	A,B	
		CSC.Z695.R	◎		Seminar on Computer Science S5	0-2-0	1,3,4,5	A,B	
		CSC.Z696.R	◎		Seminar on Computer Science F5	0-2-0	1,3,4,5	A,B	
Research-related courses	600 level	CSC.U671.L			Internship C (Computing)	0-0-2	3,4,5	C,D,E	【School of Computing】(XCO.U671) Available to School of Computing students only
		CSC.U672.L			English Presentation Skills B (Computing)	2-0-0	3	E	【School of Computing】(XCO.U672)
		CSC.X681.L			Forum on Computing S3	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U681)
		CSC.X682.L			Forum on Computing F3	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U682)
		CSC.X683.L			Forum on Computing S4	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U683)
		CSC.X684.L			Forum on Computing F4	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U684)
		CSC.X685.L			Forum on Computing S5	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U685)
		CSC.X686.L			Forum on Computing F5	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U686)
		CSC.I661.L			InfoSyEnergy-outreach	0-0-1		B,C,D	【Academy of Energy and Informatics】(ENI.A601)

		CSC.I662.L		InfoSyEnergy-international forum 1	0-0-2		B,C,E	【Academy of Energy and Informatics】(ENI.B611)
		CSC.I663.L		InfoSyEnergy-international forum 2	0-0-2		B,C,E	【Academy of Energy and Informatics】(ENI.B612)
		CSC.I664.L		InfoSyEnergy-international forum 3	0-0-2		B,C,E	【Academy of Energy and Informatics】(ENI.B613)
		CSC.I667.L		InfoSyEnergy-international field work-short term	0-0-2		A,B,C,D,E	【Academy of Energy and Informatics】(ENI.C616)
		CSC.I668.L		InfoSyEnergy-international field work-long term	0-0-4		A,B,C,D,E	【Academy of Energy and Informatics】(ENI.C617)
Major courses	600 level	CSC.T673.L		Advanced Topics in Computing C	2-0-0	1,2	B	【School of Computing】(XCO.T673)
		CSC.T674.L		Advanced Topics in Computing D	2-0-0	1,2	B	【School of Computing】(XCO.T674)
		XCO.U697.L		Cooperative Education through Research Internships of Computing	0-0-4		C,D,E	

Note :
• ◎ : Required course, ○ : Restricted elective, O : odd academic years, E : even academic years
• 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)
• 【 】 Course offered by another graduate major

6. IGP Courses That Can Be Counted as Humanities and Social Science Courses

None

7. IGP Entrepreneurship Courses and IGP 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 Computer Science recognized as equivalent to Entrepreneurship Courses, and Entrepreneurship Courses
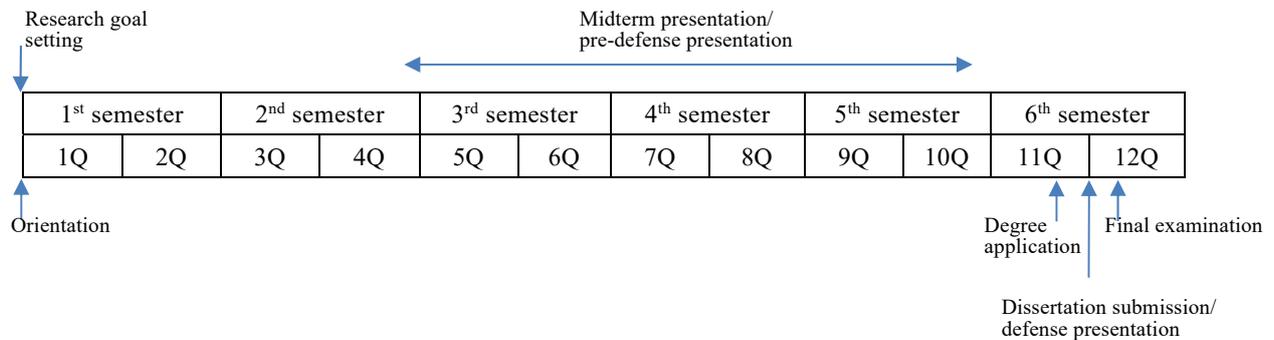
Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Entrepreneurship Courses	CSC.U671.L			Internship C (Computing)	0-0-2	GA1D	C,D,E	【School of Computing】(XCO.U671) Available to School of Computing students only
	CSC.U672.L			English Presentation Skills B (Computing)	2-0-0	GA0D GA1D	E	【School of Computing】(XCO.U672)
	CSC.X681.L			Forum on Computing S3	0-0-1	GA0D GA1D	B,C,D	【School of Computing】(XCO.U681)
	CSC.X682.L			Forum on Computing F3	0-0-1	GA1D	B,C,D	【School of Computing】(XCO.U682)
	CSC.X683.L			Forum on Computing S4	0-0-1	GA0D GA1D	B,C,D	【School of Computing】(XCO.U683)
	CSC.X684.L			Forum on Computing F4	0-0-1	GA1D	B,C,D	【School of Computing】(XCO.U684)
	CSC.X685.L			Forum on Computing S5	0-0-1	GA0D GA1D	B,C,D	【School of Computing】(XCO.U685)
	CSC.X686.L			Forum on Computing F5	0-0-1	GA1D	B,C,D	【School of Computing】(XCO.U686)
	CSC.I661.L			InfoSyEnergy-outreach	0-0-1	GA1D	B,C,D	【Academy of Energy and Informatics】(ENI.A601)
	CSC.I662.L			InfoSyEnergy-international forum 1	0-0-2	GA0D GA1D	B,C,E	【Academy of Energy and Informatics】(ENI.B611)
	CSC.I663.L			InfoSyEnergy-international forum 2	0-0-2	GA0D GA1D	B,C,E	【Academy of Energy and Informatics】(ENI.B612)
	CSC.I664.L			InfoSyEnergy-international forum 3	0-0-2	GA0D GA1D	B,C,E	【Academy of Energy and Informatics】(ENI.B613)

	CSC.I667.L			InfoSyEnergy-international field work-short term	0-0-2	GA0D GA1D	A,B,C,D,E	【Academy of Energy and Informatics】 (ENI.C616)
	CSC.I668.L			InfoSyEnergy-international field work-long term	0-0-4	GA0D GA1D	A,B,C,D,E	【Academy of Energy and Informatics】 (ENI.C617)
	XCO.U697.L			Cooperative Education through Research Internships of Computing	0-0-4	GA1D	C,D,E	
Entrepreneurship Courses	XCO.U698			Doctoral Recurrent Program 4 of school of computing	0-0-4	GA0D GA1D		Entrepreneurship Course offered by School of Computing. (Cannot be counted for Major Courses)
	XCO.U699			Doctoral Recurrent Program 2 of school of computing	0-0-2	GA0D GA1D		Entrepreneurship Course offered by School of Computing. (Cannot be counted for Major Courses).

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.

8. Research Related to the Completion of Doctoral Dissertations

The students acquire abilities for setting and solving problems, and improve their communication skills, particularly in their second language. through accomplishing their Doctoral dissertation. A rough schedule to take their Doctoral degree is shown in the figure below.

Research goal setting				Midterm presentation/ pre-defense presentation							
1st semester		2nd semester		3rd semester		4th semester		5th semester		6th semester	
1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q	9Q	10Q	11Q	12Q

Orientation — (1Q)

Degree application / Dissertation submission/ defense presentation — (11Q)

Final examination — (12Q)

• Qualification of Doctoral dissertations

Doctoral dissertations must be written by the students themselves and contain an original new idea contributing to advances in computer science or technology in computer engineering.

• Judging procedure of Doctoral dissertations

The judging committee of Doctoral dissertations consists of at least five professors. After the midterm presentation and pre-defense presentation, the submitted dissertations are evaluated by the committee members before the defense presentation. The final decision is made after the final examination where the students' English proficiency and the knowledge in their specialized field are judged.