Graduate Major in Artificial Intelligence

【Master's Degree Program】

1. Outline

We aim to foster individuals who possess a wide range of basic expertise related to artificial intelligence, such as basic mathematical science, computation theory, and modeling, and can apply these specialized abilities to solve difficult problems by collaborating with members of differing backgrounds and different areas of expertise.

2. Competencies Developed

After completing the program, students will acquire the following competencies:
- Ability to solve real-world problems by applying specialized knowledge of artificial intelligence to develop new artificial intelligence technology
- Ability to grasp complicated real-world subjects in an abstract manner
- Ability to accurately express and communicate one's thoughts and research contents
- Ability to collaborate with members of differing backgrounds and specialties to solve problems

3. Learning Goals

A) Advanced courses in artificial intelligence

B) Applied courses in artificial intelligence

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 Artificial Intelligence 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 Artificial Intelligence

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 Artificial Intelligence S1 Seminar on Artificial Intelligence F1 Seminar on Artificial Intelligence S2 Seminar on Artificial Intelligence 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 outside the Graduate Major in Artificial Intelligence standard curriculum					
Total required credits		A minimum of 30 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. 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 Artificial Intelligence

Course category		Course number		Course title	Credits	Competencies	Learning goals	Comments
Research seminars	400 level	ART.Z491.R	◎	Seminar on Artificial Intelligence S1	0-2-0	1,3,4,5	E	
		ART.Z492.R	◎	Seminar on Artificial Intelligence F1	0-2-0	1,3,4,5	E	
	500 level	ART.Z591.R	◎	Seminar on Artificial Intelligence S2	0-2-0	1,3,4,5	E	
		ART.Z592.R	◎	Seminar on Artificial Intelligence F2	0-2-0	1,3,4,5	E	
Research-related courses	400 level	ART.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
		ART.U481.L		Workshop on Artificial Intelligence I	0-0-1	1,5	B,E	
		ART.U482.L		Workshop on Artificial Intelligence II	0-0-1	1,5	B,E	
	500 level	ART.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	ART.T401.L	O	Analysis on Continuous Systems	2-0-0	1	A	【Mathematical and Computing Science】(MCS.T401)
		ART.T403.L		Statistical Learning Theory	2-0-0	1,5	A	【Mathematical and Computing Science】(MCS.T403)
		ART.T405.L	O	Theory of Algorithms	2-0-0	1	A	【Mathematical and Computing Science】(MCS.T405)
		ART.T416.L	E	Logic and Computation	2-0-0	1	A	【Mathematical and Computing Science】(MCS.T416)
		ART.T421.L	O	Human Computer Interaction	2-0-0	1,4,5	A	【Computer Science】(CSC.T421)
		ART.T441.L		Internet Infrastructure	2-0-0	1,3,4,5	A	【Computer Science】(CSC.T441)

		ART.T442.L			Internet Applications	2-0-0	1,2,3,4,5	C,D,E	【Computer Science】(CSC.T442)
		ART.T454.L			Advanced Topics in Artificial Intelligence S	2-0-0	1,4	A,D	
		ART.T455.L	O		Modeling of Discrete Systems	1-1-0	1,3,5	A	
		ART.T456.L			Non-linear Dynamical Systems	2-0-0	1,4,5	A	
		ART.T457.L			Workshop on Building Advanced Computer Network	2-0-0	1,5	B,E	
		ART.T458.L	O		Advanced Machine Learning	2-0-0	1	A	Priority for students in Graduate Majors in Artificial Intelligence and Computer Science
		ART.T459.L			Natural Language Processing	2-0-0	1	A	
		ART.T462.L			Complex Networks	2-0-0	1,5	A	
		ART.T463.L	O		Computer Graphics	2-0-0	1	A	
		ART.T465.L			Sparse Signal Processing and Optimization	2-0-0	1,4,5	A	
		ART.T466.L			3D Computer Vision	2-0-0	1	A	
		ART.T467.L			Computer Vision	2-0-0	1	A	
		ART.T468.L	E		Mathematical Modeling	2-0-0	1	A	
		ART.U472.L			English Presentation Skills A (Computing)	2-0-0	3	E	【School of Computing】(XCO.U472)
		ART.T496.L	E		Advanced Topics in Computing AE	1-0-0	1,2	B	【School of Computing】(XCO.T496)
		ART.T497.L	O		Advanced Topics in Computing AO	1-0-0	1,2	B	【School of Computing】(XCO.T497)
		ART.T498.L	E		Advanced Topics in Computing BE	1-0-0	1,2	B	【School of Computing】(XCO.T498)
		ART.T499.L	O		Advanced Topics in Computing BO	1-0-0	1,2	B	【School of Computing】(XCO.T499)
	500 level	ART.T543.L			Bioinformatics	2-0-0	1,4	A	
		ART.T545.L			Molecular Simulation	1-1-0	1,5	A	
		ART.T546.L			Design Theory in Biological Systems	2-0-0	1	A	
		ART.T547.L			Multimedia Information Processing	2-0-0	1	A	

ART.T548.L		Advanced Artificial Intelligence	2-0-0	1		A	Priority for students in Graduate Majors in Artificial Intelligence and Computer Science
ART.T551.L		Image and Video Recognition	2-0-0	1		A	
ART.T553.L		Medical and Health Informatics	2-0-0	1		A	
ART.T554.L		Biological Signal Processing and Its Application to Medicine and Engineering	2-0-0	1		A	
ART.T555.L		Responsible Artificial Intelligence	2-0-0	1		A	

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 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

Table M3. Courses of the Graduate Major in Artificial Intelligence recognized as equivalent to Entrepreneurship Courses, and

Entrepreneurship Courses

Course category	Course number			Course title	Credits	GA*	Learning goals	Comments
	ART.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
	ART.U472.L			English Presentation Skills A (Computing)	2-0-0	GA0M GA1M	E	【School of Computing】 (XCO.U472)
	ART.U481.L			Workshop on Artificial Intelligence I	0-0-1	GA0M	B,E	Available to Artificial Intelligence graduate major students only
	ART.U482.L			Workshop on Artificial Intelligence II	0-0-1	GA1M	B,E	Available to Artificial Intelligence graduate major students only
	ART.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)

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 Tokyo Tech Academy for Leadership (ToTAL), WISE Programs, or Center of Data Science and Artificial Intelligence 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 academy or 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.
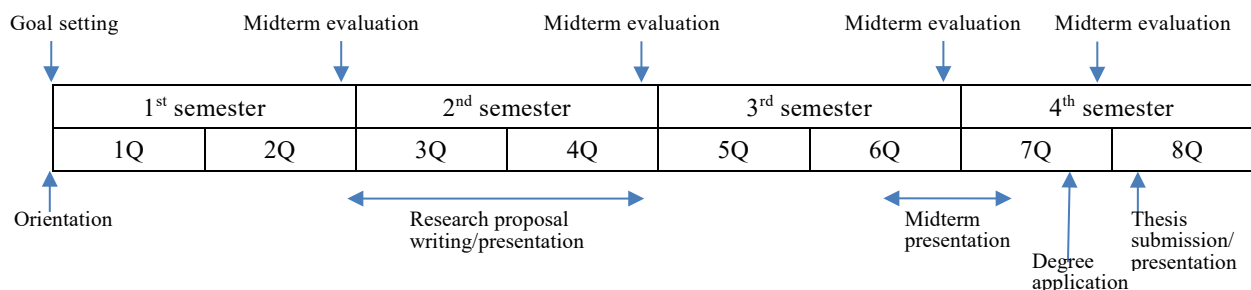
• **Research proposal writing and presentation**

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 artificial intelligence.

• **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 aim to develop individuals who have the ability to apply their expertise in artificial intelligence, define complicated real-world problems precisely, and lead a team of members of differing backgrounds and specialties to solve problems.

2. Competencies Developed

After completing the program, students will acquire the following competencies:
- Ability to pioneer and define new problems in the field of artificial intelligence, and to formulate a research plan
- Ability to grasp complicated real-world subjects in an abstract manner and discern its essence
- Ability to lead a team of members of differing backgrounds and specialties to solve problems
- Ability to disseminate research findings internationally and to lead the field of artificial intelligence

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 Artificial Intelligence 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 Requirement of the Graduate Major in Artificial Intelligence

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 Artificial Intelligence S3 Seminar on Artificial Intelligence F3 Seminar on Artificial Intelligence S4 Seminar on Artificial Intelligence F4 Seminar on Artificial Intelligence S5 Seminar on Artificial Intelligence 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 Artificial Intelligence 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. 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 Artificial Intelligence

Course category		Course number			Course title	Credits	Competencies	Learning goals	Comments
Research seminars	600 level	ART.Z691.R	◎		Seminar on Artificial Intelligence S3	0-2-0	1,3,4,5	A,B	
		ART.Z692.R	◎		Seminar on Artificial Intelligence F3	0-2-0	1,3,4,5	A,B	
		ART.Z693.R	◎		Seminar on Artificial Intelligence S4	0-2-0	1,3,4,5	A,B	
		ART.Z694.R	◎		Seminar on Artificial Intelligence F4	0-2-0	1,3,4,5	A,B	
		ART.Z695.R	◎		Seminar on Artificial Intelligence S5	0-2-0	1,3,4,5	A,B	
		ART.Z696.R	◎		Seminar on Artificial Intelligence F5	0-2-0	1,3,4,5	A,B	
Research-related courses	600 level	ART.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
		ART.U672.L			English Presentation Skills B (Computing)	2-0-0	3	E	【School of Computing】(XCO.U672)
		ART.X681.L			Forum on Computing S3	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U681)
		ART.X682.L			Forum on Computing F3	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U682)
		ART.X683.L			Forum on Computing S4	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U683)
		ART.X684.L			Forum on Computing F4	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U684)
		ART.X685.L			Forum on Computing S5	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U685)
		ART.X686.L			Forum on Computing F5	0-0-1	2,3,4,5	B,C,D	【School of Computing】(XCO.U686)

		ART.I661.L			InfoSyEnergy-outreach	0-0-1		B,C,D	【Academy of Energy and Informatics】(ENI.A601)
		ART.I662.L			InfoSyEnergy-international forum 1	0-0-2		B,C,E	【Academy of Energy and Informatics】(ENI.B611)
		ART.I663.L			InfoSyEnergy-international forum 2	0-0-2		B,C,E	【Academy of Energy and Informatics】(ENI.B612)
		ART.I664.L			InfoSyEnergy-international forum 3	0-0-2		B,C,E	【Academy of Energy and Informatics】(ENI.B613)
		ART.I667.L			InfoSyEnergy-international field work-short term	0-0-2		A,B,C,D,E	【Academy of Energy and Informatics】(ENI.C616)
		ART.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	ART.T673.L			Advanced Topics in Computing C	2-0-0	1,2	B	【School of Computing】(XCO.T673)
		ART.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	1,3,4,5	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 Artificial Intelligence 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	ART.U671.L			Internship C (Computing)	0-0-2	GA1D	C,D,E	【School of Computing】(XCO.U671) Available to School of Computing students only
	ART.U672.L		English Presentation Skills B (Computing)		2-0-0	GA0D GA1D	E	【School of Computing】(XCO.U672)
	ART.X681.L		Forum on Computing S3		0-0-1	GA0D GA1D	B,C,D	【School of Computing】(XCO.U681
	ART.X682.L		Forum on Computing F3		0-0-1	GA1D	B,C,D	【School of Computing】(XCO.U682)

|	ART.X683.L			Forum on Computing S4	0-0-1	GA0D GA1D	B,C,D	【School of Computing】 (XCO.U683)
	ART.X684.L			Forum on Computing F4	0-0-1	GA1D	B,C,D	【School of Computing】 (XCO.U684)
	ART.X685.L			Forum on Computing S5	0-0-1	GA0D GA1D	B,C,D	【School of Computing】 (XCO.U685)
	ART.X686.L			Forum on Computing F5	0-0-1	GA1D	B,C,D	【School of Computing】 (XCO.U686)
	ART.I661.L			InfoSyEnergy-outreach	0-0-1	GA1D	B,C,D	【School of Computing】 (ENI.A601)
	ART.I662.L			InfoSyEnergy-international forum 1	0-0-2	GA0D GA1D	B,C,E	【Academy of Energy and Informatics】 (ENI.B611)
	ART.I663.L			InfoSyEnergy-international forum 2	0-0-2	GA0D GA1D	B,C,E	【Academy of Energy and Informatics】 (ENI.B612)
	ART.I664.L			InfoSyEnergy-international forum 3	0-0-2	GA0D GA1D	B,C,E	【Academy of Energy and Informatics】 (ENI.B613)
	ART.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)
	ART.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 Tokyo Tech Academy for Leadership (ToTAL), WISE Programs, or Center of Data Science and Artificial Intelligence 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 academy or 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.
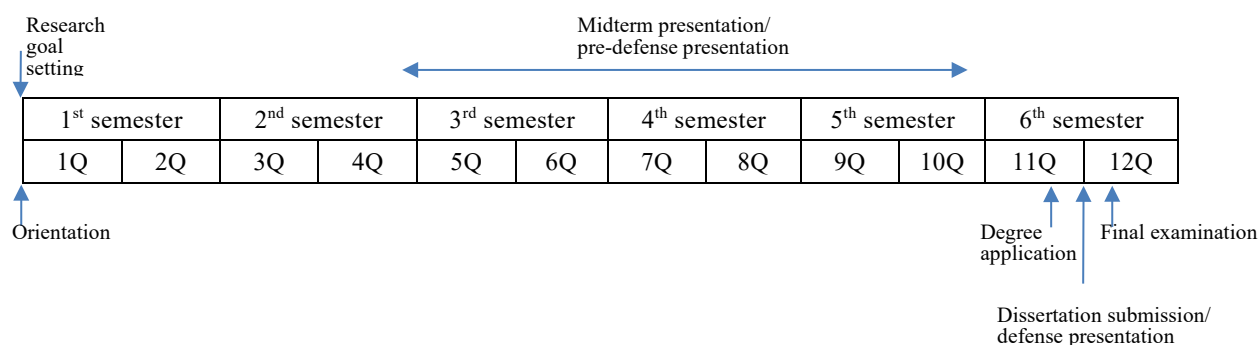
• **Qualification of Doctoral dissertations**

Doctoral dissertations must be written by the students themselves and contain an original new idea contributing to advances in artificial intelligence.

• **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.