Graduate Major in Global Engineering for Development, Environment and Society

【Master's Degree Program】

1. Outline

Science and technology have advanced dramatically owing to the specialization or subdivision of existing academic disciplines. Meanwhile, the world appears to have shrunk rapidly with the spread of globalization. Despite these developments, complex problems such as global environmental issues have continued to plague the global society. Simple integration of technologies that are produced from each specialization is not enough to solve these problems. Furthermore, changes in the industrial structure have been accelerating because of innovation and the maturity of various industries and societies of developed nations. Creation of new technologies, values, and concepts that offer a new perspective without being biased towards the framework of existing modern academic systems is urgently needed.

The aim of the Graduate Major in Global Engineering for Development, Environment and Society (GEDES) is to build the ability or environment for (1) the creation of new technologies, values, and concepts required by society; and (2) the elucidation and treatment of numerous problems faced by the global society through holistic and accurate understanding; without bias towards the framework of existing academic systems, and with strong resilience to inevitable social changes. Moreover, the education program aims to train global engineers that possess the ability to “co-create”, high-level communication skills, and management skills. Hence, they will be able to work effectively with specialists of different fields, leading multiple projects or an organization.

2. Competencies Developed

In this program, students will acquire the following skills:

I. Fundamental ability applicable to diverse related fields
- Theoretical and mathematical ability to think and analyze
- Ability to understand physical and natural phenomena
- Ability to use measurement and calculation technology for general purpose

II. Application ability without being biased towards the framework of the existing academic system
- Ability to solve a problem using an appropriate method
- Ability to plan, propose, and examine the new technology, value, and concept
- Ability to design and operate a system

III. Global Engineering Skills
- Ability to work in international cooperation (communication and presentation)
- Social responsibility and sense of ethics
- Self-deployment skills (autonomy and ability to take action)

3. Learning Goals

The department offers the educational program for the following purposes to allow students to master the above-mentioned skills:

A) Acquire the basic academic skills to specialize in the field of global engineering for development, environment, and society (to master I):

By acquiring the basic academic skills to specialize in the field of global engineering for development, environment, and society, students will find out the problem and improve their understanding of the methodology to solve it.

B) Acquire the academic skills in the diverse fields related to global engineering for development, environment, and society (to master I and II)

Students will acquire not only the academic skills of one specialized field but also the interdisciplinary academic skills across several related fields.

C) Acquire the ability to find out and solve the problem by themselves (to master II and III)

Acquire and develop the practical skills to solve a problem through lecture and practice on a social, environmental, and international project while complying with engineer's ethics

D) Acquire the ability to understand and systematize the latest trend in the research field (to master II and III)

Students will develop research abilities to systematize studies conducive to the development of the specialized field. They will understand the relevance and contribution of one's own studies as well as the latest research trend in the field.

E) Acquire practical international communication skills (to master III)

Students will cultivate communication skills in the mixed educational environment in laboratories that includes both Japanese and foreign students. In addition, students will acquire the practical skills to work in international cooperation through practical experience including international internship.

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. Fulfill requirements in Table M1 below.
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. Graduate Major in Global Engineering for Development, Environment and 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 from 400-level •1 credit from 500-level	5 credits	C	
	Entrepreneurship Courses		2 credits		C,D,E	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses					
Core courses	Research seminars	Seminar for Global Engineering S1 Seminar for Global Engineering F1 Seminar for Global Engineering S2 Seminar for Global Engineering F2 A total of 8 credits, 2 credits each from the above courses.		24 credits	A,B,C,D,E	
	Research-related courses				D,E	
	Major courses	Project Design & Management S Project Design & Management F A total of 4 credits, 2 credits each from the above courses.	12 credits		A,B,C,D,E	
	Major courses and Research-related courses <u>outside</u> the Graduate Major in Global Engineering for Development, Environment and Society standard curriculum				B,C	

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 Global Engineering for Development, Environment and Society

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Research seminars	400 level	GEG.Z491.R	◎		Seminar for Global Engineering S1	0-2-0	1,3,5	A,B,C,D,E	
		GEG.Z492.R	◎		Seminar for Global Engineering F1	0-2-0	1,3,5	A,B,C,D,E	
	500 level	GEG.Z591.R	◎		Seminar for Global Engineering S2	0-2-0	1,3,5	A,B,C,D,E	
		GEG.Z592.R	◎		Seminar for Global Engineering F2	0-2-0	1,3,5	A,B,C,D,E	
Major courses	400 level	GEG.E401.L			Global Environmental System and Ecosystem Dynamics	2-0-0	1,4,5	A,B	
		GEG.E404.L			Technologies for Energy and Resource Utilization	1-0-0	1,2,3	A,C,D	
		GEG.E411.L			Atmospheric Environment in Megacities	2-0-0	1	A,B,C	
		GEG.E412.L			Hydrology and Water Resources Conservation	2-0-0	1,2,3,5	A,B	
		GEG.E413.L			Geospatial data analysis for environment studies	1-0-0	3,4,5	A,B,C,D	
		GEG.E421.L			Energy & Environment-1	1-0-0	1,5	A,B,E	
		GEG.P411.L			Project Evaluation for Sustainable Society	1-0-0	1,4,5	A,B,C	
		GEG.P451.R	◎		Project Design & Management S	0-1-1	2,3,5	B,C,E	
		GEG.P452.R	◎		Project Design & Management F	0-1-1	2,3,4,5	B,C,E	

		GEG.S401.L			Environmental Policy	1-0-0	1,2,4	A,B	
		GEG.S402.L			The economics and systems analysis of environment, resources and technology	1-0-0	1,4,5	A,B	
		GEG.S412.L			Methods of Analysis for Socioeconomic and Environmental Data	1-0-0	3,5	A,C	
		GEG.S413.L			Science Media and Communication	0.5-0.5-0	2,3,5	A,E	
		GEG.S414.L			Methodology of Transdisciplinary Research	0.5-0.5-0	1,2,4	A, B, D	
		GEG.S421.L			Economy of energy system	1-0-0	1,4,5	A,C	【Prior for Energy Science and Informatics Course and Academy of Energy and Informatics Program】 (ESI.A408.A) (ENI.H403)
		GEG.S422.L			Economic Development and Energy Policies	1-0-0	1,4,5	A, B	
		GEG.T412.L			Chemical Process Synthesis for Development	2-0-0	1,5	A,C	
		GEG.T413.L			Basic Behaviormetrics: Theory and Methods	2-0-0	1,5	A,B	
		GEG.T414.L			Linear Wave Theory and Simulation	1-0-0	1	A	
		GEG.T415.L			Properties of Solid Materials	1-0-0	1	A,B	【Mechanical Engineering】 (MEC.E432)
		GEG.T421.L			Energy system theory	1-0-0	1,4	A,C	【Prior for Energy Science and Informatics Course and Academy of Energy and Informatics Program】 (ESI.A407.A)
		GEG.T422.L			Materials Simulation	2-0-0	1	B	【School of Materials and Chemical Technology】
		GEG.T423.L			Materials Informatics	2-0-0	1	B	

									(XMC.A402.L) (XMC.A404.L)
	500 level	GEG.E501.L			Environmental Impact Assessment	1-0-0	1	A,B	
		GEG.E502.L			Environmental Hydraulics	1-0-0	1	A,B	
		GEG.E512.L			Utilization of Resources and Wastes for Environment	1-0-0	1,2,4,5	A,B	
		GEG.E513.L	O		Landscape Ecology	1-0-0	1,5	A	
		GEG.E532.L			Numerical Simulation of Environments	1-0-0	1	A,B	【Urban Design and Built Environment】 (UDE.E506)
		GEG.I501.L			Coastal Disaster Mitigation for Engineers and Planners	1-0-0	1,2,5	A,B,C	
		GEG.S502.L			Sustainable Finance	2-0-0	1, 2	A, B	
		GEG.S503.L			Digital Policy	1-0-0	1,2,4, 5	C,D ,E	
		GEG.T501.L			Introduction to Information and Communication Technologies for Development	1-0-0	1	A,B	
		GEG.T502.L			Perspective and Understanding of Various Kinds of Material and Standardization	1-0-0	2	A,B	
		GEG.T503.L			Introduction to Systems Engineering	1-0-0	3,5	B	
		GEG.T504.L			Application of Systems Engineering	1-1-0	1,2,5	B	【Engineering Sciences and Design】 (ESD.D506)
		GEG.F541.L			Global Engineering Fieldwork A	0-0-1	2,3,4,5	C,E	
		GEG.F542.L			Global Engineering Fieldwork B	0-0-1	2,3,4,5	C,E	
		GEG.F543.L			Global Engineering Fieldwork C	0-0-1	2,3,4,5	C,E	
		GEG.F544.L			Global Engineering Fieldwork D	0-0-1	2,3,4,5	C,E	
		GEG.F551.L			Global Engineering Internship A	0-0-2	2,3,4,5	C,E	
		GEG.F552.L			Global Engineering Internship B	0-0-2	2,3,4,5	C,E	

		GEG.F553.L			Global Engineering Internship C	0-0-2	2,3,4,5	C,E	
		GEG.F554.L			Global Engineering Internship D	0-0-2	2,3,4,5	C,E	
		GEG.F531.L			Global Engineering International Workshop A (Master course)	0-0-1	1,3	D,E	
		GEG.F532.L			Global Engineering International Workshop B (Master course)	0-0-1	1,3	D,E	
		GEG.F533.L			Global Engineering International Workshop C (Master course)	0-0-1	1,3	D,E	
		GEG.F534.L			Global Engineering International Workshop D (Master course)	0-0-1	1,3	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

• 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.D400.R): P (Project), E (Environment), S (Social environmental policy), I (International development), T (Technology), F (Fieldwork, internship), L (Lecture method).

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 Global Engineering for Development, Environment and Society recognized as equivalent to Entrepreneurship Courses

Course category	Course number	Course title	Credits	GA*	Learning goals	Comments
Courses that can be counted as Entrepreneurship Courses	GEG.F541.L - 544L	Global Engineering Fieldwork A, B, C, D	0-0-1	GA1M	C,E	
	GEG.F551.L - 554.L	Global Engineering Internship A, B, C, D	0-0-2	GA1M	C,E	
	GEG.F531.L - 534.L	Global Engineering International Workshop A, B, C, D (Master course)	0-0-1	GA1M	D,E	

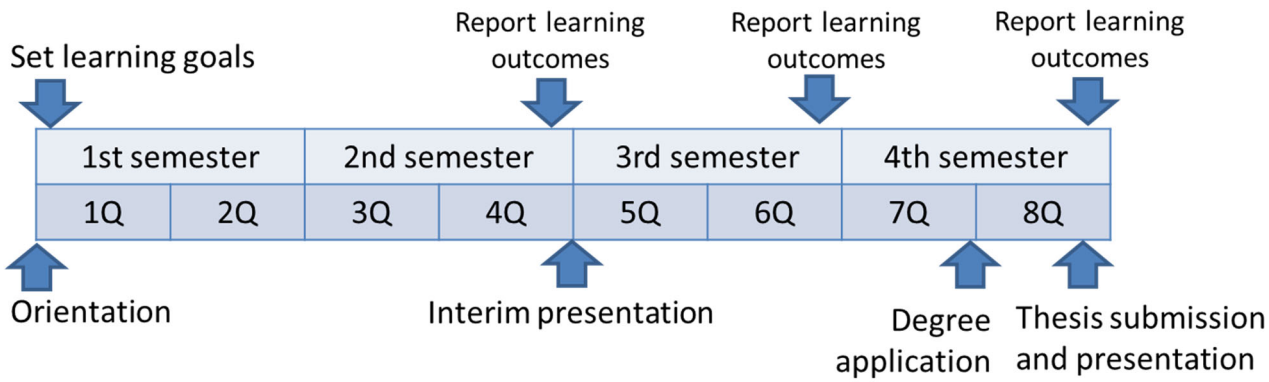
Credits in Entrepreneurship Courses must be attained from among the above-listed courses and those listed as such in the Liberal Arts and Basic Science Courses Guide.

＊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 Theses

Through the Master's thesis research, students shall experience a series of research processes and improve problem solving and communications skills. The timeline of the Master's thesis research is shown below. The items in the upper and lower lines of the table will be conducted in each laboratory and through the course, respectively.



・ Establishing learning objectives and intermediate presentation

Establishing learning objectives (in each laboratory) and orientation (in the course) will be done in 1Q. Both will be geared toward understanding the student's career objectives, as well as his or her research background and the purpose of the research. Requisite intermediate presentations shall be conducted in 4Q. Teaching staff will evaluate students' progress toward learning objectives. When necessary, their goals and/or the content will be revised for the completion of the Master's thesis.

・ Examination criteria for the Master's thesis

The Master's thesis shall be an original composition. It must contain the original discussion with new findings in a field of global engineering for development, environment, and society, or useful findings contributing to the development of science and engineering.

・ Implementation of the thesis examination

The Master's thesis panel shall consist of a minimum of three judges. The student who want to proceed to the doctor course will be examined by five judges. After the preliminary review of the thesis by the judges, the candidate shall have an oral presentation, conducted entirely in English.

【Doctoral Degree Program】

1. Outline

The educational program aims to develop the human resource with an accurate understanding of the framework of science and engineering. The program follows on from the Master's degree course without being biased towards the framework of the system, facilitating the solution of complex problems faced by the international society, as well as the creation of new technology, value, and concept required in the society.

Science and technology have developed dramatically through the advancement, specialization, and subdivision of the existing academic disciplines. Further, the world has shrunk rapidly through the spread of globalization. However, complex problems such as global environmental issues have plagued the international society and cannot be solved by simply integrating each elemental technology. Furthermore, a change in the industrial structure has been accelerated by the maturation of the industry and society of developed countries, including ours. Creation of a new technology, value, and concept that offer a new perspective without being biased towards the framework of the existing academic system is urgently required.

The aim of the educational program is to build the ability to (1) create a new technology, value, and concept required in the society and (2) solve the numerous problems faced by the international society with an accurate understanding, without being biased towards the framework of the existing academic system, to cope with the above social change. Moreover, the education aims to equip global engineers with the "ability to co-create" including communication skills to work effectively in cooperation with an engineer from a different field and management skills to operate multiple projects or an organization.

2. Competencies Developed

In this program, students will acquire the following skills, which are more advanced than in the Master's degree course:

In this program, students will acquire the following skills:

I. Fundamental ability applicable to diverse related fields
- Theoretical and mathematical ability to think and analyze
- Ability to understand physical and natural phenomena
- Ability to use measurement and calculation technology for general purpose

II. Application ability without being biased towards the framework of the existing academic system
- Ability to solve a problem using an appropriate method
- Ability to plan, propose, and examine the new technology, value, and concept
- Ability to design and operate a system

III. Global Engineering Skills
- Ability to work in international cooperation (communication and presentation)
- Social responsibility and sense of ethics
- Self-deployment skills (autonomy and ability to take action)

3. Learning Goals

The department offers the educational program for the following purposes to allow students to master the above-mentioned skills:

A) Acquire the basic academic skills to specialize in the field of global engineering for development, environment, and

society (to master I):

By acquiring the basic academic skills to specialize in the field of global engineering for development, environment, and society, students will find out the problem and improve their understanding of the methodology to solve it.

B) Acquire the academic skills in the diverse fields related to global engineering for development, environment, and society (to master I and II)

Students will acquire not only the academic skills of one specialized field but also the interdisciplinary academic skills across several related fields.

C) Acquire the ability to find out and solve the problem by themselves (to master II and III)

Acquire and develop the practical skills to solve a problem through lecture and practice on a social, environmental, and international project while complying with engineer's ethics

D) Acquire the ability to understand and systematize the latest trend in the research field (to master II and III)

Students will develop research abilities to systematize studies conducive to the development of the specialized field. They will understand the relevance and contribution of one's own studies as well as the latest research trend in the field.

E) Acquire practical international communication skills (to master III)

Students will cultivate communication skills in the mixed educational environment in laboratories that includes both Japanese and foreign students. In addition, students will acquire the practical skills to work in international cooperation through practical experience including international internship.

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. Fulfill requirements in Table D1 below.
3. Pass the doctoral thesis 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. Graduate Major in Global Engineering for Development, Environment and 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	C	
	Entrepreneurship Courses		4 credits		C,D,E	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses					
Core courses	Research seminars	Seminar for Global Engineering S3 Seminar for Global Engineering F3 Seminar for Global Engineering S4 Seminar for Global Engineering F4 Seminar for Global Engineering S5 Seminar for Global Engineering F5 A total of 12 credits, 2 credits each from the above courses.		18 credits	A,B,C,D,E	
	Research-related courses				D,E	
	Major courses				A,B,C,D,E	
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 Global Engineering for Development, Environment and Society

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Research seminars	600 level	GEG.Z691.R	◎		Seminar for Global Engineering S3	0-2-0	1,3,4,5	A,B,C,D,E	
		GEG.Z692.R	◎		Seminar for Global Engineering F3	0-2-0	1,3,4,5	A,B,C,D,E	
		GEG.Z693.R	◎		Seminar for Global Engineering S4	0-2-0	1,3,4,5	A,B,C,D,E	
		GEG.Z694.R	◎		Seminar for Global Engineering F4	0-2-0	1,3,4,5	A,B,C,D,E	
		GEG.Z695.R	◎		Seminar for Global Engineering S5	0-2-0	1,3,4,5	A,B,C,D,E	
		GEG.Z696.R	◎		Seminar for Global Engineering F5	0-2-0	1,3,4,5	A,B,C,D,E	
Research-related courses	600 level	GEG.L631.L			Advanced Theory of Teaching Method 1A	0-1-1	3,5	A,B	
		GEG.L632.L			Advanced Theory of Teaching Method 1B	0-1-1	3,5	A,B	
		GEG.L633.L			Advanced Theory of Teaching Method 1C	0-1-1	3,5	A,B	
		GEG.L634.L			Advanced Theory of Teaching Method 1D	0-1-1	3,5	A,B	
		GEG.L635.L			Advanced Theory of Teaching Method 2A	0-1-1	3,5	A,B	
		GEG.L636.L			Advanced Theory of Teaching Method 2B	0-1-1	3,5	A,B	
		GEG.L637.L			Advanced Theory of Teaching Method 2C	0-1-1	3,5	A,B	
		GEG.L638.L			Advanced Theory of Teaching Method 2D	0-1-1	3,5	A,B	
		GEG.L639.L			Advanced Theory of Teaching Method 3A	0-1-1	3,5	A,B	
		GEG.L640.L			Advanced Theory of Teaching Method 3B	0-1-1	3,5	A,B	
		GEG.L641.L			Advanced Theory of Teaching Method 3C	0-1-1	3,5	A,B	

		GEG.L642.L			Advanced Theory of Teaching Method 3D	0-1-1	3,5	A,B	
		GEG.L643.L			Training in Teaching Method 1A	0-0.5 -0.5	3,5	A,B	
		GEG.L644.L			Training in Teaching Method 1B	0-0.5 -0.5	3,5	A,B	
		GEG.L645.L			Training in Teaching Method 1C	0-0.5 -0.5	3,5	A,B	
		GEG.L646.L			Training in Teaching Method 1D	0-0.5 -0.5	3,5	A,B	
		GEG.L647.L			Training in Teaching Method 2A	0-0.5 -0.5	3,5	A,B	
		GEG.L648.L			Training in Teaching Method 2B	0-0.5 -0.5	3,5	A,B	
		GEG.L649.L			Training in Teaching Method 2C	0-0.5 -0.5	3,5	A,B	
		GEG.L650.L			Training in Teaching Method 2D	0-0.5 -0.5	3,5	A,B	
		GEG.L651.L			Training in Teaching Method 3A	0-0.5 -0.5	3,5	A,B	
		GEG.L652.L			Training in Teaching Method 3B	0-0.5 -0.5	3,5	A,B	
		GEG.L653.L			Training in Teaching Method 3C	0-0.5 -0.5	3,5	A,B	
		GEG.L654.L			Training in Teaching Method 3D	0-0.5 -0.5	3,5	A,B	
		GEG.F651.L			Practice in Company 1A (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F652.L			Practice in Company 1B (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F653.L			Practice in Company 1C (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F654.L			Practice in Company 1D (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F655.L			Practice in Company 2A (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F656.L			Practice in Company 2B (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F657.L			Practice in Company 2C (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F658.L			Practice in Company 2D (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F659.L			Practice in Company 3A (Global Engineering)	0-1-1	1,5	B,C,D	

		GEG.F660.L			Practice in Company 3B (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F661.L			Practice in Company 3C (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.F662.L			Practice in Company 3D (Global Engineering)	0-1-1	1,5	B,C,D	
		GEG.P651.L			Advanced Theory of Co-creation 1A	0-1-1	3,4,5	C,D,E	
		GEG.P652.L			Advanced Theory of Co-creation 1B	0-1-1	3,4,5	C,D,E	
		GEG.P653.L			Advanced Theory of Co-creation 1C	0-1-1	3,4,5	C,D,E	
		GEG.P654.L			Advanced Theory of Co-creation 1D	0-1-1	3,4,5	C,D,E	
		GEG.P655.L			Advanced Theory of Co-creation 2A	0-1-1	4,5	C,D,E	
		GEG.P656.L			Advanced Theory of Co-creation 2B	0-1-1	4,5	C,D,E	
		GEG.P657.L			Advanced Theory of Co-creation 2C	0-1-1	4,5	C,D,E	
		GEG.P658.L			Advanced Theory of Co-creation 2D	0-1-1	4,5	C,D,E	
		GEG.P659.L			Advanced Theory of Co-creation 3A	0-1-1	4,5	C,D,E	
		GEG.P660.L			Advanced Theory of Co-creation 3B	0-1-1	4,5	C,D,E	
		GEG.P661.L			Advanced Theory of Co-creation 3C	0-1-1	4,5	C,D,E	
		GEG.P662.L			Advanced Theory of Co-creation 3D	0-1-1	4,5	C,D,E	
		GEG.P631.L			Global Engineering Off-Campus Project 1A	0-0-1	2,3,4,5	C,D,E	
		GEG.P632.L			Global Engineering Off-Campus Project 1B	0-0-1	2,3, 4,5	C,D,E	
		GEG.P633.L			Global Engineering Off-Campus Project 1C	0-0-1	2,3,4,5	C,D,E	
		GEG.P634.L			Global Engineering Off-Campus Project 1D	0-0-1	2,3,4,5	C,D,E	
		GEG.P635.L			Global Engineering Off-Campus Project 2A	0-0-1	2,3,4,5	C,D,E	
		GEG.P636.L			Global Engineering Off-Campus Project 2B	0-0-1	2,3,4,5	C,D,E	
		GEG.P637.L			Global Engineering Off-Campus Project 2C	0-0-1	2,3,4,5	C,D,E	

		GEG.P638.L			Global Engineering Off-Campus Project 2D	0-0-1	2,3,4,5	C,D,E	
		GEG.P639.L			Global Engineering Off-Campus Project 3A	0-0-1	2,3,4,5	C,D,E	
		GEG.P640.L			Global Engineering Off-Campus Project 3B	0-0-1	2,3,4,5	C,D,E	
		GEG.P641.L			Global Engineering Off-Campus Project 3C	0-0-1	2,3,4,5	C,D,E	
		GEG.P642.L			Global Engineering Off-Campus Project 3D	0-0-1	2,3,4,5	C,D,E	
		GEG.F631.L			Global Engineering International Workshop 1A (Doctor course)	0-0-1	1,3	D,E	
		GEG.F632.L			Global Engineering International Workshop 1B (Doctor course)	0-0-1	1,3	D,E	
		GEG.F633.L			Global Engineering International Workshop 1C (Doctor course)	0-0-1	1,3	D,E	
		GEG.F634.L			Global Engineering International Workshop 1D (Doctor course)	0-0-1	1,3	D,E	
		GEG.F635.L			Global Engineering International Workshop 2A (Doctor course)	0-0-1	1,3	D,E	
		GEG.F636.L			Global Engineering International Workshop 2B (Doctor course)	0-0-1	1,3	D,E	
		GEG.F637.L			Global Engineering International Workshop 2C (Doctor course)	0-0-1	1,3	D,E	
		GEG.F638.L			Global Engineering International Workshop 2D (Doctor course)	0-0-1	1,3	D,E	
		GEG.F639.L			Global Engineering International Workshop 3A (Doctor course)	0-0-1	1,3	D,E	
		GEG.F640.L			Global Engineering International Workshop 3B (Doctor course)	0-0-1	1,3	D,E	
		GEG.F641.L			Global Engineering International Workshop 3C (Doctor course)	0-0-1	1,3	D,E	
		GEG.F642.L			Global Engineering International Workshop 3D (Doctor course)	0-0-1	1,3	D,E	
Major courses	**600 level**	GEG.S601.L			Academic Writing A	1-0-0	3,4	A,B,E	Energy Science and Informatics Course (ESI.E610)
		GEG.S602.L			Academic Writing B	1-0-0	1,2,3,4	A,B,E	Energy Science and Informatics Course (ESI.E611)
		GEG.P673.L			Transdisciplinary Science and Engineering Off-Campus Project S	0-0-4	1,2,3,4,5	C,D,E	

		GEG.P674.L			Transdisciplinary Science and Engineering Off-Campus Project F	0-0-4	1,2,3,4,5	C,D,E	
		GEG.F663.L			Cooperative Education through Research Internships of Global Engineering for Development, Environment and Society	0-0-4	1,3,4,5	B,C,D	

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

• 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): P (Project), E (Environment), S (Social environmental policy), I (International development), T (Technology), F (Fieldwork, internship), L (Lecture method).

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 Global Engineering for Development, Environment and 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	GEG.L631.L-642.L	Advanced Theory of Teaching Method 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D	0-1-1	GA1D	A,B	
	GEG.L643.L-654.L	Training in Teaching Method 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D	0-0.5 -0.5	GA1D	A,B	
	GEG.F651.L-662.L	Practice in Company (Global Engineering) 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D	0-1-1	GA1D	B,C,D	
	GEG.P651.L-662.L	Advanced Theory of Co-creation 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D	0-1-1	GA1D	C,D,E	
	GEG.P631.L-642.L	Global Engineering Off-Campus Project (Global Engineering) 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D	0-0-1	GA1D	C,D,E	
	GEG.F631.L-642.L	Global Engineering International Workshop (Doctor course) 1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D, 3A, 3B, 3C, 3D	0-0-1	GA1D	D,E	
	GEG.P673.L-674.L	Transdisciplinary Science and Engineering Off-Campus Project S, F	0-0-4	GA1D	C,D,E	
	GEG.F663.L	Cooperative Education through Research Internships of Global Engineering for Development, Environment and Society	0-0-4	GA1D	B,C,D	
Entrepreneurship Courses	GEG.R661	Doctoral Recurrent Program 1 of GEDES	0-0-1	GA0D GA1D		Entrepreneurship Course offered by the Graduate Major in Global Engineering for Development, Environment and Society. (Cannot be counted for
	GEG.R662	Doctoral Recurrent Program 2-1 of GEDES	0-0-2	GA0D GA1D		
	GEG.R663	Doctoral Recurrent Program 3 of GEDES	0-0-3	GA0D GA1D		
	GEG.R664	Doctoral Recurrent Program 4 of GEDES	0-0-4	GA0D GA1D		
	GEG.R665	Doctoral Recurrent Program 2-2 of GEDES	0-0-2	GA0D GA1D		

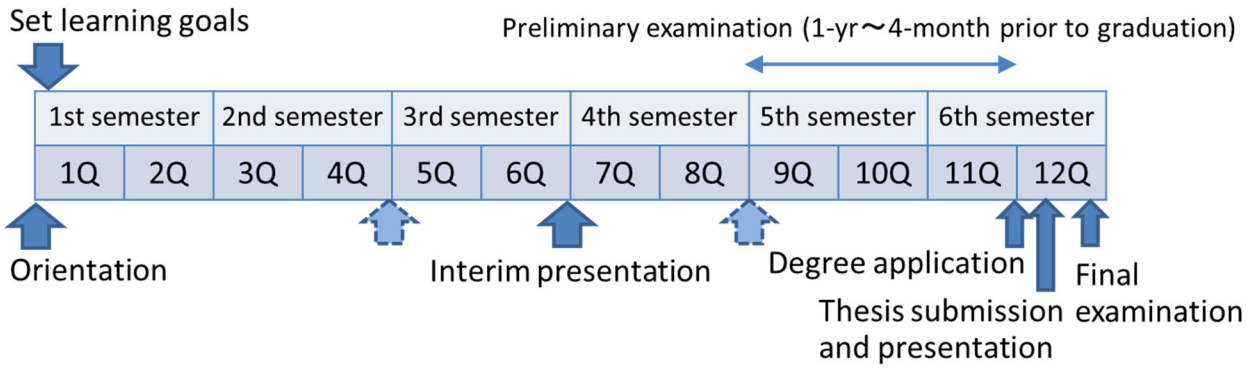
								Major Courses)
Credits in Entrepreneurship Courses must be attained from among the above-listed courses and those listed as such in the Liberal Arts and Basic Science Courses Guide. **＊GA: Graduate Attributes**								

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 Theses

The doctoral thesis research process fosters the ability to find and solve problems and improves English communication skills. These competencies will be acquired through setting and evaluating learning objectives.

The doctoral thesis research timeline is shown below. The items on the upper and lower lines of the table will be conducted in each laboratory and through the course, respectively. The intermediate presentation is regularly set at the end of 6Q. However, the end of 4Q or 8Q can be chosen according to the research progress under the supervisors' approval.



・ Examination criteria for the doctoral thesis

The doctoral thesis shall be an original dissertation with rigorous academic values in a field of global engineering for development, environment, and society. The major part of the thesis shall be published, or written at an acceptable level for publication, in qualified academic journals.

・ Implementation of the thesis examination

The doctoral thesis panel shall consist of a minimum of five judges. After a candidate passes the preliminary examination, he or she shall submit the thesis and conduct an oral presentation, entirely in English. Then, the thesis shall be reviewed by judges and the candidate shall proceed to the final examination/evaluation. For the phase, the candidate's English aptitude and comprehension of the research field shall be tested.