Graduate Major in Nuclear Engineering

【Master's Degree Program】

1. Outline

Growing attention has been placed on nuclear energy as an ultimate measure for reduction of fossil fuel consumption and CO_2 emission. Under the circumstances of global warming and the price hike of oil, gas and coal, a number of countries have been considering the implementation of nuclear power plants. The key factor of the nuclear energy development is the development of human resources. Our original course of international nuclear engineering has been established in 1993. Since then, a number of students have joined us from many countries and graduated from our course. They are actively contributing to the development of industries and technologies in Japan or in their own countries. This graduate course provides with core curriculum for nuclear reactor engineering and fuel cycle technologies and also covers extended nuclear energy, such as laser and particle beams, accelerator, plasma sciences, nuclear fusion, energy and environment, and social relations.

2. Competencies Developed

The curriculum is structured to allow students to acquire advanced specialized knowledge of nuclear engineering, broad vision and education, and a strong sense of ethics and responsibility based on the systematic or comprehensive knowledge of science and engineering learned in the Undergraduate Program. It also enables students to acquire more advanced specialized knowledge, logical dialogue skills, writing skills, practical problem-solving ability, and creativity through Research Seminars and master's thesis research.

3. Learning Goals

The goals provided in the course to obtain the competencies described in the curriculum are as follows:

A) Highly specialized knowledge to understand the essence of challenges in nuclear engineering

B) Broad education and wide view acquired by energy/environment-related classes as well as internship programs

C) Mastery of high ethics and societal responsibilities needed for nuclear engineers

D) Mastery of skills to solve practical problems by interactive classes

E) Master thesis writing guided by academic advisors

F) Mastery of skills to deploy discussion with academic presentations and scientific communications

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 Nuclear Engineering curriculum,
   - 8 credits acquired from Research Seminars;
   - a minimum of 21 credits acquired from courses of Research Seminars, Research-Related Courses, and Major Courses
   - 8 credits acquired from required Major Courses
   - 5 credits acquired from restricted selective Major Courses
   - a minimum of 5 credits acquired from Liberal Arts and Basic Science Courses (3 credits from Humanities and Social Science Courses of which 2 credits must be from 400-level courses and 1 credit from 500-level courses, and 2 credits from Career Development 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. Graduate Major in Nuclear Engineering 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	B	
	Career development courses		2 credits		C	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses				B	
Core courses	**Research seminars**	Seminar in Nuclear Engineering S1 Seminar in Nuclear Engineering F1 Seminar in Nuclear Engineering S2 Seminar in Nuclear Engineering F2 A total of 8 credits, 2 credits each from the above courses.		21 credits	B,D,E,F	
	Research-related courses				B	
	Major courses	8 credits	A total of 5 credits from Restricted electives Group A		A,B	
	Major courses and Research-related Courses <u>outside</u> the Graduate Major in Nuclear Engineering standard				B	

	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 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 M2. Core Courses of the Graduate Major in Nuclear Engineering

Course category		**Course number**			**Course title**	**Credits**	**Competencies**	**Learning goals**	**Comments**
Research seminars	**400 level**	NCL.Z491.R	◎	★	Seminar in Nuclear Engineering S1	0-2-0	1,2,3,4,5	A,B,D,F	
		NCL.Z492.R	◎	★	Seminar in Nuclear Engineering F1	0-2-0	1,2,3,4,5	A,D,F	
	500 level	NCL.Z591.R	◎	★	Seminar in Nuclear Engineering S2	0-2-0	1,2,3,4,5	A,D,F	
		NCL.Z592.R	◎	★	Seminar in Nuclear Engineering F2	0-2-0	1,2,3,4,5	A,D,F	
Research-related courses	**500 level**	NCL.I501.L			Internship in Nuclear Engineering I	0-0-1	2,4,5	B	
		NCL.I502.L			Internship in Nuclear Engineering II	0-0-2	2,4,5	B	
		NCL.I503.L			Internship in Nuclear Reactor Decommissioning I	0-0-1	2,4,5	B	
		NCL.I504.L			Internship in Nuclear Reactor Decommissioning II	0-0-2	2,4,5	B	
		NCL.I505.L		★	International Internship in Nuclear Engineering I	0-0-2	1,2,3,4,5	B	
		NCL.I506.L		★	International Internship in Nuclear Engineering II	0-0-2	1,2,3,4,5	B	
		NCL.I507.L		★	International Internship in Nuclear Engineering III	0-0-2	1,2,3,4,5	B	

		NCL.I508.L		★	International Internship in Nuclear Engineering IV	0-0-2	1,2,3,4, 5	B	
Major courses	400 level	NCL.A401.L		★	Laser and Particle−Beam Technology and Its Medical Applications	2-0-0	3	A	
		NCL.A402.L		★	Nuclear Fusion Reactor Engineering	2-0-0	3	A	
		NCL.B401.L		★ □	Radiation Biology and Medicine	2-0-0	3	A	For ACEEES
		NCL.C401.R	◎	★ □	Nuclear Fuel Cycle Engineering	2-0-0	3	A	For ACEEES
		NCL.C402.L		★	Radioactive Waste Management and Disposal Engineering	1-0-0	3	A	
		NCL.C403.L		★ □	Nuclear Chemical Engineering	1-0-0	3	A	For ACEEES
		NCL.D401.A	○	★	Experiments for Materials related to Decommissioning A	0-0-1	3,5	A	Either NCL.D401.A or NCL.D402.A can be earned.
		NCL.D402.A	○	★	Experiments for Materials related to Decommissioning B	0-0-1	3,5	A	Either NCL.D401.A or NCL.D402.A can be earned.
		NCL.D403.A	○	★	Experiment on Severe Accident Engineering	1-0-1	3,5	A	
		NCL.D404.L			Nuclear Reactor Decommissioning	1-0-0	3	A	
		NCL.D405.A	○	★	Experiments for Nuclear Fuel Debris and Back−end Fuel Cycle A	0-0-1	3	A	Either NCL.D405.A or NCL.D406.A can be earned.
		NCL.D406.A	○	★	Experiments for Nuclear Fuel Debris and Back−end Fuel Cycle B	0-0-1	3	A	Either NCL.D405.A or NCL.D406.A can be earned.
		NCL.F401.L			Ethics for Nuclear System Development	1-0-0	2,3,4,5	C	
		NCL.F402.L			Acts and Regulations on Atomic Energy	1-0-0	3,5	B	
		NCL.F403.L		★	Global Nuclear Security	2-0-0	3	B	
		NCL.N401.L		★ □	Basic Nuclear Physics	2-0-0	3,5	A	For ACEEES
		NCL.N402.R	◎	★ □	Neutron Transport Theory	1-1-0	3,5	A	For ACEEES

		NCL.N403.L		★ □	Nuclear Materials and Structures	2-0-0	3	A	For ACEEES
		NCL.N404.A	○	★	Thermal−Hydraulics and Radiation−Measurement Laboratory	0-0-1	3,5	A	
		NCL.N405.L		★ □	Nuclear Reactor Thermal-hydraulics	2-0-0	3	A	For ACEEES
		NCL.N406.R	◎	★ □	Nuclear Reactor Theory	1-1-0	3,5	A	For ACEEES
		NCL.N407.R	◎	★ □	Nuclear Safety Engineering	2-0-0	3	A	For ACEEES
		NCL.N408.A	○	★	Nuclear Reactor Physics Laboratory	0-0-2	2,3,5	A	
		NCL.N409.L		★	Nuclear Energy Systems	2-0-0	3	A	
		NCL.F451.L			Nuclear Engineering Science I	2-0-0	3	A	
		NCL.F452.L			Nuclear Engineering Science II	2-0-0	3,5	A	
		NCL.F453.L			Low Carbon Sociology	2-0-0	2,4,5	B	
		NCL.F454.L			Safety and Regional Symbiosis for Nuclear Energy	2-0-0	2,4,5	B	
		NCL.U401.L		★ ●	Measurement of Environmental Radiation	1-0-1	2,4,5	A	Only for U-ATOM students
		NCL.U402.L		★ ●	Simulation of Severe Nuclear Accidents	1-1-0	3,5	A	Only for U-ATOM students
		NCL.U403.L		★ ●	Environmental Dynamics of Radioactive Nuclides	1-1-0	3,5	A	Only for U-ATOM students
	500 level	NCL.B501.L			Radiation Health Effects and Protection Exercise	0-1-1	3,5	A,D	
		NCL.D501.L			Special Lecture on Reactor Decommissioning	1-0-0	3	A,B	
		NCL.O501.L			Special Lecture on Nuclear Engineering I	1-0-0	1,3	A,B	
		NCL.O502.L		★	Special Lecture on Nuclear Engineering II	1-0-0	1,3	A,B	
		NCL.O503.L		★	Special Lecture on Nuclear Engineering III	1-0-0	1,3	A,B	
		NCL.O504.L		★	Special Lecture on Nuclear Engineering IV	1-0-0	1,3	A,B	
		NCL.O505.L		★	Special Lecture on Nuclear Engineering V	1-0-0	1,3	A,B	
		NCL.O506.L		★	Special Lecture on Nuclear Engineering VI	1-0-0	1,3	A,B	

		NCL.O507.L		★	Special Lecture on Nuclear Engineering VII	1-0-0	1,3	A,B	
		NCL.O508.L		★	Special Lecture on Nuclear Engineering VIII	1-0-0	1,3	A,B	
		NCL.U501.L		★ ●	Nuclear Dojo 1	1-0-0	1,2,4	A	Only for U-ATOM students
		NCL.U502.L		★ ●	Nuclear Dojo 2	1-0-0	3,4	A	Only for U-ATOM students
		NCL.U503.L		★ ●	Nuclear Dojo 3	1-0-0	1,3,4,5	A	Only for U-ATOM students
		NCL.U504.L		●	Nuclear Engineering Volunteer Activities I	0-0-1	2,4,5	B	Only for U-ATOM students
		NCL.U505.L		●	Nuclear Engineering Volunteer Activities II	0-0-1	2,4,5	B	Only for U-ATOM students
		NCL.U506.L		★ ●	English in a Global World	1-0-0	1,2,5	B	Priority in U-ATOM students
		NCL.U507.L		★ ●	International Relations of Nuclear Technology	1-0-0	1,2,4,5	B	Priority in U-ATOM students
		NCL.U508.L		★ ●	International Political Economy and Energy Strategy	1-0-0	1,2,4,5	B	Priority in U-ATOM students
		NCL.U509.L		★ ●	French Language and Culture	1-0-0	1,2	B	Priority in U-ATOM students
		NCL.U510.L		★ ●	Basic International Law and Diplomacy	1-0-0	1,4	B	Priority in U-ATOM students
		NCL.U511.L		★ ●	History of Research, Development and Utilization of Nuclear Energy	1-0-0	1,3	B	Priority in U-ATOM students

Note：

- ◎：Required course, ○：Restricted elective, ★: Classes in English, O：odd academic years, Ｅ：even academic years
- □：Course recognized as equivalent to that of the Academy for Co-creative Education of Environment and Energy Science (ACEEES).
- ●：Course recognized as equivalent to that of the Academy for Global Nuclear Safety and Security Agent (U-ATOM).
- Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = 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): A (Nuclear fusion and accelerator engineering), B (Radiation biology and medicine), C (Nuclear fuel cycle engineering), D (Nuclear reactor decommissioning engineering), F (Basic nuclear engineering), I (Internships), M (Medical engineering), N (Nuclear reactor engineering), O (Wide and advanced nuclear engineering), U (Leading Graduate School (U-ATOM) subjects), Z (Research seminars).

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

None

7. IGP Courses That Can Be Counted as Career Development Courses

In order to fulfill the completion requirements for the master's degree program, students must attain at least 2 credits in Career Development Courses, and should satisfy all of the Graduate Attributes (GA) specified in Table MA-1 of the "Career Development Courses" (Liberal Arts and Basic Science Courses) in the Guide to Graduate Education and International Graduate Program. Students will be evaluated in regards to GA achievements at the time of their degree completion. As to the courses with more than one GA, the number of GA stipulated for the courses is considered to be acquired regardless of the credits received for the courses.

Major Courses that enable students to acquire GA and that are recognized as equivalent to Career Development Courses are listed in Table M3 below.

However, it must be noted that credits attained from these courses cannot be counted more than once as Major Courses or Career Development Courses towards the completion requirements for the master's degree program.

For Graduate Attributes, refer to the Guide to the Career Development Courses.
The Graduate Attributes of the Master's Degree Program are listed in Table MA-1 as follows:

C0M: Able to delineate one's career plan clearly and recognize the skills necessary to materialize the plan, also considering its relations to the society

C1M: Able to utilize its own expertise to the development of academia and technology, and work with others with different expertise to contribute to problem-solving

Table M3. Courses of the Graduate Major in Nuclear Engineering recognized as equivalent to Career Development Courses

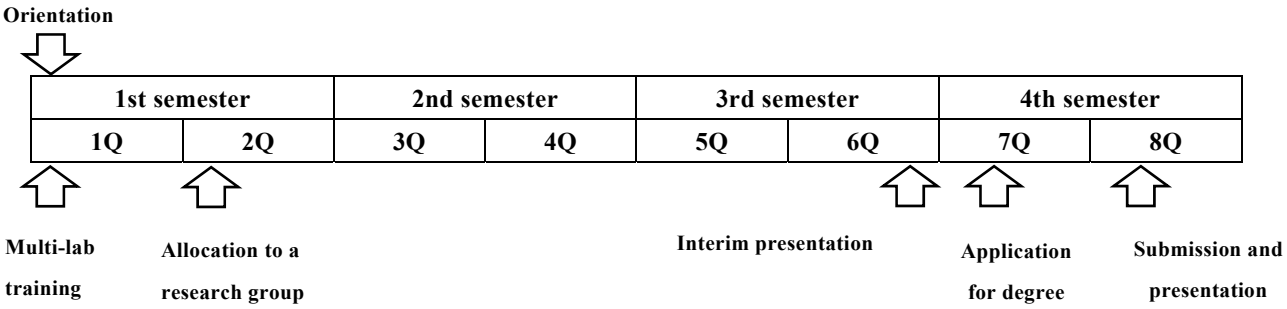
Course category	Course number	Course title	Credits	GA*	Learning goals	Comments
Courses that can be counted as Career Development Courses	NCL.F401.L	Ethics for Nuclear System Development	1-0-0	C0M, C1M	C	
	NCL.F402.L	Acts and Regulations on Atomic Energy	1-0-0	C1M	B	

Credits in Career Development 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

8. Research Related to the Completion of Master Theses

In the research related to the completion of master thesis, the students experience a series of research processes, and acquire abilities to identify, to investigate, and to solve new issues. The procedure is as follows:



・interim presentation

On the 6th quarter, an interim presentation is examined to clarify background and objective of the research in terms of career formation.

・criterion for judgment

Master thesis must be the original including new scientific knowledge in the nuclear engineering or valuable knowledge contributed to the progress of the nuclear engineering.

・judgement procedure of master thesis

The referee board consists of more than 3 referees. After the pre-review by the referees, the thesis is finally evaluated though the oral presentation. A student wishing to go on to the doctor course is examined by 5 referees.

【Doctoral Degree Program】

1. Outline

Growing attention has been placed on nuclear energy as an ultimate measure for reduction of fossil fuel consumption and CO2 emission. Under the circumstances of global warming and the price hike of oil, gas and coal, a number of countries have been considering the implementation of nuclear power plants. The key factor of the nuclear energy development is the development of human resources. Our original course of international nuclear engineering has been established in 1993. Since then, a number of students have joined us from many countries and graduated from our course. They are actively contributing to the development of industries and technologies in Japan or in their own countries. This graduate course provides with core curriculum for nuclear reactor engineering and fuel cycle technologies and also covers extended nuclear energy, such as beam, accelerator, plasma sciences, nuclear fusion, energy and environment, and social relations.

2. Competencies Developed

The curriculum is designed to allow students to polish what they have learned in the Master's Program, including advanced specialized knowledge of nuclear engineering, broad vision and education, a sense of ethics and social responsibility, logical dialogue skills, writing skills, practical problem-solving skills, and creativity. Furthermore, it enables students to acquire the abilities to discover problems and research them, to create new knowledge, to disseminate, to pioneer and lead new fields, and to develop leadership with which they can play an active role in international society.

3. Learning Goals

The goals provided in the course to obtain the competencies described in the curriculum are as follows:

A) Abilities to create and to disseminate new knowledge by the use of the advanced specialized knowledge of nuclear engineering

B) Abilities to resolve practical issues under deep understanding of nuclear engineering

C) To develop leadership skills, high ethics, and societal responsibilities

D) Doctoral thesis writing guided by academic advisors

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 Nuclear Engineering curriculum,
    - a minimum of 18 credits acquired from courses of Research Seminars, Research-Related Courses, and Major Courses
    - 12 credits acquired from Research Seminars (If the student completes the doctor study in less

than 12 quarters, the required credit is reduced according to the number of spent quarters.)

- a minimum of 6 credits acquired from Major Courses; and
- a minimum of 6 credits acquired from Liberal Arts and Basic Science Courses

  (2 credits from Humanities and Social Science Courses, and 4 credits from Career Development Courses).

3. Give the oral presentation in English in the interim presentation meeting.
4. Pass the doctoral thesis review and defense.
5. Achieve the score of 730 or more in TOEIC standard in an external official English language test.

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 Nuclear Engineering 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	
	Career development courses		4 credits		C	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses					
Core courses	Research seminars	Seminar in Nuclear Engineering S3 Seminar in Nuclear Engineering F3 Seminar in Nuclear Engineering S4 Seminar in Nuclear Engineering F4 Seminar in Nuclear Engineering S5 Seminar in Nuclear Engineering F5 A total of 12 credits, 2 credits each from the above courses.		18 credits	A,B	
	Research-related courses				B	
	Major courses		6 credits		A,B	
	Major courses and Research-related courses <u>outside</u> the Graduate Major in Nuclear Engineering standard curriculum					
Total required credits		A minimum of 24 credits including those attained according to the above conditions				
Note		・Japanese Language and Culture Courses offered to international students can be recognized as equivalent to the Humanities and Social Science Courses of the corresponding course level.				

	• **For details of the Liberal Arts and Basic Science Courses, please refer to the relevant sections.**

5. IGP Courses

Table D2 shows the Core Courses of the Doctoral Degree Program of this major. Core courses listed in the Comments column are those provided by other majors and are recognized as equivalent to the corresponding Major Courses or Research-Related Courses of the standard curriculum of this major.

Table D2. Core Courses of the Graduate Major in Nuclear Engineering

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Research seminars	600 level	NCL.Z691.R	◎	★	Seminar in Nuclear Engineering S3	0-2-0	1,2,3,4,5	A,D	
		NCL.Z692.R	◎	★	Seminar in Nuclear Engineering F3	0-2-0	1,2,3,4,5	A,D	
		NCL.Z693.R	◎	★	Seminar in Nuclear Engineering S4	0-2-0	1,2,3,4,5	A,D	
		NCL.Z694.R	◎	★	Seminar in Nuclear Engineering F4	0-2-0	1,2,3,4,5	A,D	
		NCL.Z695.R	◎	★	Seminar in Nuclear Engineering S5	0-2-0	1,2,3,4,5	A,D	
		NCL.Z696.R	◎	★	Seminar in Nuclear Engineering F5	0-2-0	1,2,3,4,5	A,D	
Research-related [illegible]	600 level	NCL.I601.L		★	Nuclear Engineering Off-Campus Project	0-0-4	1,2,3,4,5	B	
Major courses	600 level	NCL.A601.L		★	Special Lecture on Accelerator and Fusion Reactor Technology I	1-0-0	3	A	
		NCL.A602.L		★	Special Lecture on Accelerator and Fusion Reactor Technology II	1-0-0	3	A	
		NCL.A603.L		★	Special Lecture on Accelerator and Fusion Reactor Technology III	1-0-0	3	A	
		NCL.C601.L		★	Special Lecture on Nuclear Fuel Cycle I	1-0-0	3	A	
		NCL.C602.L		★	Special Lecture on Nuclear Fuel Cycle II	1-0-0	3	A	
		NCL.C603.L		★	Special Lecture on Nuclear Fuel Cycle III	1-0-0	3	A	

		NCL.C604.L		★	Nuclear Fuel Cycle Engineering Special Laboratory	0-0-2	3,5	A	
		NCL.N601.L		★	Special Lecture on Nuclear Reactor Technology I	1-0-0	3	A	
		NCL.N602.L		★	Special Lecture on Nuclear Reactor Technology II	1-0-0	3	A	
		NCL.N603.L		★	Special Lecture on Nuclear Reactor Technology III	1-0-0	3	A	
		NCL.N604.L		★	Thermal - Hydraulics and Radiation - Measurement Special Laboratory	0-0-2	3,5	A,B	
		NCL.N605.L		★	Nuclear Reactor Physics Special Laboratory	0-0-2	3,5	A,B	
		NCL.N606.L		★	Nuclear Material Special Laboratory	0-0-2	3	A,B	
		NCL.N607.L		★	Severe Accident Special Laboratory	0-0-2	3,5	A,B	
		NCL.O601.L		O	Special Lecture on Radiation management I	1-0-0	3,5	A	odd academic years
		NCL.O602.L		O	Special Lecture on Radiation management II	1-0-0	3,5	A	odd academic years
		NCL.U601.L		★ ●	Nuclear Dojo 4	1-0-0	3,4	A	Only for U-ATOM students
		NCL.U602.L		★ ●	Nuclear Dojo 5	1-0-0	3,4	A	Only for U-ATOM students
		NCL.U603.L		★ ●	Nuclear Dojo 6	1-0-0	1,2,3,4, 5	A	Only for U-ATOM students
		NCL.U604.L		★ ●	Nuclear Security Training	1-1-0	3,5	A	Only for U-ATOM students
		NCL.U605.L		★ ●	Risk Communication I	1-0-0	2,5	B	Priority in U-ATOM students
		NCL.U606.L		★ ●	Risk Communication II	1-0-0	2,5	B	Priority in U-ATOM students
		NCL.U607.L		★ ●	Basics of Philosophy	1-0-0	1,2,5	B	Priority in U-ATOM students
		NCL.U608.L		★ ●	Basics of Culture and Civilization	1-0-0	1	B	Priority in U-ATOM students

		NCL.U610.L		★ ●	Global Nuclear Internship in Japan	0-2-0	2,3,4,5	B	Only for U-ATOM students
		NCL.U611.L		★ ●	Global Nuclear Internship in Foreign Countries 1	0-2-0	2,3,4	B	Only for U-ATOM students
		NCL.U612.L		★ ●	Global Nuclear Internship in Foreign Countries 2	0-2-0	2,3,4	B	Only for U-ATOM students
		NCL.U613.L		★ ●	Arts and Human	1-0-0	1	B	Priority in U-ATOM students

Note：

• ◎：Required course, ○：Restricted elective, ★: Classes in English, O：odd academic years, Ｅ：even academic years

• □：Course recognized as equivalent to that of the Academy for Co-creative Education of Environment and Energy Science (ACEEES).

• ●：Course recognized as equivalent to that of the Academy for Global Nuclear Safety and Security Agent (U-ATOM).

• Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = 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): A (Nuclear fusion and accelerator engineering), C (Nuclear fuel cycle engineering), I (Internships), N (Nuclear reactor engineering), U (Leading Graduate School (U-ATOM) subjects), Z (Research seminars).

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

None

7. IGP Courses That Can Be Counted as Career Development Courses

In order to fulfill the completion requirements for the doctoral degree program, students must attain at least 4 credits in Career Development Courses, and should satisfy all of the Graduate Attributes (GA) specified in Table A-1 or A-2 of the “Career Development Courses” (Liberal Arts and Basic Science Courses) in the Guide to Graduate Education and International Graduate Program. Students will be evaluated in regards to GA achievements at the time of their degree completion. As to the courses with more than one GA, the number of GA stipulated for the courses is considered to be acquired regardless of the credits received for the courses.

Major Courses that enable students to acquire GA and that are recognized as equivalent to Career Development Courses are listed in Tables D3-1 and D3-2 below.

However, it must be noted that credits attained from these courses cannot be counted more than once as Major Courses or Career Development Courses towards the completion requirements for the doctoral degree program.

For Graduate Attributes, refer to the Guide to the Career Development Courses.

The Graduate Attributes of the Academic Leader Program (ALP) are listed in Table A-1 as follows:

A0D: You will be able to precisely draw your own career plan and self-train yourself to acquire the skills required for attaining your goals in the academic field

A1D: You will be able to ascertain the true nature of phenomena, master the secret of learning, and lead the pioneering of a new academic discipline or research area

A2D: You will be able to understand the position of academia in society, and adequately explain the academic progress to members of society, which is the stakeholder

A3D: You will be able to nurture junior students in educational institutions, inculcating in them an interest in academics and enabling them to later join in the pioneering of new academic disciplines or research areas

The Graduate Attributes of the Productive Leader Program (PLP) are listed in Table A-2 as follows:

P0D: You will be able to precisely draw your own career plan and self-train yourself to acquire the skills required for attaining your goals in the industry, etc.

P1D: You will be able to precisely grasp the needs of society and detect its problems, and lead the future developments in science and technology

P2D: While leading teams consisting of members with varied specialties and value systems, you will be able to create products and enterprises that bring forth new values in the society

P3D: Through the project, you will be able to nurture junior students, enabling them to later join in the development of next generation society and industry

Table D3-1. Courses of the Graduate Major in Nuclear Engineering recognized as equivalent to Career Development Courses in the Academic Leader Program (ALP)

Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Career Development Courses	NCL.U610.L		●	Global Nuclear Internship in Japan	0-2-0	A0D	B	Only for U-ATOM students
	NCL.U611.L		★ ●	Global Nuclear Internship in Foreign Countries 1	0-2-0	A0D	B	Only for U-ATOM students
	NCL.U612.L		★ ●	Global Nuclear Internship in Foreign Countries 2	0-2-0	A0D	B	Only for U-ATOM students

Credits in Career Development 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

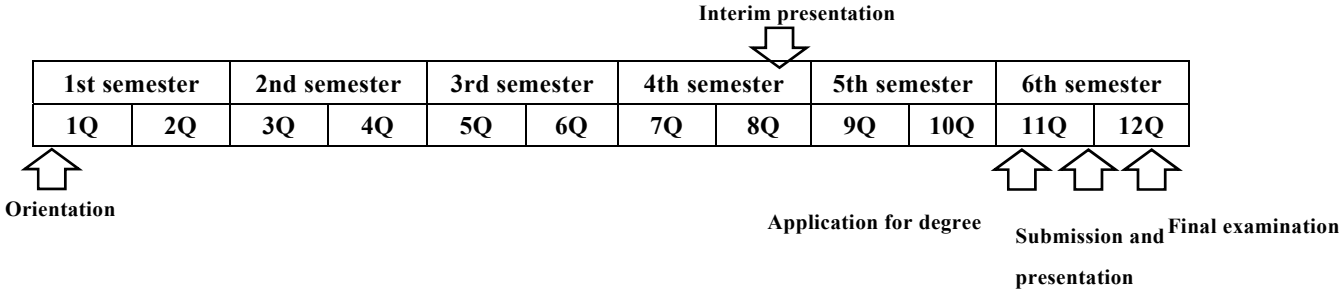
Table D3-2. Courses of the Graduate Major in Nuclear Engineering recognized as equivalent to Career Development Courses in the Productive Leader Program (PLP)

Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Career Development Courses	NCL.U610.L		●	Global Nuclear Internship in Japan	0-2-0	P0D	B	Only for U-ATOM students
	NCL.U611.L		★ ●	Global Nuclear Internship in Foreign Countries 1	0-2-0	P0D	B	Only for U-ATOM students
	NCL.U612.L		★ ●	Global Nuclear Internship in Foreign Countries 2	0-2-0	P0D	B	Only for U-ATOM students
Credits in Career Development 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								

Students enrolled in the educational program for leading graduate schools or in the Tokyo Tech Academy for Leadership (ToTAL) may be offered courses recognized as equivalent to Career Development Courses besides those listed as such in the “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 that offers the relevant program.

8. Research Related to the Completion of Doctoral Theses

In the research related to the completion of doctoral thesis, the students acquire abilities to solve and to discover problems through the learning design and process. English communication skill equal to or higher than TOEIC 730 is also required.



・interim presentation

On the 8th[h] quarter, an interim presentation is examined to clarify target and completion for the research.

・criterion for judgment

Doctoral thesis must be the original including creative and new scientific knowledge in the nuclear engineering, and its main part must be published or have equivalent level in the international scientific journals.

・judgement procedure of doctoral thesis

The referee board consists of more than 5 referees. After the oral presentation and the pre-review by the referees, the thesis is finally evaluated. Scholastic ability is also examined in the finale examination.