Graduate Major in Information and Communications Engineering

【Master's Degree Program】

1. Outline

We aim to cultivate researchers, engineers and candidates of executives globally playing active part in various fields such as industries; such individuals have top class competence in theoretical comprehension and practical application development in broad expertise on fundamental and applied technologies, which support human centered and sustainable advanced information and communications society from both hardware and software aspects and include communication and network, signal processing, VLSI (very large scale integrated circuits), computer, security, media information processing, bio information processing, sensory information processing and intelligent information processing.

2. Competencies Developed

After completing the program, students will acquire the following competencies:

- Expert abilities required for research and development in information and communications engineering fields.
- Skills to learn expert abilities in related fields and to apply them to practical problem solving.
- Skills for new problem solving and creative proposal applying expertise in a relation with the society.
- Skills to comprehend and systematize research and development trends with international perspective.
- Skills to engage in businesses relating to information and communication fields.
- Skills to explain and document about information on science and technology. Skills to develop arguments on them.
- Skills for engaging research and development with strong sense of ethics.

3. Learning Goals

To obtain the competencies described in the curriculum provided in this course, the goals of learning are as follows:

A) Mastery of fundamental expertise in information and communication engineering
Look back upon fundamental expertise fields studied in undergraduate and establish fundamental knowledges on the fields.

B) Mastery of developed expertise in information and communication engineering
Establish cutting edge knowledges from international perspective systematically.

C) Mastery of liberal arts and career literacy
Study humanities, social sciences, interdisciplinary courses and latest trends in industries to acquire literacy as an engineer or researcher in information and communication engineering and wide field of view and ethics for leaders in industries.

D) Mastery of expertise in different fields
Acquire cross sectoral and interdisciplinary knowledge in broad science and engineering to widen expertise and get flexibility for different fields.

E) Mastery of creative proposal and problem solving
Acquire creative proposal skills and pragmatic problem solving skills by working on individual research theme for master thesis proactively. Acquire skills to develop logical discussion, through the master's thesis research guidance by the supervisor.

F) Mastery of skills on design and communication
Acquire skills on problem setting, specification development, project management and communications, through making personal portfolio, research plan presentation and intermediate review.

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 Table M1 below,
   - attain 8 credits acquired from Research Seminars;
   - attain a minimum of 22 credits from Core Courses in the Graduate Major in Information and Communications Engineering;
   - attain a minimum of 2 credits from the group A, and a minimum of 2 credits from the group B;
   - attain a minimum of 2 credits from Major courses or Research-related courses outside the Graduate Major in Information and Communications Engineering standard curriculum; and
   - attain a minimum of 2 credits from 400-level and a minimum of 1 credit from 500-level courses from Humanities and Social Science Courses, and a minimum of 2 credits from Career Development Courses. Both GA0M and GA1M of Graduate Attributes (GA) must be included for Career Development Courses.
3. Complete the research plan presentation and the intermediate review, and 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 Information and Communications 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	C	
	Career development courses		2 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 Information and Communications Engineering S1 Seminar in Information and Communications Engineering F1		22 credits from the Graduate Major in	E	

		Seminar in Information and Communications Engineering S2 Seminar in Information and Communications Engineering F2 A total of 8 credits, 2 credits each from the above courses.		Information and Communications Engineering standard curriculum		
	Research-related courses					
	Major courses		2 credits from group A and 2 credits from group B		A	
	Major courses or Research-related courses <u>outside</u> the Graduate Major in Information and Communications Engineering standard curriculum			2 credits	D	
Total required credits		**A minimum of 30 credits including those attained according to the above conditions.**				
Note		**・Group A consists of Communications and Computer Engineering I and Communications and Computer Engineering II.** **Group B consists of Human-Centric Information Systems I and Human-Centric Information Systems II** **・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.**				

Research ethics education

It is recommended to complete at least one of the following 1) or 2).

1) Either "Master's Social and Business Rules and Ethics (*1)," "Essence of Humanities and Social Sciences2 :Ethics in Engineering," "Ethics of Scientists(*2)," or "Ethics of Engineers(*2)"
   (*1) This course was offered as “Social and Business Rules and Ethics” until 2021.
   (*2) These courses are not offered now.
2) Three modules or more from APRIN e-learning program "JST Course (2) Engineering" including the following
   - Research Misconduct
   - Ethical Issues in the Management of Data in Engineering Research
   - Whistleblowing and the Obligation to Protect the Public

Each student should register the content of each learning record into the Portfolio before the master's intermediate review.

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 Information and Communications Engineering

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Research seminars	400 level	ICT.Z491.R	◎		Seminar in Information and Communications Engineering S1	0-2-0	1,2,3,4,5	E	
		ICT.Z492.R	◎		Seminar in Information and Communications Engineering F1	0-2-0	1,2,3,4,5	E	
	500 level	ICT.Z591.R	◎		Seminar in Information and Communications Engineering S2	0-2-0	1,2,3,4,5	E	
		ICT.Z592.R	◎		Seminar in Information and Communications Engineering F2	0-2-0	1,2,3,4,5	E	
Major courses	400 level	ICT.A402.A	A ○		Communications and Computer Engineering I	2-0-0	1	A	
		ICT.A406.B	B ○		Human-Centric Information Systems I	2-0-0	1,5	A	
		ICT.A413.A	A ○		Communications and Computer Engineering II	2-0-0	1	A	
		ICT.A418.B	B ○		Human-Centric Information Systems II	2-0-0	1,4,5	A	
		ICT.A481.L			Graph Theory with Engineering Application	1-0-0	1	B	School of Engineering

									(XEG.S404)
		ICT.C401.L			Modern Cryptography	2-0-0	1	B	
		ICT.C412.L		J	Advanced Communication System Engineering	2-0-0	1,5	B	
		ICT.C417.L		J	Data Communication System	2-0-0	1,4	B	
		ICT.D401.L		J	Solving social issues with cutting-edge technology	0-1-0	3,4,5	B	Engineering Sciences and Design (ESD.E407.L)
		ICT.H404.L		J	Medical Informatics	1-0-0	1,5	B	
		ICT.H409.L			Optics in Information Processing	1-0-0	1	B	
		ICT.H411.L			Basic Sensation Informatics	1-0-0	1,5	B	
		ICT.H416.L			Statistical Theories for Brain and Parallel Computing	2-0-0	1,4,5	B	
		ICT.H420.L			Large Scale Computing Systems	1-0-0	1	B	
		ICT.H421.L			Medical Imaging Systems	1-0-0	1	B	
		ICT.H422.L			Computational Brain	1-0-0	1	B	
		ICT.I408.L			Analog Integrated Circuits	2-0-0	1,4,5	B	
		ICT.I415.L			VLSI System Design	2-0-0	1,4,5	B	
		ICT.I419.L			VLSI Layout Design	2-0-0	1	B	
		ICT.I427.L			Reconfigurable Computing	1-0-0	1	B	
		ICT.I426.L			Topics in Computer Architecture (School of Engineering)	1-0-0	1	B	School of Engineering (XEG.S406)
		ICT.I483.L			Topics in Digital VLSI Design	1-0-0	1	B	School of Engineering (XEG.S405)
		ICT.O424.L			Scientific Writing and Presentation Skills	2-0-0	3,4	F	School of Engineering (XEG.G401)
		ICT.O433.L		J	Ota City Start-up Experience Off-Campus Project)	0.5-0-0.5	3,4,5	C	Tokyo Tech Academy for

									Super Smart Society (SSS.S433)
		ICT.S403.L		J	Multidimensional Information Processing	2-0-0	1,5	B	
		ICT.S407.L			Wireless Signal Processing	2-0-0	1	B	
		ICT.S414.L			Advanced Signal Processing (ICT)	2-0-0	1,4,5	B	
	500 level	ICT.A512.L			Advanced Information and Communication Theory	2-0-0	1,5	B	
		ICT.C506.L			Advanced Information and Communication Network	2-0-0	1,3,4	B	
		ICT.C511.L		J	Advanced Topics in Mobile Communications	2-0-0	1	B	
		ICT.C581.L		J	Advanced Topics in Wireless Communication Systems	2-0-0	1	B	
		ICT.H503.L			Speech Information Technology	2-0-0	1,5	B	
		ICT.H504.L			Medical Image Processing	2-0-0	1,5	B	
		ICT.H507.L			Virtual Reality and Interaction	2-0-0	1,2,4	B	
		ICT.H508.L			Language Engineering	2-0-0	1,3	B	
		ICT.H513.L		J	IT Society and Information Security	2-0-0	1,5	B	
		ICT.H514.L			Mechanisms of Visual Perception	1-0-0	1,5	B	
		ICT.H517.L			Advanced Measurement of Sensory Information	2-0-0	1,5	B	
		ICT.O518.L			Information and Communications Engineering Course Off-Campus Project (Master Course)	0-2-0	1,2,3,4,5	C	

Note：

• ◎：Required course，○：Restricted elective，J：in Japanese

• 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): A (fundamental courses), C (communication/network/security courses), D (Design), S (Signal Processing), H (human centric system courses), I (Integrated Circuit/Computational machinery courses), O (carrier courses), Z (Research seminars)

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

None

7. IGP Career Development Courses and 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" listed as one of the "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. As to the courses with two GAs, both GAs stipulated for the courses are considered to be acquired if students receive the corresponding credits for those courses.

Career Development Courses and Major Courses that enable students to acquire GA and that are recognized as equivalent to Career Development Courses, offered by the Graduate Major, are listed in Table M3 below. Students can also acquire GA and credits by taking the Career Development Courses offered by Innovator and Inventor Development Platform (IIDP) listed as one of the "Liberal Arts and Basic Science Courses" in the Guide to Graduate Education and International Graduate Program.

However, it must be noted that credits attained from those courses that can be counted as Career Development Courses can be counted towards the completion requirements of master's degree program, either for the Major Courses or for the Career Development Courses (i.e., not for both). Nevertheless, even in the cases from those mentioned above where attained credits pertaining to these courses are not considered as Career Development Courses, their associated GAs may be considered by the Graduate Major to have been acquired.

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:

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, and ethics 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 Information and Communications Engineering recognized as equivalent to Career Development Courses, and Career Development Courses

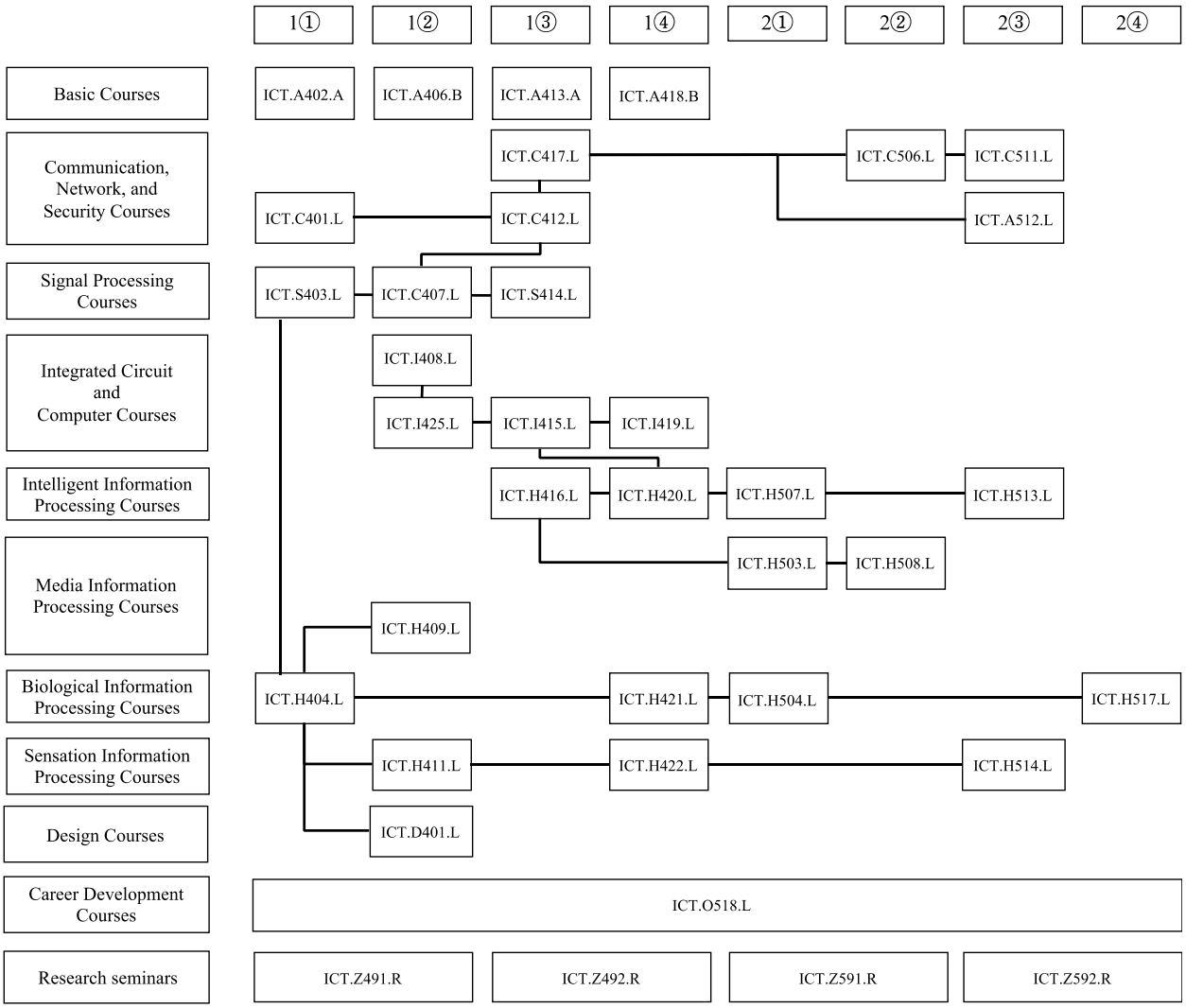
Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Career Development Courses	ICT.O518.L			Information and Communications Engineering Course Off-Campus Project (Master Course)	0-2-0	GA1M	C	
Career Development Courses	ICT.O573			Master's Recurrent Program of Information and Communications Engineering Course 1-1	0-0-1	GA0M GA1M	C	Career Development Course offered by the

	ICT.O574			Master's Recurrent Program of Information and Communications Engineering Course 1-2	0-0-1	GA0M GA1M	C	Graduate Major in Information and Communications Engineering. You cannot count for the Major Course.
	ICT.O575			Master's Recurrent Program of Information and Communications Engineering Course 2	0-0-2	GA0M GA1M	C	

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**

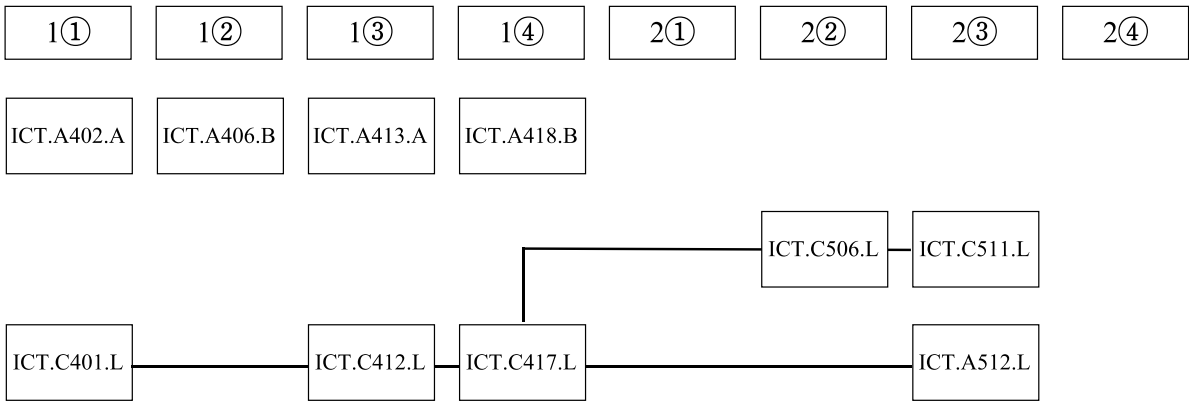
8. Overview of Curriculum System



9. Example of a Standard Curriculum

Systematical selection of courses related to student's own specialization is recommended, besides the fundamental courses that are restricted electives.

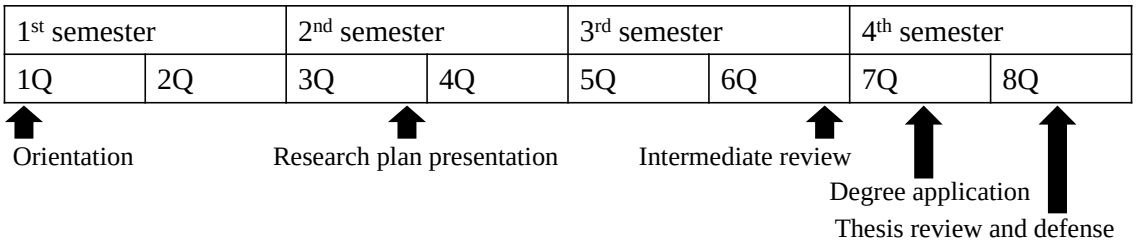
[Example] Focus in Communication Network Security



10. Research Related to the Completion of Master Theses

Important objectives in the master's thesis research are to experience a process of research and to develop skills on problem setting, problem solving and communication.

Though a standard flow is shown below, the schedule of events such as the reviews can be varied on individual status such as research progress and enough consultation with the supervisor is required to determine details such as research schedule.



- Research plan presentation and intermediate review

  From career development points of view, to be conscious of research background and purpose clearly, a research plan presentation and intermediate review are placed by around after the 3Q's and 6Q's end respectively. In the research plan presentation, individuals organize and make a presentation, which consists of research plan and preliminary research results. The question-and-answer session deepens the understanding on research background and confirms validity of problem setting of the research plan to develop skills on problem setting and communication. In the intermediate review, individuals organize and make a presentation, which contains research progress and problem solving plan after the review. The jury evaluates whether the presentation has or will have an original study including new knowledge with academic value or useful contribution in information and communications engineering, as the results of the research.

- Criteria for master thesis review

  Master thesis must be self-written, and contain new knowledge with academic value or useful contribution in the field of information and communications engineering.

- Thesis review procedures

  The jury committee consists of at least three professors. It is required to pass an intermediate review (after 6Q in standard) to submit the thesis. The submitted thesis and the final defense including an oral presentation are evaluated (during or after 8Q). In case of the applicants for the doctoral degree program, the jury committee consists of at least five professors.

【Doctoral Degree Program】

1. Outline

We aim to cultivate researchers, engineers, candidates of executives globally playing active part in various field such as industries, and leaders of leading and pioneering frontier science and technology for achieving a plentiful global society; such individuals have top class competence in theoretical comprehension and practical application development in broad expertise on fundamental and applied technologies, which support human centered and sustainable advanced information and communications society from both hardware and software aspects and include communication and network, signal processing, VLSI (very large scale integrated circuits), computer, security, media information processing, bio information processing, sensory information processing and intelligent information processing.

2. Competencies Developed

After completing the program, students will acquire the following competencies with higher level than master's program:

- Expert abilities required for research and development in information and communications engineering fields.
- Skills to learn expert abilities in related fields and explore new field, as well as to apply them to practical problem solving.
- Skills for new problem solving and creative proposal applying expertise in a relation with the society.
- Skills to comprehend and systematize research and development trends with global field of view.
- Skills to engage in highly professional businesses relating to information and communication fields.
- Skills to develop new knowledge based on previous works according to original research which relating to information and communication fields and independently complete work as a researcher.
- Skills to explain and document about information on science and technology, in addition to leading a research and development team as a team leader.
- Skills for engaging research and development with strong sense of ethics.

3. Learning Goals

To obtain the competencies described in the competencies developed provided in this course, learn along the curriculum that has the following characteristics:

A) Mastery of highly specialized expertise in information and communication engineering
Look back upon expertise studied in master, and master higher specialized expertise needed for doctoral research.

B) Mastery of problem setting skills and advanced problem solving skills
Through the doctoral research guidance, set and challenge the new research issue to master problem setting skills and advanced problem solving skills.

C) Mastery of wide and deep knowledge and ethics
Through research activities such as seminars, establish the cutting-edge knowledges from international perspective systematically in information and communication engineering to master wide and deep knowledge and ethics.

D) Mastery of skills for original research and technological development
Through research presentation in international conferences and paper publishing in academic journals as a researcher, acquire skills to contribute new knowledges to conversational academic standards at the international level.

E) Mastery of skills to manage the process of research
Through intermediate review and achievement review in addition to regular presentations in research activities such as seminars, master the skills to manage research processes.

F) Mastery of internationally accepted leadership

Through international conferences and internship, actively discuss with researchers and engineers of the front-line in overseas including people from different research fields. Then, establish skills to develop advanced discussions and to organize and aggregate different ideas and advices as a leader.

G) Mastery of advanced perspective on trends in the industries in Japan and overseas

Through lectures and seminars, learn about latest trends in the information and communication industry, to master advanced perspective and ethics required for the leader of the industry.

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 Table D1 below,
   - attain 12 credits from Research Seminars in Information and Communications;
   - attain a minimum of 2 credits from 600-level Humanities and Social Science Courses; and
   - attain a minimum of 4 credits from 600-level Career Development Courses. All of Graduate Attributes (GA) (GA0D and GA1D) must be included.
3. Complete the intermediate and achievement reviews, and pass the doctoral 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. Graduate Major in Information and Communications 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,D	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other courses					
Core courses	Research seminars	Research Seminar in Information and Communications S3 Research Seminar in Information and Communications F3 Research Seminar in Information and Communications S4 Research Seminar in Information and Communications F4 Research Seminar in Information and Communications S5 Research Seminar in Information and Communications F5 A total of 12 credits, 2 credits each from the above courses.		12 credits from the Graduate Major in Information and Communications Engineering standard curriculum	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.				

Research ethics education

It is recommended to complete at least one of the following 1) or 2).

1) Career development course "Doctoral Ethics of Scientists and Engineers (*1)".
   (*1) This course was offered as “Ethics of Scientists and Engineers” until 2021.
2) All the modules from APRIN e-learning program "JST Course (2) Engineering" as follows:
   - Research Misconduct
   - Ethical Issues in the Management of Data in Engineering Research
   - Responsible Authorship
   - Ethical Issues in the Peer Review and Publication of Engineering Research
   - Collaborative Research in Engineering Fields
   - Whistleblowing and the Obligation to Protect the Public
   - Managing Public Research Funds

Each student should register the content of each learning record into the Portfolio before the doctor's intermediate review.

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 Information and Communications Engineering

Course category		Course number	Course title			Credits	Competencies	Learning goals	Comments
Research seminars	600 level	ICT.Z691.R	◎		Seminar in Information and Communications Engineering S3	0-2-0	1,2,3,4,5	B,C,E,G	
		ICT.Z692.R	◎		Seminar in Information and Communications Engineering F3	0-2-0	1,2,3,4,5	B,C,E,G	
		ICT.Z693.R	◎		Seminar in Information and Communications Engineering S4	0-2-0	1,2,3,4,5	B,C,E,G	
		ICT.Z694.R	◎		Seminar in Information and Communications Engineering F4	0-2-0	1,2,3,4,5	B,C,E,G	
		ICT.Z695.R	◎		Seminar in Information and Communications Engineering S5	0-2-0	1,2,3,4,5	B,C,E,G	
		ICT.Z696.R	◎		Seminar in Information and Communications Engineering F5	0-2-0	1,2,3,4,5	B,C,E,G	
Major courses	600 level	ICT.C601.L			Quantum Information Processing	2-0-0	1,4,5	A	
		ICT.I627.L			Advanced Topics in Computer Architecture (School of Engineering)	1-0-0	1,4,5	A	【School of Engineering】(XEG.S607)
		ICT.I683.L			Advanced Topics in Digital VLSI Design	1-0-0	1,4,5	A	【School of Engineering】(XEG.S605)

		ICT.O602.L			Special Experiments of Information and Communications Engineering I	0-0-2	1,3,5	E	
		ICT.O603.L			Special Experiments of Information and Communications Engineering II	0-0-2	1,3,5	E	
		ICT.O604.L			Special Experiments of Information and Communications Engineering III	0-0-2	1,3,5	E	
		ICT.O605.L			Presentation Exercises of Information and Communications Engineering Course I	0-1-0	1,3	D,F	
		ICT.O606.L			Presentation Exercises of Information and Communications Engineering Course II	0-1-0	1,3	D,F	
		ICT.O607.L		J	Information and Communications Engineering Course Off-Campus Project (Doctor Course)	0-2-0	1,2,3,4,5	F,G	
		ICT.O608.L			Information and Communications Engineering Course Long-Term Off-Campus Project (Doctor Course)	0-4-0	1,2,3,4,5	F,G	
		ICT.O609		J	Cooperative Education through Research Internships of Information and Communications Engineering Course	0-0-4	1,3,4,5	F,G	

Note：

• ◎：Required course，○：Restricted elective，J：in Japanese

• Competencies: 1 = Specialist skills, 2 = Liberal arts skills, 3 = Communication skills, 4 = Applied skills (inquisitive thinking and/or problem-finding skills), 5 = Applied skills (practical and/or problem-solving skills)

• The character preceding the three digits in the course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D600.R): A (fundamental courses), C/S (communication/network/security courses), H (human centric system courses), I (Integrated Circuit/Computational machinery courses), J/O (carrier courses), Z (Research seminars)

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

None

7. IGP Career Development Courses and 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 of the “Career Development Courses” listed as one of the “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. As to the courses with two GAs, both GAs stipulated for the courses are considered to be acquired if students receive the corresponding credits for those courses.

Career Development Courses and Major Courses that enable students to acquire GA and that are recognized as equivalent to Career Development Courses, offered by the Graduate Major, are listed in Tables D3 below. Students can also acquire GA and credits by taking the Career Development Courses offered by Innovator and Inventor Development Platform (IIDP) listed as one of the “Liberal Arts and Basic Science Courses” in the Guide to Graduate Education and International Graduate Program.

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

For Graduate Attributes, refer to the Guide to the Career Development Courses.
The Graduate Attributes of the Doctoral Degree Program are listed in Table A-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 the advanced leadership skills, entrepreneurial skills, knowledge and expertise, and by developing social responsibility necessary for materializing your designed career.

Table D3. Courses of the Graduate Major in Information and Communications Engineering recognized as equivalent to Career Development Courses, and Career Development Courses

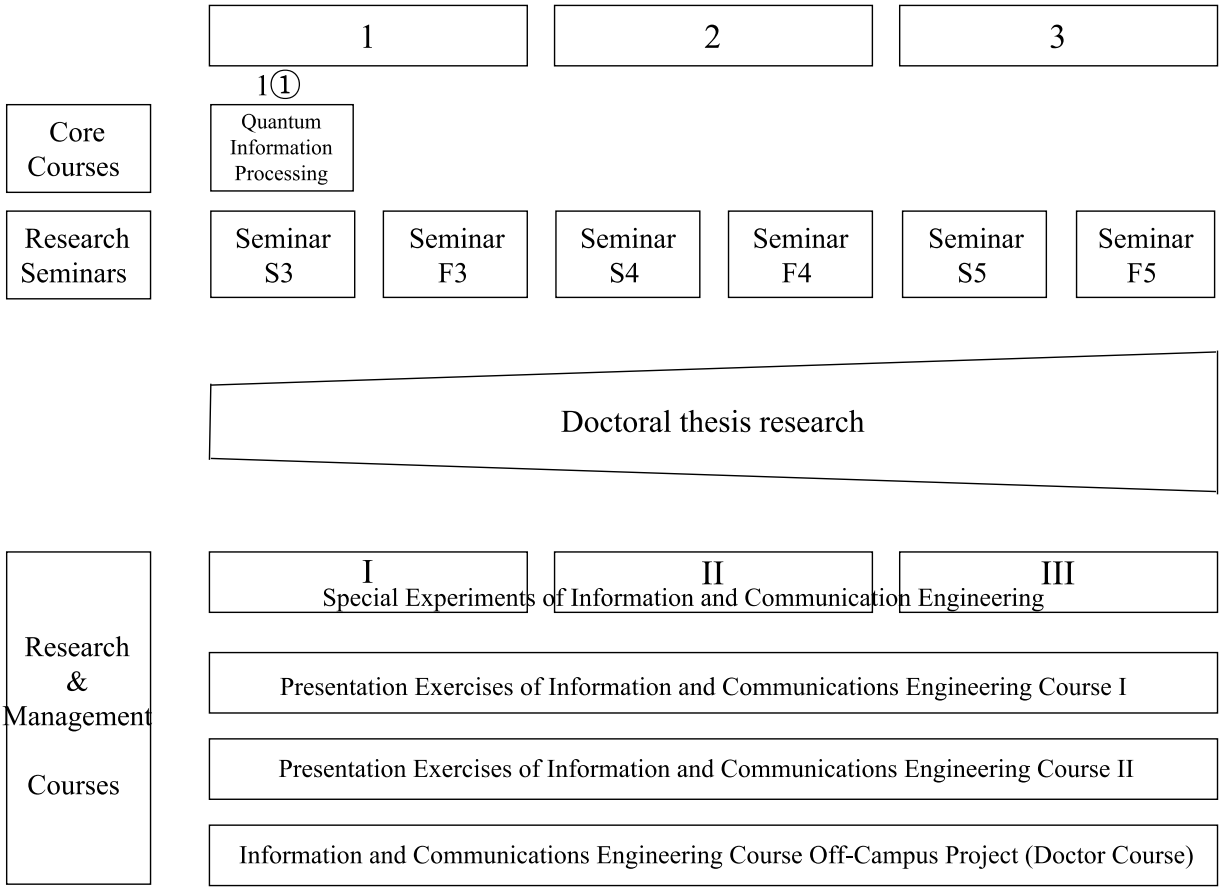
Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Career Development Courses	ICT.O607.L		J	Information and Communications Engineering Course Off-Campus Project (Doctor Course)	0-2-0	GA1D	F,G	
	ICT.O608.L			Information and Communications Engineering Course Long-Term Off-Campus Project (Doctor Course)	0-4-0	GA1D	F,G	
	ICT.O609		J	Cooperative Education through Research Internships of Information and Communications Engineering Course	0-0-4	GA1D	F,G	
Career Development Courses	ICT.O661			Doctoral Recurrent Program of Information and Communications Engineering Course 1	0-0-1	GA0D GA1D	F,G	Career Development Course offered by the Graduate Major in Information and Communications Engineering. You cannot count for the Major Course.
	ICT.O662			Doctoral Recurrent Program of Information and Communications Engineering Course 2-1	0-0-2	GA0D GA1D	F,G	
	ICT.O665			Doctoral Recurrent Program of Information and Communications Engineering Course 2-2	0-0-2	GA0D GA1D	F,G	
	ICT.O663			Doctoral Recurrent Program of Information and Communications Engineering Course 3	0-0-3	GA0D GA1D	F,G	
	ICT.O664			Doctoral Recurrent Program of Information and Communications Engineering Course 4	0-0-4	GA0D GA1D	F,G	

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, the Tokyo Tech Academy for Leadership (ToTAL) or WISE Programs 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. Overview of Curriculum System

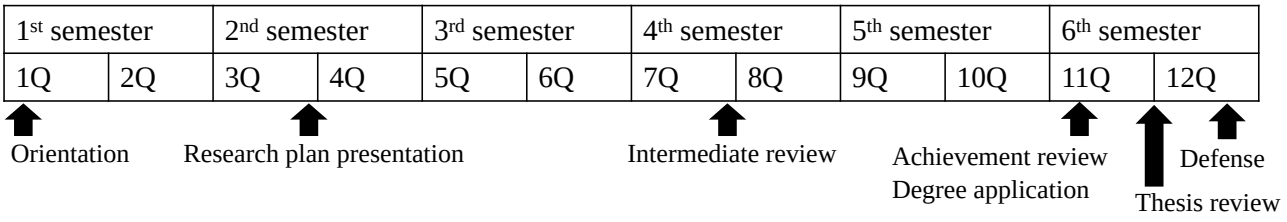


9. Example of a Standard Curriculum

It is recommended to take 600-level courses such as “Quantum Information Processing” and “Special Experiments of Information and Communication Engineering I, II, and III,” besides research seminars that are required courses. “Presentation Exercises of Information and Communications Engineering Course I / II” and “Information and Communications Engineering Course Off-Campus Project (Doctor Course)” are also desirable.

10. Research Related to the Completion of Doctoral Dissertation

Doctoral research requires problem setting skills in addition to problem solving skills. Though a standard flow is shown below, the schedule of events such as presentations and reviews can be varied on individual status such as research progress and enough consultation with the supervisor is required to determine details such as research schedule. In the research plan presentation, students present their research plan and preparation status. The presentation aims to enhance the student's ability for problem setting and communication skills, by deepening the understandings of research area's background and recognizing the validity of problem setting on their research plan through questions and answers in the review. In the intermediate review, students present progress of their research and plan for solving problems, and are evaluated if they have obtained or are expected to obtain their own claims including novel knowledge with academic values or useful contribution for the development of the information and communications engineering field.



- Criteria for doctoral dissertation evaluation
  Doctoral dissertation must be an original self-written dissertation with novelty, originality and enough academic value and the main parts must be published in publications such as international level academic journals.

- Doctoral dissertation defense procedure
  The jury committee consists of at least five professors. Deployments of external jury committee members from other universities, research institutes and enterprises etc. is encouraged.
  It is required to pass an intermediate review (in 7Q in standard) and an achievement review (in 11Q in standard) before dissertation review. To take an achievement review, an intermediate review must be passed. After the dissertation submission, the dissertation presentation (in 11Q in standard) is held before the defense (in 12Q in standard).