For entrants in AY 2025

Appended Form 1

Specifications for Major Program
Name of School (Program)〔School of Engineering Cluster 2(Electrical, Electronic and Systems Engineering)〕

Program name (Japanese)	半導体システムプログラム
(English)	Program of Semiconductor Systems

1.Academic Degree to be Acquired：Bachelor's degree in engineering

2. Overview

In the fields of electricity, electronics, systems, information, and in other related fields, technological innovation has been advancing rapidly. We are now in a situation where innovative technology, ideas, and theories are being produced not only by deepening expert knowledge in a specific area, but by combining expert knowledge from multiple fields. As the impact of such technology on society is getting greater, it is always necessary to keep in mind the relationship between humankind, society, and nature.

On the basis of these social trends, Cluster 2 in the School of Engineering (Electrical, Electronic and Systems Engineering) has prepared the following programs with the aim of developing professionals who have a wide range of perspectives and insights, a sense of responsibility, and an ethical outlook, as well as specialized technological, problem-analyzing, and problem-solving abilities.

・The Program of Semiconductor Systems
・The Program of Electrical Systems and Information Engineering

Except for in exceptional circumstances, students who are enrolled in Cluster 2 in the School of Engineering (Electrical, Electronic and Systems Engineering) can choose this program from the above two options at the start of the second year, after going through liberal arts education and specialized education for one year after enrollment.

In the Program of Semiconductor Systems, students study electronic engineering centering on semiconductor devices such as integrated circuits.

Semiconductor device technology is one of the central technologies that supports modern society, in which computerization and informatization have been advancing. Today we use a number of devices and types of equipment in daily life and at work, such as audio and video equipment (TVs, video players, etc.) information processing and communication equipment (computers, the internet, smart devices, etc.), transportation equipment (automobiles), electric home appliances (cooking devices, etc.), medical equipment, manufacturing equipment used in factories, etc., most of which is capable of complicated processing through simple operations using semiconductor devices. In medical and nursing care equipment, and in robots working at disaster sites, which are expected to become increasingly important in the years to come, operability that can achieve complex movement is more necessary than ever. Therefore, the ability to detect the situation using high performance and high functioning sensors, together with complex information processing using integrated circuits, is indispensable. Furthermore, machine learning and artificial intelligence-based decision-making and processing are also being realized.

Meanwhile, considering the energy issues and global environmental problems that are expected to become serious in the future, electronic engineering technology centering on semiconductor devices has a major role to play in resolving many challenges. In order to reduce wasteful energy consumption by the efficient operation of various equipment, the utilization of semiconductor devices, not least solar cells, which are semiconductor devices that generate energy, is absolutely necessary.

Needless to say, new technology to reduce energy consumption by semiconductor devices themselves is also necessary. It goes without saying that semiconductor devices and their systems are also key technologies in rapidly developing technologies such as generative AI and quantum computing.

To respond to such needs, it is necessary to refine current semiconductor technology through the introduction of new materials and new operating principles, and to develop technology that incorporates other fields. In order to develop professionals who have systematic knowledge and the ability to develop innovative technology, and who can play a central role in solving such challenges, this program offers a curriculum in which students can learn systematically and extensively, from basic knowledge such as quantum physics, mechanisms of information processing, and basic semiconductor physics, to the latest research such as high performance electronic devices in nanometer size, processor operation, and high-functioning integrated circuit systems.

The following are the characteristics of the Program of Semiconductor Systems.

(1) Class subjects are arranged to make it possible for students to learn in order the subjects related to each of the fields, physics and materials, semiconductor devices, information processing system architecture, and integrated systems. Class subjects are also arranged so that the association of subjects in each field is taken into consideration.

(2) Entry-level subjects and introductory subjects in each field (Introduction to Physical Electronics, Logical System Design, and Introduction to Semiconductor Devices and Circuits) have been prepared for the second year. Consideration has been given to ensuring that students can see the whole picture in the specialized subject groups that they study. On the other hand, a variety of specialized subjects, including the most advanced science and technology, are offered in the second semester of the third year.

(3) Subjects concerning physics and solid state physics, which form basis of materials and semiconductor devices, have been designed so that students can learn the basic principles necessary for innovative technological development. Students can also systematically learn the design engineering of integrated circuits from the basics of electrical and electronic circuits to the latest integrated circuits.

(4) Systematic study of the latest integrated circuit technology, communications and information processing systems, from the basics of electrical and electronic circuits to computer configuration and operation.

(5) This program focuses on acquisition of knowledge, and technical and research ability, in relation to actual “things” such as materials, devices, and integrated circuits. For graduation work, subjects pertinent to the latest research have been set, such as the new theory of operating principles, the manufacture of functional materials, the evaluation of physical properties, the manufacture of new functional devices and semiconductor devices in nanometer size, algorithms utilizable in actual systems, and the design and prototype of integrated circuits.

(6) In collaboration with other programs, students can learn subjects concerning electric energy, electronic control, signal processing, and software.

3. Academic Awards Policy (Goals of the Program and Policy for Awarding Degrees)

The Program of Semiconductor Systems offers an education that emphasizes the field of physical properties and materials, which forms the basis for new devices, the field of high-performance semiconductor devices in nanometer size, and the field of information system architecture, centering on high performance integrated circuits. By providing both the basic concepts and cutting edge knowledge in each field, and by identifying the mutual relationships between the fields in a systematic manner, this program aims at developing professionals who can take the lead in engineering development in the semiconductor engineering field and who have the ability to develop innovative technology by fusing together the different fields, which will be of growing importance in the future.

Specifically, this program offers education aimed at cultivating a broad range of general knowledge, an international perspective which aspires to peace, a general sense of judgment, and a well-rounded character.

The program awards a bachelor’s degree in engineering to students who, in addition to the number of credits necessary to meet the standard of the course, have acquired the liberal arts education and specialized education necessary to prepare them for achieving the following goals:

【Goal A】Acquisition of the ability to recognize the relationship between science and technology, and humankind, society, and the natural environment, from various perspectives, and the ability to understand the responsibilities engineers have for society.

【Goal B】 Acquisition of the basic knowledge commonly required in the field of semiconductor systems and the abilities applicable to the field.

【Goal C】 Acquisition of the ability to analyze given challenges by using expertise, and draw solutions that meet

the requirements of society.
【Goal D】 Acquisition of the ability to draw up plans and measures to resolve challenges, and the will to carry these measures out.
【Goal E】Acquisition of the ability to gather information and to communicate in Japanese and English. Acquisition of the ability to sum up one's thoughts and accomplishments, to write logically, and to give a presentation.

4.Curriculum Policy （Policy for Preparing and Implementing the Curriculum)

The Program of Electronic Devices and Systems prepares and implements a curriculum that provides the following knowledge and abilities so that students are able to achieve goals A to E listed above.

In the curriculum described above, teaching and learning will be implemented by utilizing active learning and online classes, depending on the delivery methods of the program, such as lectures and seminars.

In addition to strict grading using the standards clearly outlined in the syllabus, learning outcomes are evaluated based on the degree to which the goals set by the educational program are achieved.

○Knowledge/Understanding

・Cultivation of the understanding of society-technology relations and the ethical outlook necessary for an engineer (Goal A). This is obtained through mastery of liberal arts education subjects such as “Introduction to University Education”, and “Information Subjects”, and basic specialized subjects such as “Introduction to Energy and Information Systems” to be offered in the first year.

・Basic knowledge of mathematics, such as differential and integral calculus, and linear algebra, required by scientists and engineers (Goal B). This is obtained through mastery of such basic subjects as “Calculus” to be offered in the first year.

・ Basic knowledge of physical theory and experimental methods required by scientists and engineers (Goal B). This is obtained through mastery of basic subjects such as “General Mechanics”, “Experimental Methods and Laboratory Work in Physics” to be offered in the first year.

・General understanding and acquisition of knowledge about technologies in the field of semiconductor systems, and acquisition of the basic knowledge common to this field (Goal B). This is obtained through mastery of “Introduction to Energy and Information Systems” and “Electric Circuit Theory I” to be offered in the first year.

○Abilities/Skills

・The mathematical methodology required by experts in the field of semiconductor systems (Goal B). This is obtained through mastery of basic specialized subjects such as “Applied Mathematics” to be offered during the period from the third or fourth term of the first year through the second year.

・The concepts, knowledge, and methodology that form the foundation of the field of semiconductor systems (Goal B). This is obtained through mastery of specialized subjects to be offered during the period from the third or fourth term of the first year through the third year.

・The ability to apply basic concepts, knowledge, and methodology in the field of semiconductor systems to concrete, professional issues (Goal B). This is obtained through mastery of specialized subjects to be offered during the period from the third or fourth term of the first year through the third year.

・ The ability to resolve problems and challenges by using experiments to solve practical problems, by using methods of numerical calculation, and by gathering relevant data (Goal D). This is obtained through mastery of basic specialized subjects such as “Basic Experiments in Electrical Engineering” and “Programming” to be offered during the period from the first or second term of the second year through the third year.

・ The ability to make action plans on one’s own initiative in relation to practical issues and challenges, make adjustments and resolve problems and challenges by using basic and specialized knowledge and methods (Goal C, D). This is obtained through mastery of “Graduation Thesis” to be offered in the fourth year.

○Comprehensive Abilities

・Creative and logical thinking to analyze practical problems and challenges, and to reach rational solutions that meet the requirements of society, as well as the engineering development abilities to physically realize such solutions (Goal C, D). These are obtained through mastery of “Graduation Thesis” to be offered in the fourth year.

・The ability to organize research results and write logically, including regarding the significance and validity of the obtained outcomes, and to present these research outcomes and discuss them verbally and in an easy-to-understand manner (Goal E). This is obtained through mastery of “Graduation Thesis” to be offered in the fourth year.

・The teamwork, leadership, and communication abilities needed to work in a group (Goal E). These are obtained through mastery of basic specialized subjects such as “Basic Experiments in Electrical Engineering” to be offered during the period from the second year through the third year.

・The ability to take an approach to solving various problems after understanding that such problems that exist in humankind, society, and among individuals can be interpreted in various ways depending on social conditions, cultures, etc. (Goal A, D). This is obtained through mastery of liberal arts education subjects such as “Basic Language I” and “Area Courses”.

・The ability to read, write, converse, and retrieve information in the English language necessary for conducting research (Goal E). This is obtained through mastery of “Technical English” to be offered in the third year and “Graduation Thesis” to be offered in the fourth year.

5. Program Timing and Acceptance Conditions

At the beginning of the second year, students are assigned to this program based on consideration of their request and academic results. In order to be assigned to this program, students must acquire a total of 34 or more credits in liberal arts education subjects and specialized education subjects by the end of the first year.

6. Qualifications to be Acquired

By mastering the predetermined courses, students can obtain Type-1 High School Teaching License (Industry). Students qualify as electrical chief engineers and engineers for architectural equipment after having hands-on experience for some years after graduation. The details are given in student handbook.

7. Class subjects and course content

* For class subjects, see the course list table on the attached sheet.
* For course content, see the syllabus for each academic year.

Evaluation of academic achievement	Converted values
S(Excellent: 90 points or higher)	4
A(Superior:80-89 points)	3
B(Good: 70-79 points)	2
C(Fair: 60-69 points)	1

8. Academic Achievements

At the end of each semester, the evaluation criteria are applied to each evaluation item of academic achievement to clearly demonstrate the level of attainment. Students’ grade calculation for each subject from admission to the current semester is given in one of three levels: “Excellent,” “Very Good,” and “Good,” based on evaluation criteria calculated by adding the weighted values to the numerically-converted values of their academic achievements (S = 4, A = 3, B = 2, and C= 1) in each subject being evaluated.

Academic achievement	Evaluation criteria
Excellent	3.00～4.00
Very Good	2.00～2.99
Good	1.00～1.99

* See the relationship between evaluation items and evaluation criteria in the attached sheet 2.
* See the relationship between evaluation items and class subjects in the attached sheet 3.
* See the curriculum map in the attached sheet 4.

9. Graduation Thesis (Graduation Research) (Positioning, When and how to be assigned, etc.)

○ Positioning

Graduation work aims at imparting general research skills by conducting research in line with the research agenda

established for each student. The following are more concrete goals:

1. The acquisition of the ability to make a research plan based on the research agenda and execute the research in accordance with the plan
2. The acquisition of the ability to collect materials related to the research agenda, demonstrate a deep understanding of the research agenda, and identify problems
3. The acquisition of the ability to analyze the problems in the research agenda and reach solutions in accordance with the requirements of society
4. The acquisition of the ability to read, write, converse, and retrieve information in the English language necessary for conducting research
5. The acquisition of the ability to organize research results and write in coherent sentences the significance and validity of the obtained outcomes
6. The acquisition of the ability to present the research outcomes and discuss them verbally in an easy-to-understand manner

○ When and how it is assigned

The requirements for embarking on a graduation thesis are as described in the student handbook.

Students in the fourth year or over, who satisfy the requirements for embarking on a graduation thesis, are to be assigned as requested. How adjustments are made in relation to assignment is explained to the applicable students at a briefing held in advance. A briefing session about research topics or an open laboratory is held around the time from February to March for students who are to be assigned to the research laboratory and to the program.

10. Responsibility System

(1) PDCA Responsibility System (“Plan,” “Do,” “Check,” and “Act”)

This program is operated by teachers who support the Program of Semiconductor Systems, however, the program targets students who belong to Cluster 2 and, therefore, the person responsible for executing the program is the Cluster 2 leader. Planning, implementing, evaluation, and handling are discussed mainly in the Cluster 2 Education Program committee and in the Cluster 2 committee (held, in principle, on the first Wednesday of every month) in an appropriate manner. Depending on the situation or content, a working group is established at the instruction of the Cluster leader to focus in the issues at hand.

When there is a need to consider the response on a program basis, research laboratory groups responsible for the applicable program take the necessary measures. In that case, the responsible person is appointed by the Cluster leader.

(2) Program assessment

○ Criteria for Program assessment

- Whether or not each class subject is properly allocated in light of the goals of the program, and whether course content is appropriate
- Whether or not students taking the course have one average achieved the goal or above
- Whether or not the system runs in proper cycles that enable the program to continually improve in an upward spiral

○ How it is assessed

- Conducting self-assessment for each subject based on the results of class evaluations carried out by students who have taken the course, and also based on grade calculation results
- Regarding the upward spiral of the program, obtaining the questionnaire from graduates in suitable cycles and also collecting the needs from business corporations

○ Position on giving feedback to students and how it is approached

- For individual courses, the teacher in charge gives comments on course evaluation results and academic achievement results.
- For re-examining the program structure, the reasons for and the purposes of re-examination are given on the website.

Cluster 2 (Electrical, Electronic and Systems Engineering)

◎ Required subject (period of registration specified)

○ Compulsory elective subject (any of these subjects shall be registered

△ Free elective subject (any of these subjects shall be registered)

Subject Type					Required No. of credits	Class subjects, etc.	No. of credits	Type of course registration	Year in which the subject is taken(*The lower figure means semester) (Note 1)													
									1st grade				2nd grade				3rd grade				4th grade	
									Spring		Fall		Spring		Fall		Spring		Fall		Spring	Fall
									1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T 2T	3T 4T
Liberal Arts Education Subjects	Peace science curse				2		2	Compulsory elective		○												
	Common Subjects	Basic Courses in University Education	Introduction to University Education		2	Introduction to University Education	2	Required	◎													
			Introductory Seminar for First-Year		2	Introductory Seminar for First-Year Students	2	Required	◎													
			Advanced Seminar		0		1	Free elective			△	△										
		Area Courses			4	Courses in Arts and Humanities/Social Sciences	2	Compulsory elective	○		○											
					4	Courses in Natural Sciences	2			○		○										
		Foreign Languages	English (Note2・3)	Basic English Usage	2	Basic English UsageI	1	Required	◎	◎												
						Basic English UsageII	1				◎	◎										
				Communication Ⅰ	2	CommunicationIA	1	Required	◎	◎												
						Communication IB	1		◎	◎												
				Communication Ⅱ	2	Communication IIA	1	Required			◎	◎										
						Communication IIB	1				◎	◎										
			Initial Foreign Languages (Select one language from German, French, Spanish, Russian, Chinese, Korean and Arabic)		2	1 subjects from Basic language I	1	Compulsory elective	○													
						1 subjects from Basic language II	1			○													
		Information and Data Science Courses			2	Introduction to Information and Data Sciencies	2	Required		◎												
		Health and Sports Cou			2		1or2	Compulsory elective	○	○	○	○										
	Basic Subjects				16	CalculusI	2	Required		◎												
						CalculusII	2					◎										
						Linear AlgebraI	2		◎													
						Linear AlgebraII	2				◎											
						Seminar in Basic Mathematics I	1			◎												
						Seminar in Basic Mathematics II	1					◎										
						General Mechanics I	2		◎													
						General Mechanics II	2				◎											
						Experimental Methods and Laboratory Work in Physics I(Note 4)	1				◎											
						Experimental Methods and Laboratory Work in Physics II(Note 4)	1					◎										
	Free elective subjects				6	From all Subject Type (Note 5)		Free elective	△	△	△	△										
	No. of credits required for graduation				48																	

Note 1: When students fail to acquire the credit during the term or semester marked with ◎, ○, △ in the boxes for the year in which the course is taken, they can take the course in subsequent terms or semesters. Depending on class subject, courses may be offered in semesters or terms different from those scheduled. Please be sure to check the time schedule for Liberal Arts

Note 2: The credit obtained by mastery of self-directed study of "Online Seminar in English A・B" cannot be counted towards the credit necessary for graduation. The credit obtained by Overseas Language Training can be recognized as Communication Ⅰ or Ⅱ if application is made in advance. For more details, please refer to the article on English in Liberal Arts Education in the student handbook.

Note 3: We have a recognition of credit system for foreign language proficiency tests. For more details, please refer to the article on Foreign Language in Liberal Arts Education in the student handbook.

Note 4: Students must take both「Experimental Methods and Laboratory WorkI(1credit)」and「Experimental Methods and Laboratory WorkII(1credit)」.

Note 5: You should take subjects from the Area courses in Natural Sciences and Basic subjects.

Cluster 2 Basic Specialized Subjects

◎ Required subject
○Compulsory elective subje
△Free elective subject

Class Subjects	Credits	Type of course registration		Class Hours/Week																Note
		Electrical, Systems and Information Engineering	Semiconductor Systems	1st grade				2nd grade				3rd grade				4th grade				
				Spring		Fall		Spring		Fall		Spring		Fall		Spring		Fall		
				1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	
Applied Mathematics I	2	◎	◎			4														
Applied Mathematics II	2	○	◎					4												
Applied Mathematics III	2	◎	◎						4											
Discrete Mathematics I	2	○	△						4											(School of Informatics and Data Science)
Synthesis of Applied Mathematics	2	○	○							4										
Engineering Mathematics A	2	△	△									4								
Engineering Mathematics C	2	△	○								4									
Probability and Statistics	2	◎	○					4												
Technical English	1	◎	◎											4						
Introduction to Energy and Information Systems	2	◎	◎				4													
Electric Circuit Theory I	2	◎	◎			4														
Programming I	2	◎	◎						4											
Programming II	2	◎	◎							4										
Programming III	2	△	○									4								
Basic Experiments in Electrical Engineering I	2	◎	◎					5	5											
Basic Experiments in Electrical Engineering II	2	◎	◎							5	5									
Experiments in Electrical Engineering Electronics and System Engineering I	2		◎									5	5							
Experiments in Electrical Engineering Electronics and System Engineering II	2	◎										5	5							

Cluster 2 Specialized Subjects

(Program of Electronic Devices and Systems)

◎ Required subject
○・ⒶCompulsory elective subject
△Free elective subject

Class Subjects	Credits	Type of course	Class Hours/Week																Note
			1st grade				2nd grade				3rd grade				4th grade				
			Spring		Fall		Spring		Fall		Spring		Fall		Spring		Fall		
			1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	
Electromagnetism I	2	◎					2	2											
Electromagnetism II	2	◎							2	2									
Exercise of Electromagnetism I	1	◎					2	2											
Exercise of Electromagnetism II	1	◎							1	1									
Electromagnetic Wave Propagation	2	○									4								
Introduction to Physical Electronics	2	◎						4											
Quantum Mechanics	2	Ⓐ							4										
Thermodynamics and Statistical Mechanics	2	○										4							
Solid State Physics	2	Ⓐ									4								
Surface Science and Nanotechnology	2	○												4					
Introduction to Semiconductor Devices and Circuits	2	◎						4											
Solid State Electronics	2	Ⓐ								4									
Semiconductor Device Engineering	2	○										4							
Optoelectronic Semiconductor Devices	2	○											4						
Electronic Material Engineering	2	○												4					
Electric and Electronic Measurements	2	○							4										
Electric Transient Phenomena	2	○							4										
Logic System Design Ⅰ	2	◎					4												
Logic System Design Ⅱ	2	Ⓐ						4											
Semiconductor Process Engineering	2	○											4						
Circuit Theory IIB	2	○						4											
Exercise of Circuit Theory ⅡB	1	○						4											
Computer Architecture	2	Ⓐ							4										
Electronic Circuits	2	○								4									
Electric Energy Generation and Conversion	2	△								4									
Fundamentals of Power Systems	2	△									4								
Control Systems Engineering I	2	○						4											
Control Systems Engineering II	2	△								4									
Signal Processing Engineering	2	△										4							
Bioelectrical Engineering	2	△										4							
Robotics	2	△											4						
Communication Engineering	2	○										4							
Hardware Description Language	2	Ⓐ								4									
Introduction to Artificial Intelligence	2	△					4												
Computer Network	2	△												4					(School of Informatics and Data Science)
Algorithms and Data Structures	2	△							4										(School of Informatics and Data Science)
Graduation Thesis	5	◎																	

Academic Achievements in Semiconductor Systems Program

The Relationship between Evaluation Items and Evaluation Criteria

Academic Achievements			Evaluation Criteria		
Evaluation Items			Excellent	Very Good	Good
Knowledge/Understanding	(1)	The ethics and understanding about the relations between society and technology considered basically necessary for engineers.	Sufficiently understand relations between society and technology, and be able to behave with a sufficient sense of ethics.	Understand relations between society and technology at the standard level, and be able to behave with a standard sense of ethics.	Marginally understand relations between society and technology, and be able to behave with a minimum sense of ethics.
	(2)	Basic knowledge of mathematics such as calculus and linear algebra, which is required for scientists/engineers.	Acquire and be able to utilize sufficient basic knowledge of mathematics such as calculus and linear algebra.	Acquire and be able to utilize standard basic knowledge of mathematics such as calculus and linear algebra.	Acquire and be able to utilize minimum basic knowledge of mathematics such as calculus and linear algebra.
	(3)	Basic knowledge of theories and experimental methods of physics, which is required for scientists/engineers.	Acquire and be able to utilize sufficient basic knowledge of theories and experimental methods of physics.	Acquire and be able to utilize standard basic knowledge of theories and experimental methods of physics.	Acquire and be able to utilize minimum basic knowledge of theories and experimental methods of physics.
	(4)	Comprehensive understanding and knowledge of technologies in semiconductor engineering. Also, basic knowledge which is common in these fields.	Sufficiently acquire and be able to utilize general, common and basic knowledge of semiconductor engineering.	Acquire and be able to utilize general, common and basic knowledge of semiconductor engineering, at the standard level.	Marginally acquire and be able to utilize general, common and basic knowledge of semiconductor engineering.
Abilities/Skills	(1)	Mathematical methods required for professionals in semiconductor engineering.	Sufficiently acquire and be able to utilize mathematical methods which are required for professionals in semiconductor engineering.	Acquire and be able to utilize mathematical methods which are required for professionals in semiconductor engineering, at the standard level.	Marginally acquire and be able to utilize mathematical methods which are required for professionals in semiconductor engineering.
	(2)	Concepts, knowledge and methods which are the basis for studies related to semiconductor engineering.	Sufficiently acquire and be able to utilize concepts, knowledge and methods which are the basis for studies related to semiconductor engineering.	Aquire and be able to utilize concepts, knowledge and methods of semiconductor engineering, at the standard level.	Marginally acquire and be able to utilize concepts, knowledge and methods which are the basis for studies related to semiconductor engineering.
	(3)	Ability to apply basic concepts, knowledge, and methods of semiconductor engineering to concrete/technical problems.	Acquire and be able to utilize sufficient abilities to apply basic concepts, knowledge and methods of semiconductor engineering to concrete/technical problems.	Acquire and be able to utilize standard abilities to apply basic concepts, knowledge and methods of semiconductor engineering to concrete/technical problems.	Acquire and be able to utilize marginal abilities to apply basic concepts, knowledge and methods of semiconductor engineering to concrete/technical problems.
	(4)	Ability to solve practical issues and problems by conducting experiments, using numerical computation methods, and collecting relevant materials.	Acquire and be able to utilize sufficient abilities to solve practical issues and problems by conducting experiments, using mathematical methods, and collecting relevant materials.	Acquire and be able to utilize standard abilities to solve practical issues and problems by conducting experiments, using mathematical methods, and collecting relevant materials.	Acquire and be able to utilize marginal abilities to solve practical issues and problems by conducting experiments, using mathematical methods, and collecting relevant materials.
	(5)	Ability to solve pracitical issues and problems by voluntarily making a plan, revising it, and utilizing basic and technical knowledge and methods.	Acquire and be able to utilize sufficient abilities to solve pracitical issues and problems by voluntarily making a plan, revising it, and utilizing basic and technical knowledge and methods.	Acquire and be able to utilize standard abilities to solve pracitical issues and problems by voluntarily making a plan, revising it, and utilizing basic and technical knowledge and methods.	Acquire and be able to utilize marginal abilities to solve pracitical issues and problems by voluntarily making a plan, revising it, and utilizing basic and technical knowledge and methods.
Comprehensive Abilities	(1)	Creative thinking ability and logical thinking skills to analyze practical problems and tasks, and to lead to rational solutions satisfying social needs, as well as technical development skills to physically realize the solutions.	Sufficiently aqcuire and be able to utilize logical thinking skills to lead to rational solutions satisfying social needs and technical development skills to phisically realize the solutions.	Aqcuire and be able to utilize logical thinking skills to lead to rational solutions satisfying social needs and technical development skills to phisically realize the solutions, at the standard level.	Marginally aqcuire and be able to utilize logical thinking skills to lead to rational solutions satisfying social needs and technical development skills to phisically realize the solutions.
	(2)	Skills to organize research results and to describe them logically including the significance and the effectiveness of the obtained outcomes as well as to make easy-to-understand oral presentations and discussions.	Acquire and be able to utilize sufficient skills to organize research results and to describe them logically including the significance and the effectiveness of the obtained outcomes as well as to make easy-to-understand oral presentations and discussions.	Acquire and be able to utilize standard skills to organize research results and to describe them logically including the significance and the effectiveness of the obtained outcomes as well as to make easy-to-understand oral presentations and discussions.	Acquire and be able to utilize marginal skills to organize research results and to describe them logically including the significance and the effectiveness of the obtained outcomes as well as to make easy-to-understand oral presentations and discussions.
	(3)	Teamwork, leadership and communication skills in group works.	Sufficiently acquire and be able to utilize the teamwork, leadership and communication skills for presentations and discussions through solving issues in group works.	Acquire and be able to utilize the teamwork, leadership and communication skills for presentations and discussions through solving issues in group works, at the standard level.	Marginally acquire and be able to utilize the teamwork, leadership and communication skills for presentations and discussions through solving issues in group works.
	(4)	Ability to understand that various problems, which humanity, society, and individuals are facing, can be interpreted variously depending on social status, culture and so on, as well as to deal with those problems to solve.	Sufficiently acquire and utilize skills to fully understand that various problems, which humanity, society, and individuals are facing, can be interpreted variously depending on social status, culture and so on, as well as to deal with those problems to solve.	Acquire and utilize skills at the standard level to understand that various problems, which humanity, society, and individuals are facing, can be interpreted variously depending on social status, culture and so on, as well as to deal with those problems to solve.	Marginally acquire and utilize skills to minimally understand that various problems, which humanity, society, and individuals are facing, can be interpreted variously depending on social status, culture and so on, as well as to deal with those problems to solve.
	(5)	Ability of English conversation, reading and writing skills necessary for research accomplishment.	Sufficiently acquire and be able to utilize the ability of English conversation, reading and writing skills necessary for engineers.	Acquire and be able to utilize the ability of English conversation, reading and writing skills necessary for engineers, at the standard level.	Marginally acquire and be able to utilize the ability of English conversation, reading and writing skills necessary for engineers.

Placement of the Liberal Arts Education in the Major Program

Liberal Arts Education in this program assumes the role of establishing the academic foundation on which the specialized education for Cluster 2 in the School of Engineering is built. It fosters a willing, self-reliant attitude and cultivates scientific thinking based on data gathering ability, analytical ability, and critical thinking ability. It establishes an outlook that makes it possible to provide insight on the inner nature of things and their background from a broad perspective, and enhances linguistic ability to a level appropriate for living as a world citizen, and also strengthens interest in peace and the ability integrates a broad range of knowledge into a body of knowledge that will be truly useful in solving problems. It cultivates the ability to explore and promote cross-disciplinary and comprehensive research that goes beyond the established frameworks.

Relationships between the evaluation items and class subjects

Subject type	Class subjects	credits	Type of course registration	Period	Evaluation items																												Total weighted values of evaluation items in the subject
					Knowledge/Understanding								Abilities/Skills										Comprehensive Abilities										
					(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)		(5)		(1)		(2)		(3)		(4)		(5)		
					Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	
Liberal Arts Education	Introduction to University Education	2	Required	1 semester	50	1																							50	1			100
Liberal Arts Education	Introductory Seminar for First-Year Students	2	Required	1 semester																			50	1	50	1							100
Liberal Arts Education	Peace Science Courses	2	Compulsory elective	1 semester																									100	1			100
Liberal Arts Education	Area Courses	8	Compulsory elective	1・2 semester																									100	1			100
Liberal Arts Education	Basic English Usage I	1	Required	1 semester																											100	1	100
Liberal Arts Education	Basic English Usage II	1	Required	2 semester																											100	1	100
Liberal Arts Education	Communication IA	1	Required	1 semester																											100	1	100
Liberal Arts Education	Communication IB	1	Required	1 semester																											100	1	100
Liberal Arts Education	Communication IIA	1	Required	2 semester																											100	1	100
Liberal Arts Education	Communication IIB	1	Required	2 semester																											100	1	100
Liberal Arts Education	Basic language I	1	Compulsory elective	1 semester																									100	1			100
Liberal Arts Education	Basic language II	1	Compulsory elective	1 semester																									100	1			100
Liberal Arts Education	Introduction to Information and Data Sciences	2	Required	1 semester	100	1																											100
Liberal Arts Education	Health and Sports Courses	2	Compulsory elective	1・2 semester																									100	1			100
Liberal Arts Education	Calculus I	2	Required	1 semester			100	1																									100
Liberal Arts Education	Calculus II	2	Required	2 semester			100	1																									100
Liberal Arts Education	Linear Algebra I	2	Required	1 semester			100	1																									100
Liberal Arts Education	Linear Algebra II	2	Required	2 semester			100	1																									100
Liberal Arts Education	Seminar in Basic Mathematics I	1	Required	1 semester			100	1																									100
Liberal Arts Education	Seminar in Basic Mathematics II	1	Required	2 semester			100	1																									100
Liberal Arts Education	General Mechanics I	2	Required	1 semester					100	1																							100
Liberal Arts Education	General Mechanics II	2	Required	2 semester					100	1																							100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics I・II	2	Required	2 semester					100	1																							100
Specialized Education	Applied Mathematics I	2	Required	2 semester									100	1																			100
Specialized Education	Applied Mathematics II	2	Required	3 semester									100	1																			100
Specialized Education	Applied Mathematics III	2	Required	3 semester									100	1																			100
Specialized Education	Discrete Mathematics I	2	Free elective	3 semester									100	1																			100
Specialized Education	Synthesis of Applied Mathematics	2	Compulsory elective	3 semester									100	1																			100
Specialized Education	Engineering Mathematics A	2	Free elective	3 semester									100	1																			100
Specialized Education	Engineering Mathematics C	2	Compulsory elective	4 semester									100	1																			100
Specialized Education	Probability and Statistics	2	Compulsory elective	3 semester									100	1																			100
Specialized Education	Technical English	1	Required	6 semester																											100	1	100
Specialized Education	Introduction to Energy and Information Systems	2	Required	2 semester	50	1					50	1																					100
Specialized Education	Electric Circuit Theory I	2	Required	2 semester							100	1																					100
Specialized Education	Programming I	2	Required	3 semester											50	1			50	1													100
Specialized Education	Programming II	2	Required	4 semester											50	1			50	1													100
Specialized Education	Programming III	2	Compulsory elective	7 semester											50	1			50	1													100
Specialized Education	Basic Experiments in Electrical Engineering I	2	Required	3 semester															50	1							50	1					100
Specialized Education	Basic Experiments in Electrical Engineering II	2	Required	4 semester															50	1							50	1					100
Specialized Education	Experiments in Electrical Engineering Electronics and Systems Engineering I	2	Required	2 semester															50	1							50	1					100
Specialized Education	Electromagnetism I	2	Required	3 semester											100	1																	100
Specialized Education	Electromagnetism II	2	Required	4 semester											50	1	50	1															100
Specialized Education	Exercise of Electromagnetism I	1	Required	3 semester											50	1	50	1															100
Specialized Education	Exercise of Electromagnetism II	1	Required	4 semester											50	1	50	1															100
Specialized Education	Electromagnetic Wave Propagation	2	Compulsory elective	5 semester													100	1															100
Specialized Education	Introduction to Physical Electronics	2	Required	3 semester											100	1																	100
Specialized Education	Quantum Mechanics	2	Compulsory elective	3 semester											100	1																	100
Specialized Education	Thermodynamics and Statistical Mechanics	2	Compulsory elective	5 semester											100	1																	100
Specialized Education	Solid State Physics	2	Compulsory elective	5 semester											100	1																	100
Specialized Education	Surface Science and Nanotechnology	2	Compulsory elective	6 semester													100	1															100
Specialized Education	Introduction to Semiconductor Devices and Circuits	2	Required	5 semester											100	1																	100
Specialized Education	Solid State Electronics	2	Compulsory elective	5 semester											100	1																	100
Specialized Education	Semiconductor Device Engineering	2	Compulsory elective	5 semester													100	1															100
Specialized Education	Optoelectronic Semiconductor Devices	2	Compulsory elective	6 semester													100	1															100
Specialized Education	Electronic Material Engineering	2	Compulsory elective	6 semester													100	1															100
Specialized Education	Electric and Electronic Measurements	2	Compulsory elective	4 semester													100	1															100
Specialized Education	Electric Transient Phenomena	2	Compulsory elective	4 semester											50	1	50	1															100
Specialized Education	Logic System Design I	2	Required	2 semester											50	1	50	1															100
Specialized Education	Logic System Design II	2	Compulsory elective	3 semester											50	1	50	1															100
Specialized Education	Semiconductor Process Engineering	2	Compulsory elective	6 semester													100	1															100
Specialized Education	Circuit Theory IIB	2	Compulsory elective	5 semester											50	1	50	1															100
Specialized Education	Exercise of Circuit Theory IIB	2	Compulsory elective	7 semester											50	1	50	1															100
Specialized Education	Computer Archtecture	2	Compulsory elective	4 semester											50	1	50	1															100
Specialized Education	Electric Energy Generation and Conversion	2	Free elective	4 semester													100	1															100
Specialized Education	Fundamentals of Power Systems	2	Free elective	5 semester													100	1															100
Specialized Education	Control Systems Engineering I	2	Compulsory elective	5 semester											50	1	50	1															100
Specialized Education	Control Systems Engineering II	2	Free elective	6 semester											50	1	50	1															100
Specialized Education	Signal Processing Engineering	2	Free elective	6 semester											50	1	50	1															100
Specialized Education	Bioelectrical Engineering	2	Free elective	7 semester													100	1															100
Specialized Education	Robotics	2	Free elective	6 semester											100	1																	100
Specialized Education	Communication Engineering	2	Compulsory elective	5 semester													100	1															100
Specialized Education	Hardware Description Language	2	Compulsory elective	3 semester											50	1	50	1															100
Specialized Education	Introduction to Artificial Intelligence	2	Free elective	5 semester													100	1															100
Specialized Education	Computer Network	2	Free elective	6 semester													100	1															100
Specialized Education	Algorithms and Data Structures	2	Free elective	6 semester													100	1															100
Specialized Education	Graduation Thesis	5	Required	7semester																	25	1	25	1	25	1					25	1	100

Curriculum Map of Semiconductor Systems

	Academic Achievement	1st grade		2nd grade		3rd grade		4th grade	
	Evaluation Items	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Knowledge/Understanding	The ethics and understanding about the relations between society and technology considered basically necessary for engineers.	<IT>Introduction to University Education	<IT>Introduction to Energy and Information Systems						
		Introduction to Information and Data Sciencies							
	Basic knowledge of mathematics such as calculus and linear algebra, which is required for scientists/engineers.	CalculusI	CalculusII						
		Linear AlgebraI	Linear AlgebraII						
		Seminar in Basic Mathematics I	Seminar in Basic Mathematics II						
	Basic knowledge of theories and experimental methods of physics, which is required for scientists/engineers.	General Mechanics I	General Mechanics II						
			Experimental Methods and Laboratory Work in Physics I・II						
	Comprehensive understanding and knowledge of technologies in semiconductor engineering. Also, basic knowledge which is common in		<IT>Introduction to Energy and Information Systems						
			Electric Circuit Theory I						
Abilities/Skills	Mathematical methods required for professionals in semiconductor engineering.		Applied Mathematics I	Applied Mathematics II	Synthesis of Applied Mathematics	Engineering Mathematics A			
				Applied Mathematics III	Engineering Mathematics C				
				Probability and Statistics					
	Concepts, knowledge and methods which are the basis for studies related to semiconductor engineering.			Programming I	Programming II	Programming III	Robotics		
				Electromagnetism I	Electromagnetism II	Thermodynamics and Statistical Mechanics			
				Exercise of Electromagnetism I	Exercise of Electromagnetism II	Solid State Physics			
				Introduction to Physical Electronics	Quantum Mechanics	Signal Processing Engineering			
				Introduction to Semiconductor Devices and Circuits	Solid State Electronics				
				Logic System Design I	Electric Transient Phenomena				
				Logic System Design II	Electronic Circuits				
				Circuit Theory IIB	Control Systems Engineering II				
				Control Systems Engineering I	Computer Architecture				
				Exercise of Circuit Theory IIB	Hardware Description Language				
				Introduction to Artificial Intelligence	Algorithms and Data Structures				
	Ability to apply basic concepts, knowledge, and methods of semiconductor engineering to concrete/technical problems.			Exercise of Electromagnetism I	Electromagnetism II	Electromagnetic Wave Propagation	Surface Science and Nanotechnology		
				Logic System Design I	Exercise of Electromagnetism II	Semiconductor Device Engineering	Optoelectronic Semiconductor Devices		
				Logic System Design II	Electric Transient Phenomena	Fundamentals of Power Systems	Electronic Material Engineering		
				Circuit Theory IIB	Electric and Electronic Measurements	Signal Processing Engineering	Semiconductor Process Engineering		
				Control Systems Engineering I	Electronic Circuits	Bioelectrical Engineering	Computer Network		
				Exercise of Circuit Theory IIB	Electric Energy Generation and Conversion	Communication Engineering			
				Introduction to Artificial Intelligence	Control Systems Engineering II				
					Computer Architecture				
					Hardware Description Language				
					Algorithms and Data Structures				
	Ability to solve practical issues and problems by conducting experiments, using numerical computation methods, and collecting relevant materials.			Basic Experiments in Electrical Engineering I	Basic Experiments in Electrical Engineering II	Experiments in Electrical Engineering (Electronics and System Engineering)			
				Programming I	Programming II	Programming III			
	Ability to solve pracitical issues and problems by voluntarily making a plan, revising it, and utilizing basic and technical knowledge and methods.							Graduation Thesis	Graduation Thesis
Comprehensive Abilities	Creative thinking ability and logical thinking skills to analyze practical problems and tasks, and to lead to rational solutions satisfying social needs, as well as technical development skills to physically realize the solutions.	Introductory Seminar for First-Year Students						Graduation Thesis	Graduation Thesis
	Skills to organize research results and to describe them logically including the significance and the effectiveness of the obtained outcomes as well as to make easy-to-understand oral presentations and discussions.	Introductory Seminar for First-Year Students						Graduation Thesis	Graduation Thesis
	Teamwork, leadership and communication skills in group works.			Basic Experiments in Electrical Engineering I	Basic Experiments in Electrical Engineering II	Experiments in Electrical Engineering (Electronics and System Engineering)			
	Ability to understand that various problems, which humanity, society, and individuals are facing, can be interpreted variously depending on social status, culture and so on, as well as to deal with those problems to solve.	<IT>Introduction to University Education	Area Courses						
		Peace Science Courses	Health and Sports Courses						
		Area Courses							
		Health and Sports Courses							
		Basic language I・II							
	Ability of English conversation, reading and writing skills necessary for research accomplishment.	Basic English UsageI	Basic English UsageII				Technical English	Graduation Thesis	Graduation Thesis
		CommunicationIA	Communication IIA						
		Communication IB	Communication IIB						

(Ex) Liberal Arts Education | Basic Specialized Subjects | Specialized Subjects | Graduation Thesis