

# For entrants in AY 2023

Appended Form 1

## Specifications for Major Program

Name of School (Program) School of Engineering Cluster 2(Electrical, Electronic and Systems Engineering)

Program name (Japanese)	
(English)	Program of Electronic Devices and 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 Electronic Devices and 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 Electronic Devices and 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, mobile phones, 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, the realization of judgment processing using artificial intelligence is eagerly awaited.

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.

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 and basic semiconductor physics,

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”, “

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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.

**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.

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

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 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 April for students who are to be assigned to the research laboratory and to the program.

10. Responsibility System

(1) PDCA Responsibility S3.1 (t)-13.1 (e 805.44 0.e,d05.44 2.1 (S)-21.44 0.4946.4 (o)1816.1.988 0 TdßS3.1 (t)8 (.)]65uar)-1



## 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	Electronic Devices and 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						





Academic Achievements in Electronic Devices and 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 electronics engineering. Also, basic knowledge which is common in these fields.	Sufficiently acquire and be able to utilize general, common and basic knowledge of electronics engineering.	Acquire and be able to utilize general, common and basic knowledge of electronics engineering, at the standard level.	Marginally acquire and be able to utilize general, common and basic knowledge of electronics engineering.
Abilities/Skills	(1) Mathematical methods required for professionals in electronics engineering.	Sufficiently acquire and be able to utilize mathematical methods which are required for professionals in electronics engineering.	Acquire and be able to utilize mathematical methods which are required for professionals in electronics engineering, at the standard level.	Marginally acquire and be able to utilize mathematical methods which are required for professionals in electronics engineering.
	(2) Concepts, knowledge and methods which are the 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 practical 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 practical 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 practical 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 practical 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 acquire and be able to utilize logical thinking skills to lead to rational solutions satisfying social needs and technical development skills to physically realize the solutions.	Acquire and be able to utilize logical thinking skills to lead to rational solutions satisfying social needs and technical development skills to physically realize the solutions, at the standard level.	Marginally acquire and be able to utilize logical thinking skills to lead to rational solutions satisfying social needs and technical development skills to physically 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.



Curriculum Map of Electronic Devices and Systems

