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 lear	_
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", " sn (al (c-20.1 (h 0 of)-2 e

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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	Converted
achievement	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-tounderstand 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 TdBS3.1 (t)8 (.)]65uar)-1

Cluster 2 Electrical, Electronic and Systems Engineering

Required subject (period of registration specified)

Compulsory elective subject (any of these subjects shall be registered $% \left(1\right) =\left(1\right) \left(1\right) \left($

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

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ucatic		German, French, Spanish, Russian, Chinese, Korean and Arabic) Information and Data Science Courses		2	1 subjects from Basic language II	1	ory elective																	
Liberal Arts Education Subjects				2	Introduction to Information and Data Sciencies	2	Required																	
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ĿÏ						CalculusI	2	elective															_	—
						CalculusII	2																	
						Linear AlgebraI	2																	
						Linear AlgebraII	2																	
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						General Mechanics II	2																	
						Experimental Methods and Laboratory Work in Physics I Note 4	1																	<u> </u>
						Experimental Methods and Laboratory Work in Physics II Note 4	1																	<u> </u>
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The credit obtained by mastery of "English-speaking Countries Field Research" or 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 or 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 Work 1credit and Experimental Methods and Laboratory Work 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

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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

Required subject
Compulsory elective subject
Free elective subject

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The Relationship between Evaluation Items and Evaluation Criteria

11101	tora	Academic Achievements	2 Tanada on Ontonia	Evaluation Criteria	
		Evaluation Items	Excellent	Very Good	Good
ing	(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.
Knowledge/Understanding	(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.
nowledge/U	(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.
Kr	(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.
	(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.
ills	(2)	Concepts, knowledge and methods which are the experiments, using mathematical methods, and			
Abilities/Skills					
A			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 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 practitical 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.
	(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 phisically 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 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.
Abilities	(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.
Comprehensive Abilities	(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.
Cor	(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.		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.

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Curriculum Map of Electronic Devices and Systems

	Evaluation Items	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
	The ethics and understanding about	<1T>Introduction to University Education	CIT-Introduction to Knergy and Information Systems						
ing	the relations between society and technology considered basically necessary for engineers.	Introduction to Information and Data Sciencies							
and	Basic knowledge of mathematics such	CalculusI	CalculusII						
nderst		Linear AlgebraI Seminar in Basic Mathematics I	Linear AlgebraII						
Knowledg/Understanding			General Mechanics II						
now			Experimental Methods and Laboratory Work in Physics I						
Z	Comprehensive understanding and		<id-latedaction and="" energy="" information="" p="" systems<="" to=""></id-latedaction>						
	knowledge of technologies in electronics engineering. Also, basic knowledge which is common in these		Electric Circuit Theory I						
	Mathematical methods required for		Applied Mathematics I	Applied Mathematics II	Synthesis of Applied Mathematics				
	professionals in electronics			Applied Mathematics III	Engineering Mathematics C				
	engineering.			Probability and Statistics			D.1		
				Programming I	Programming II	Thermodynamics and Statistical Mechanics			
				Electromagnetism I Exercise of Electromagnetism I		Solid State Physics			
					Quantum Mechanics	Signal Processing Engineering			
	Concepts, knowledge and methods				Solid State Physics				
	which are the basis for studies related to electronics engineering.			<1T>Logic System Design	·				
	to electronics engineering.			Circuit Theory II	Electronic Circuits				
				Control Systems Engineering I	Control Systems Engineering II				
					<3T>Digital Circuit Design				
					<3T>Algorithms and Data Structures				
sills						Electromagnetic Wave Propagation	Surface Science and Nanotechnology		
Abilities/Skills				<11>Logic System Design	Exercise of Electromagnetism I	Programming II			
ilitie								Graduation Thesis Graduation Thesis	
Ab	Ability to apply basic concepts, knowledge, and methods of electronics								
	engineering to concrete/technical								
	problems.								
	Ability to solve practical issues and								
	problems by conducting experiments,								
	using numerical computation methods, and collecting relevant								
	materials.								
	Ability to solve practical issues and								
	problems by voluntarily making a plan, revising it, and utilizing basic								
	and technical knowledge and								
	methods. Creative thinking ability and logical	Introductory Seminar for First-Year Students						Graduation Thesis Grad	. m .
	thinking skills to analyze practical	introductory Seminar for Pirst: Year Scusents						Graduation Thesis Grad	uation Thesis
	problems and tasks, and to lead to rational solutions satisfying social								
	needs, as well as technical								
	development skills to physically realize the solutions.								
	Skills to organize research results and to describe them logically including	Introductory Seminar for First-Year Students						Graduation Thesis Grad	uation Thesis
ies	the significance and the effectiveness of the obtained outcomes as well as to make easy-to-understand oral presentations and discussions.								
bilit	of the obtained outcomes as well as to make easy-to-understand oral								
ve A	presentations and discussions.			Basic Experiments in Electrical Engineering I	Busic Experiments in Electrical Engineering II	Sanctones in Service Section for Services and Sunn Section for 1	Sunctionaria Service Service Services and from Services II		
nsix	Teamwork, leadership and			ngurding i	and the second s		- Various and an original a		
mprehensi	communication skills in group works.								
du	Ability to understand that various	<17>Introduction to University Education	Area Courses						
ပိ	problems, which humanity, society, and individuals are facing, can be	Peace Science Courses	Health and Sports Courses						
	interpreted variously depending on	Area Courses							
	social status, culture and so on, as well as to deal with those problems to	Health and Sports Courses							
	solve.	Basic language I II	Racio English II II				Toohnical Frank.	Graduation Thesis C. 1	untion Thei-
	Ability of English conversation, reading and writing skills necessary	CommunicationI	Basic English UsageII Communication II				recunical English	Graduation Thesis Grad	uation Thesis
	for research accomplishment.	Communication I	Communication II						
					Ex	Liberal Arts Education	Basic Specialized Subjects	Specialized Subjects Grad	uation Thesis