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

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 (electricity, electronics, systems, and information) 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

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, to the latest research such as high performance electronic devices in nanometer size and high-functioning integrated circuit systems.

The following are the characteristics of the Program of Electronic Devices and 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, 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

the following knowledge and abilities so that students are able to achieve goals A to E listed above.

Academic achievement is evaluated based on the grade calculation for each subject and the level of attainment of the goals established by education program.

Knowledge/Understanding

Cultivation of the understanding of society-technology relations and the ethical outlook necessary for an engineer

The ability to read, write, converse, and retrieve information in the English language necessary for conducting to be offered in the third year and

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). Besides that, by mastering the predetermined class subjects, students are exempted from the examination subjects of the national exams for electrical chief engineers, chief telecommunications engineers and technical radio operators. 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 n for each subject from admission to the

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)	1

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.)

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

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 a

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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	◎	◎					2	2											
Programming II	2	◎	○							2	2									
Programming III	2	△										2	2							(School of Informatics and Data Science)
Basic Experiments in Electrical Engineering I	2	◎	◎					10	10											take classes at one of the terms
Basic Experiments in Electrical Engineering II	2	◎	◎							10	10									take classes at one of the terms
Experiments in Electrical Engineering Electronics and System Engineering I	2	◎	◎									10	10							take classes at one of the terms
Experiments in Electrical Engineering Electronics and System Engineering II	2	◎	◎											10	10					take classes at one of the terms

Cluster 2 Specialized Subjects

(Program of Electronic Devices and Systems)

◎ Required subject
○Compulsory elective subjec
△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	◎					4												
Electromagnetism II	2	◎							4										
Exercise of Electromagnetism I	1	◎					2												
Exercise of Electromagnetism II	1	◎							2										
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 Physics	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	2	◎					4												
CMOS Logic Circuit Design	2	○									4								
Semiconductor Process Engineering	2	○											4						
CMOS Integrated Design	2	○												4					
Circuit Theory II	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						
Digital Circuit Design	2	△							4										(School of Informatics and Data Science)
Computer Architecture	2	△								4									(School of Informatics and Data Science)
Databases	2	△								4									(School of Informatics and Data Science)
Computer Network	2	△												4					(School of Informatics and Data Science)
Algorithms and Data Structures	2	△							4										(School of Informatics and Data Science)
Human Computer Interaction	2	△											4						(School of Informatics and Data Science)
Graduation Thesis	5	◎																	

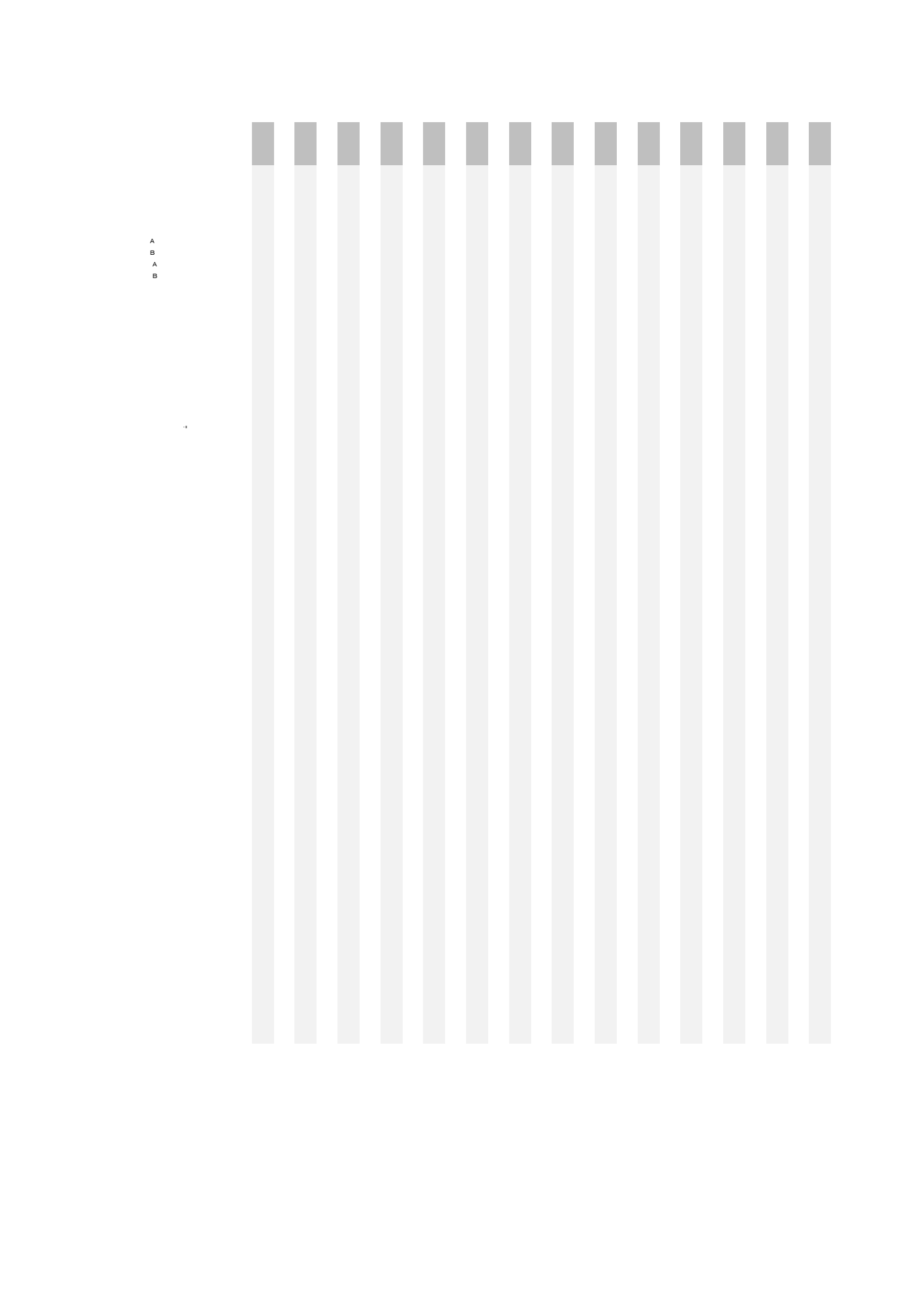
Academic Achievements in Electronic Devices and Systems Program

The Relationship between Evaluation Items and Evaluation Criteria

Academic Achievements		Evaluation Items	Evaluation Criteria		
			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 basis for studies related to electronic engineering.	Sufficiently acquire and be able to utilize concepts, knowledge and methods which are the basis for studies related to electronics engineering.	Aquire and be able to utilize concepts, knowledge and methods of electronics engineering, at the standard level.	Marginally acquire and be able to utilize concepts, knowledge and methods which are the basis for studies related to electronics engineering.
	(3)	Ability to apply basic concepts, knowledge, and methods of electronics engineering to concrete/technical problems.	Acquire and be able to utilize sufficient abilities to apply basic concepts, knowledge and methods of electronics engineering to concrete/technical problems.	Acquire and be able to utilize standard abilities to apply basic concepts, knowledge and methods of electronics engineering to concrete/technical problems.	Acquire and be able to utilize marginal abilities to apply basic concepts, knowledge and methods of electronics 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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Curriculum Map of Electronic Devices and Systems