For entrants in AY 2020

Appended Form 1

Specifications for Major Program

Name of School (Program)〔School of Engineering Cluster 1(Mechanical Systems, Transportation, Material and Energy)〕

Program name (Japanese)	輸送システムプログラム
(English)	Program of Transportation Systems

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

2. Overview

(1) Program overview

Since ancient times, humankind has developed civilization through the transportation of people and goods. Vehicles, which are a product of civilization, play an important role as a means of transporting people and goods. Furthermore, with the development of civilization, these vehicles have expanded their field from the land to the sea and then to the air. In modern times, the globalization of humankind's activity has been increasing, and complicated transportation networks have been established throughout the whole geosphere, including land, sea, and air, to support humankind's various activities. Engineering technology for transportation equipment, especially marine vessels, aircraft, automobiles, railways, and distribution systems, has become more important than ever. Meanwhile today, the geosphere, which is the field in which transportation equipment is moved, is facing serious environmental problems. In considering engineering technology for transportation equipment, it is indispensable to have the perspective of creating and maintaining not only design, from the existing viewpoint of low environmental load, but also a system of coexistence, in which artificial transportation equipment and the natural environment are in harmony with each other. Therefore, it is extremely important to develop engineering technology for creating and maintaining the geospheric environment, while exploring the oceanic and aerial environments, both locally and globally, from a physical engineering perspective. It is crucially important to establish engineering technology that enables transportation equipment and the geosphere to coexist. The Program of Transportation Systems offers the comprehensive education in engineering required by engineers working in such areas.

To be more specific, the program offers general basic education in the first year, basic education in engineering, such as mathematics and dynamics, in the second year, and specialized engineering education in the third and fourth years. During this time, students are required to acquire a wide range of knowledge about transportation equipment and the geospheric environment, and to enlarge their thinking skills. In other words, students learn the engineering skills necessary to plan, manufacture, construct, and maintain transportation equipment that can coexist in harmony with the natural environment and with distribution systems. Students also analyze and assess the geospheric environment, and study the areas of engineering relevant to planning, designing, creating, and maintaining environment-related equipment and environmental systems, in order to reduce the impact on the environment

One of the characteristics of this program is that development of overall ability as engineers is particularly emphasized, in addition to education in engineering knowledge. To that end, one of the key pillars of the program is the Project Creation Group, which allows students to actually plan, design, and manufacture products, and evaluates performance using engineering methodology. Through such learning, the program develops people who can actively take a comprehensive approach to technical issues related to transportation equipment and the geosphere, including land, ocean, air, and environment-related equipment. In other words, the program produces professionals who are able to discover problems on their own, explore solutions to the problems scientifically and rationally, and become engineers or researchers capable of taking action and showing leadership in solving problems in a harmonious and ethical way.

Technology developed by the program is mainly deployed in the areas of transportation equipment,

environmental conservation, and natural energy utilization. To be more specific, the technology is not only deployed in hardware areas such as marine vessels, aircraft and spacecraft, automobiles, information and telecommunication equipment, and wind and ocean-current power generation, but also in software areas such as transportation and distribution systems, electronic and computer systems, systems engineering, and a wide range of other areas.

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

The Program of Transportation Systems aims to nurture engineers and researchers with expertise related to transportation equipment (engineering for planning, manufacturing, building, and maintaining transportation equipment and distribution systems that can coexist in harmony with the natural environment), and coexistence with the environment (engineering for planning, designing, creating and maintaining environment-related equipment and environmental systems to analyze and better understand the geospheric environment, and to reduce the impact on the environment). In addition to that, the Program of Transportation Systems trains engineers and researchers capable of taking action and showing leadership, who are able to actively discover engineering problems, explore solutions to the problems scientifically and rationally, and solve various engineering issues in an ethical and harmonious way.

Accordingly, this program awards a bachelor's degree in engineering to students who have acquired a Liberal Arts education aimed at developing a broad and deep range of general knowledge, a global perspective for peace, general decision-making skills, and a well-rounded character; a specialized education designed to meet the goals listed below; and the number of credits necessary to meet the standard of the course.

Goal A: The acquisition of general knowledge in the three fields of natural science, humanities and society, and education, aimed at nurturing ethics and the ability to think about things from various perspectives.

Goal B: The acquisition and understanding of the fundamental knowledge required by engineers and researchers.

Goal C: The nurturing of expertise related to transportation equipment and coexistence with the environment, and the nurturing of the ability to apply this expertise to solving problems.

Goal D : The nurturing of the ability to create designs related to transportation equipment and coexistence with the environment, and the nurturing of the ability to run projects.

Goal E : The nurturing of communication skills and the ability to transmit information required by engineers and researchers.

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

The Program of Transportation Systems prepares and puts into practice a curriculum based on the following policy, to ensure that students are able to achieve the goals of the program. Learning achievement is evaluated by performance rating in each subject and the attainment of the goals set by the Education Program.

・In the first year, students take core subjects composed of compulsory and elective subjects. These subjects correspond to Goal A. They are composed of languages, information subjects, mathematics and science subjects, the introductory subjects of this program, and other Liberal Arts Education subjects.

・In the second year, students take compulsory subjects and elective subjects. These are composed of mathematical and dynamic systems subjects, which correspond to Goal B, and subjects related to mechanics of materials and fluid dynamics, which correspond to Goal C.

・In the third year, students take subjects that are closely related to transportation equipment and coexistence with the environment. At the same time, students cultivate highly professional knowledge and abilities through experiments, training, and subjects related to design and production projects. These are composed of subjects based on professional dynamic systems, which correspond to Goal C, and subjects based on project work, which correspond to Goals D and E.

・In the fourth year, students work on their graduation theses, making full use of the abilities gained by meeting Goals A to E in the Program of Transportation Systems. Based on the theses and presentations submitted, mastery of Goals A to E is generally evaluated.

5. Program Timing/Acceptance Conditions

○ When to start the program

The second semester of the second year

○ Credit requirements

Before the start of the second semester of the second year. Assignment to educational programs is decided based on student request and academic results no later than the end of the first semester of the second year.

6. Qualifications to be Acquired

Type-1 High School Teaching License (Industry)

(Students must acquire the required number of credits for the Type-1 High School Teaching License (Industry), in addition to the required number of credits for this program.)

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 fiscal year.

8. Academic Achievements

At the end of each semester, evaluation criteria are applied to each academic achievement evaluation item to clearly demonstrate the attainment level. 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)	4
A(Superior:80-89 points)	3
B(Good: 70-79 points)	2
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

* For the relation between evaluation item and evaluation criteria, see the attached sheet 2.
* For the relation between evaluation item and class subjects, see the attached sheet 3.
* For curriculum map, see the attached sheet 4.

9. Graduation Thesis (Graduation Research) (Positioning, when and how it is assigned, etc.)

○Class Goals

Students are assigned to their respective educational subjects and tutors from the Program of Transportation Systems, and choose a topic related to a specialized field. Students apply their acquired knowledge and abilities and conduct research that enables them to enhance their problem-solving abilities while trying to gain new knowledge.

Doing the above aims at cultivating the following abilities (the learning goals and corresponding evaluation items are also given):

1. Students can demonstrate scientific knowledge concerning multiple solutions to the challenges of the research. (Goal A, evaluation items: Knowledge/Understanding-1, Ability/Skills-1).
2. Students can explain knowledge and methodology that forms a basis for constituent technology related to the challenges of the research. (Goal B, evaluation items: Knowledge/Understanding-2, -3, Ability/Skills-2, -3)

3. Students can explain not only the constituent technology, related to the phenomena which form the object of their research, but also integrated, applied technology. They are also able to explain the validity and credibility of their analytical method, the applicability of their engineering knowledge, and the limits and social significance of the technology. (Goal C, evaluation items: Knowledge/Understanding-4, -5, -6, Ability/Skills-4, -5, -6)
4. Students can discover problems in their chosen research on their own initiative, explore solutions to the problems scientifically and rationally, and solve the problems logically, harmoniously, and ethically. Students can explain the validity and credibility of their analytical method. (Goal D, evaluation item: Overall Ability-1)
5. Students can express the details of their research through the effective use of written explanations, charts, and formulas, and, at the same time, are able to give presentations in a proper way. (Goal E, evaluation item: Overall Ability-2)
6. Students can identify knowledge and issues in their research results in order to answer further complex questions. (Goal E, evaluation item: Overall Ability-2)
7.Students can conduct research systematically within constraints, and can compile their results to complete a paper. (Goal E, evaluation item: Overall Ability-2)

○ When and how it is assigned

In principle, educational subjects are decided based on the student's request. However, the acceptable number of students for each educational subject is limited due to the need for educational guidance. As such, when students' requests are disproportionately distributed, some adjustment is made. The following is the schedule for graduation theses.

1. In early February of the third year, how theses are assigned and the topic of the theses for each educational subject are explained.

2. In the middle of February in the third year, students attend a final presentation for further understanding of graduation theses.

3. At the end of March in the third year, where to assign those who pass the standard for embarking on a thesis is decided at orientation.

4. How to proceed with research varies according to the topic of research for each educational subject. Students begin with research into the literature, then attend seminars, conduct surveys and experiments, and continue to work actively on research under the guidance of tutors. (The tutors evaluate learning and research attitudes in the middle of February.)

5. More than one tutor, including the head tutor, check the evaluation of class goals 5 and 1 - 3.

6 At the beginning of February in the fourth year, the students submit their theses to two examiners (head tutor and deputy head tutor) to receive evaluation of their level of attainment of class goals 1 - 7.

7 The students receive evaluation of class goals 5 and 6 at the final presentation held in the middle of February in the fourth year.

○ Method of Evaluating Performance Rating

(1)Tutors make appropriate checks to ensure that students spend time studying on a daily basis, so that they can continually enhance their problem-solving abilities, and that they conduct research, using their research daybooks, seminar data, research notebooks, relevant literature, etc. as reference and, based on this, the tutors evaluate the students' learning and research attitudes during the year.

(2)The head and deputy-head tutors evaluate the level of attainment of the class goals 1 - 7 based on the theses submitted.

(3)Furthermore, in the mid-term and final presentations, one or more teachers in attendance make an evaluation based mainly on the level of attainment of class goal 5.

Students who have earned a mark of 60% or more in all three of the above evaluations are considered to have passed and are awarded credit.

○ Other

This program aims to cultivate overall abilities by making full use of wide-ranging education and vision (Goal A , evaluation items: Knowledge/Understanding -1. Ability/Skills -1), basic knowledge (Goal B, evaluation items:

Knowledge/Understanding -2, 3　Ability/Skills -2, 3), specialized knowledge and applied skills (Goal C, evaluation items: Knowledge/Understanding -4, 5, 6　Ability/Skills -4, 5, 6) design skills and the ability to get things done (Goal D, evaluation item: Overall Ability -1), communication skills and information transmitting skills (Goal E , evaluation item: Overall ability -2) , all of which are obtained through taking the Program of Transportation Systems. Also, based on the thesis and presentation content, mastery of the abilities that graduates of this program must acquire is evaluated in a comprehensive manner.

10. Responsibility-taking System

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

In order to monitor and improve this education program, an educational monitoring and improvement system has been established, as shown in the chart below, and has been in operation since 2003. This educational monitoring and improvement system is composed of two PDCA systems, the PDCA system responsible for the monitoring and improvement of each subject and its related subjects, and the PDCA system responsible for the monitoring and improvement of the entire Education Program, including the educational goals and the image of students that is presented.

Under the monitoring and improvement system for each course, each subject and its related subjects are monitored and improved in PDCA cycles as described below.

Plan: Preparing the Syllabus

・For each subject, a WG checks the syllabus prepared by the person in charge of the subject, then either ratifies it or makes improvements.

Do: Giving a class

・The person in charge of the subject gives a class based on the syllabus approved by the subject WG.

Check: Examining and Evaluating Related Subjects, Overall Examination and Evaluation of the Education Program

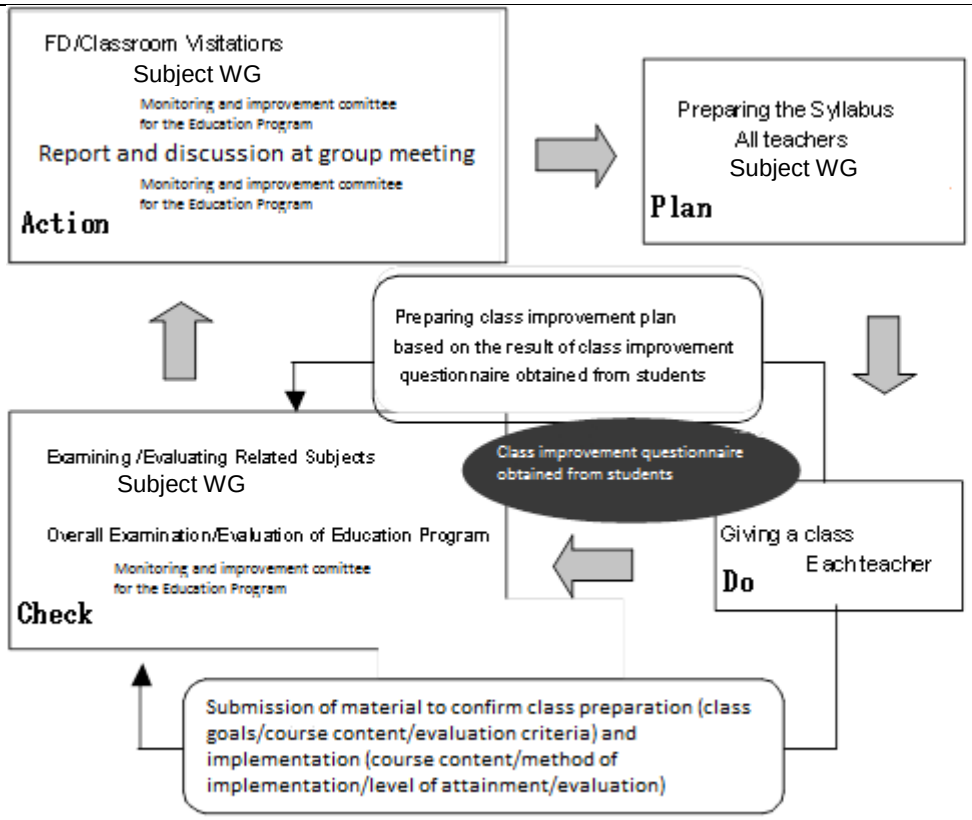
・The subject WG checks if the planning and implementation of the class is appropriate, then ratifies it or makes improvements.

・The monitoring and improvement committee for the Education Program checks if the planning and implementation of the class is appropriate, then either ratifies it or makes improvements. At that time, the materials for confirming the planning and implementation of the subject, as well as the results of class improvement questionnaire obtained from students, are used.

Action: FD/Classroom Visitations, Report to Faculty Member Meeting/ Discussion

・FD and classroom visitations are conducted at the initiative of the subject WG and the monitoring and improvement committee for the Education Program.

・When faculty members participate in external FD, the details must be reported at a faculty meeting.



(2) Education Program PDCA

In the monitoring and improvement system for the Education Program, the Education Program is monitored and improved in the PDCA style described below.

Plan: Creating the Education Program

- The Education Program is created at by the subject WG, the monitoring and improvement committee for the Education Program, and the Educational Affairs Committee of the School of Engineering.

Do: Implementing the Education Program and Cooperating with Related Subjects

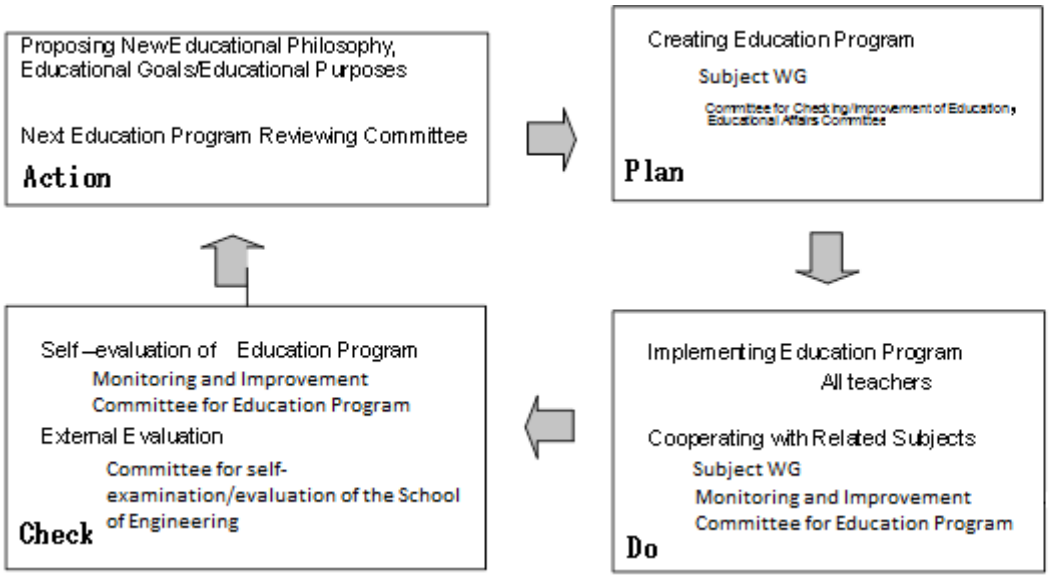
- The Education Program is implemented by each teacher, by the subject WG, and by the monitoring and improvement committee for the Education Program. At that time, cooperation is enlisted from related subjects.

Check: Self-examination of the Education Program and External Evaluation

- In the monitoring and improvement committee for the Education Program, problems with the program are examined based on the questionnaires obtained from graduates and students of the school for confirmation or making improvements
- In the monitoring and improvement committee for the School of Engineering, external examination and evaluation of the planning and implementation of the Education Program are made.

Action: Proposing New Educational Philosophy, Educational Goals/Educational Purposes

- At the next Education Program review committee, the educational philosophy and educational goals and purposes are reviewed by using the results of the above self-examination and external evaluation as reference.



(3) Program evaluation

Under the two PDCA systems detailed above, the subject WG and monitoring and improvement committee for the Education Program carry out their checks and evaluations. The following describes the activities of each committee in detail.

Subject WG

All subjects provided by this Education Program are divided into several categories. A subject WG is held by the person in charge of each related subject.

In the subject WGs, class plans, achievements, and the result of classes given (based on class improvement questionnaires) are discussed.

Monitoring and Improvement Committee of the Education Program

While the responsibility for planning and implementing each subject, and its related subjects, lies with the above-mentioned WGs, the responsibility for identifying and solving problems with the entire Education Program rests on the monitoring and improvement committee for the Education Program. This committee is composed of directors and the persons responsible for the subject WGs. The committee checks and analyzes the activities of the subject WGs, as well as discussing problems with the entire Education Program.

Cluster 1 (Mechanical Systems, Transportation, Material and Energy)

◎ 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 Courses			2		2	Required		○														
	Basic Courses in University Education	Introduction to University Education		2	Introduction to University Education	2	Compulsory elective	◎															
		Introductory Seminar for First-Year Students		2	Introductory Seminar for First-Year Students	2	Compulsory elective		◎															
	Common Subjects	Area Courses		4	Courses in Arts and Humanities/Social Sc	2	Compulsory elective	○		○													
				4	Courses in Natural Sciences	2	Compulsory elective		○		○												
		Foreign Languages	English (Note 2・3) Basic English Usage	2	Basic English UsageI	1	Required	◎	◎														
					Basic English UsageII	1				◎	◎												
			English (Note 2・3) Communication I	2	CommunicationIA	1	Required	◎	◎														
					Communication IB	1		◎	◎														
			English (Note 2・3) 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	Elements of Information Literacy or Exercise in Information Literacy	2	Compulsory elective	○	○														
		Health and Sports Courses		2		1or2	Compulsory elective	○	○	○	○												
	Basic Subjects			18	CalculusI	2	Required		◎														
					CalculusII	2					◎												
					Linear AlgebraI	2		◎															
					Linear AlgebraII	2				◎													
					Seminar in Basic Mathem	1			◎														
					Seminar in Basic Mathem	1					◎												
					General Mechanics I	2		◎															
					General Mechanics II	2				◎													
					Basic Electromagnetism	2							◎										
					Experimental Methods and Laboratory Work in Physics I (Note 4)	1				◎													
					Experimental Methods and Laboratory Work in Physics II (Note 4)	1					◎												
				2	General Chemistry	2	Compulsory elective						○										
					Experimental Methods and Laboratory Work in Chemistry I (Note 4)	1				○													
					Experimental Methods and Laboratory Work in Chemistry II (Note 4)	1					○												
	No. of credits required for graduation			46																			

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

Note 2: 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 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 English 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)」.

Cluster 1　Basic Specialized Subjects

◎ Required subject
○Compulsory elective subject
△Free elective subject

	Class Subjects	Credits	Type of course registration				Class Hours/Week														Note
			Mechanical Systems Engineering	Transportation Systems	Materials Processing	Energy Transform Engineering	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	
1st group	Applied Mathematics I	2	◎	◎	◎	◎			4														
	Applied Mathematics II	2	◎	◎	◎	◎					4												
	Applied Mathematics III	2	◎	◎	◎	◎							4										
	Engineering Mathematics A	2	○		○	○									4								
	Engineering Mathematics C	2	○	◎	○	○								4									
	Probability and Statistics	2	◎	◎	◎	◎					4												
	Synthesis of Applied Mathematics	2	○		○	○											4						
	Practice of Mechanics	1	○	△	○	○			4														
	Engineering Mechanics	2	○	△	○	○				4													
	Introduction of Mechanical and Transportation Engineering	2	◎	◎	◎	◎			4														
	Technical English	1	◎	◎	◎	◎					4												
	Basic Engineering Computer Programming	2	◎	◎	◎	◎						4											
2nd group	Mechanics of Material I	2	◎	◎	◎	◎					4												
	Thermodynamics I	2	◎	◎	◎	◎					4												
	Fluid Dynamics I	2	◎	◎	◎	◎						4											
	Control Engineering I	2	◎	◎	◎	◎						4											
	An Introduction to Engineering Materials	2	◎	◎	◎	◎					4												
	Fundamentals of Materials Processing	2	◎	◎	◎	◎						4											
	Computer Programming	2	◎	◎	◎	◎										4							
	Machine Design and Drawing	1	◎	◎	◎	◎			3	3													
	Computer Aided Design	1	◎	◎	◎	◎					3	3											
	Machine Shop Training (a)	1	◎	◎	◎	◎			3	3													
	Machine Shop Training (b)	1	◎	◎	◎	◎					3	3											

※Students can select either Machine Shop Training (a) or Machine Shop Training (b)

Cluster 1 Specialized Subjects
(Program of Transportation Systems)

◎ Required subject
○Compulsory elective subject
△Free elective subject

Class Subjects	Credits	Type of course registration	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	
Electrical and Electronic Engineering	2	○												4					
Instrumentation Engineering	2	○								4									
Reliability Engineering	2	△										4							
Experiments and Analytical Procedures in Transportation Systems	2	◎									6								
Ship Design and Practice	2	◎								6									
Transportation Systems Project	4	◎											4	4					
Fluid Dynamics for Vehicle and Environmental Systems	2	◎								4									
Structural Mechanics	2	◎							4										
Fundamentals in Dynamics	2	◎							4										
Project Management	2	◎								4									
Aircraft Design and Practice	2	○										6							
Structural Analysis and Design	2	○											4						
Theory of Elasticity	2	○									4								
Theory of Vibration	2	○									4								
Design of large scale systems	2	○											4						
Remote sensing	2	○										4							
Natural-Energy Utilization Engineering	2	○												4					
Viscous fluid and Turbulence	2	○									4								
Ocean-Atmosphere Systems	2	○											4						
Mathematical Optimization	2	○							4										
Transportation Vessels and Vehicles I	1	○									2								
Transportation Vessels and Vehicles II	1	○										2							
Transportation Vessels and Vehicles III	1	○										2							
Logistics Planning and Design	2	○												4					
Internship	1	△											3	3					
Graduation Thesis	5	◎																	

Academic Achievements in Transportation Systems Program

The Relationship between Evaluation Items and Evaluation Criteria

Academic achievement			Evaluation Criteria		
Evaluation Items			Excellent	Very Good	Good
Knowledge and Understanding	(1)	Cultural subjects: Acquiring general knowledge from viewpoints of Nature, Human and Society Science, and the understanding of a sense of ethics.	To be able to sufficiently understand the current status of earth's environment and possible future problems. Also, to be able to adequately state multiple scientific perceptions concerning engineering	At the standard level, to be able to understand the current status of earth's environment and possible future problems. Also, to be able to state multiple scientific perceptions concerning engineering	At the minimum level, to be able to understand the current status of earth's environment and possible future problems. Also, to be able to state multiple scientific perceptions concerning engineering
	(2)	Mathematical and mechanical subjects: To understand basic knowledge of mathematical dynamical system, which is essential knowledge for engineers and	To be able to sufficiently understand equations which dominate major elements of phenomena, through basic subjects such as mathematics, mechanics, kinematics, etc.	To be able to understand, in standard level, equations which dominate major elements of phenomena, through basic subjects such as mathematics, mechanics, kinematics, etc.	To be able to understand, at least, equations which dominate major elements of phenomena, through basic subjects such as mathematics, mechanics, kinematics, etc.
	(3)	Information engineering subjects: To acquire understanding and basic knowledge required for engineers and researchers.	With regard to classes of information engineering, to be able to adequately understand information process technology based on mathematics and mechanics.	With regard to classes of information engineering, to be able to understand information process technology based on mathematics and mechanics at the	With regard to classes of information engineering, to be able to understand information process technology based on mathematics and mechanics at the standard
	(4)	The area of structural engineering: The ability to apply the technical knowledge on structural engineering to solve issue related with transportation equipment and coexistence with the environment	Being able to fully explain the validity and reliability of ways of analysis in the structural engineering area and the applicability, limits and social meaning of engineering knowledge.	Being able to explain the validity and reliability of ways of analysis in the structural engineering area and the applicability, limits and social meaning of engineering knowledge skills to the standard level	Being able to explain the validity and reliability of ways of analysis in the structural engineering area and the applicability, limits and social meaning of engineering knowledge skills to the minimum level
	(5)	The area of environmental engineering and fluid dynamics: Technical knowledge on environmental engineering and fluid dynamics relating to transportation equipment and coexistence	Being able to fully explain about validity and reliability of analysis measurements in environmental engineering and fluid dynamics and application, limits and social meaning of industrial knowledge and application of skills.	Being able to explain to the standard level about validity and reliability of analysis measurements in environmental engineering and fluid dynamics and application, limits and social meaning of industrial knowledge and application of	Being able to explain to the minimum level about validity and reliability of analysis measurements in environmental engineering and fluid dynamics and application, limits and social meaning of industrial knowledge and application of
	(6)	The area of systems: Technical knowledge on systems, information and transportation systems relating to transportation equipment and coexistence with the environment	Being able to fully explain validity and reliability of analysis measurements, engineering knowledge, application of technologies, limits and social meaning in the area of systems, information, and	Being able to explain to the standard level about validity and reliability of analysis measurements, engineering knowledge, application of technologies, limits and social meaning in the area of systems,	Being able to explain to the minimum level about validity and reliability of analysis measurements, engineering knowledge, application of technologies, limits and social meaning in the area of systems,
Abilities and Skills	(1)	Cultural subjects: The ability of multilaterally thinking of matters from viewpoints of Nature, Human and Society Science.	To be able to examine sufficiently counterarguments from the viewpoints of physical science, the humanities, and sociology.	To be able to examine normally counterarguments from the viewpoints of physical science, the humanities, and sociology.	At the least, to be able to examine counterarguments from the viewpoints of physical science, the humanities, and sociology.
	(2)	Mathematical and mechanical subjects: Ability to create questions and analyze by utilizing basic knowledge of mathematical dynamical systems.	Concerning basic subjects such as mathematics, mechanics, kinematics, etc, to be able to sufficiently select equations which dominate major elements of phenomena, and to be able to appropriately describe uncertainty phenomena in mathematically	Concerning basic subjects such as mathematics, mechanics, kinematics, etc, to be able to select equations which dominate major elements of phenomena, and to be able to describe uncertainty phenomena in mathematically and reach the solution, in	Concerning basic subjects such as mathematics, mechanics, kinematics, etc, to be able to select equations which dominate major elements of phenomena, and to be able to describe uncertainty phenomena in mathematically and reach the solution, in
	(3)	Information engineering subjects: Information processing ability based on mathematics and mechanics.	With regard to classes of information engineering, to be able to sufficiently logically think, calculate, analyze, and visualize.	With regard to classes of information engineering, to be able to logically think, calculate, analyze, and visualize in the standard level.	With regard to classes of information engineering, at least, to be able to logically think, calculate, analyze, and visualize.
	(4)	The area of structural engineering: The ability to apply the technical knowledge on structural engineering to solve issue related with transportation equipment and coexistence with the environment	Being able to fully apply the ways of analysis of structural engineering areas to problem solving.	Being able to apply the ways of analysis of structural engineering areas to problem solving to the standard level.	Being able to apply the ways of analysis of structural engineering areas to problem solving to the minimum level.
	(5)	The area of environmental engineering and fluid mechanics: The ability to use technical knowledge on environmental engineering and fluid dynamics to solve issues relating to transportation equipment and coexistence with the environment	Being able to fully apply the analysis measurements in environmental engineering and fluid dynamics to solve issues.	Being able to apply the analysis measurements in environmental engineering and fluid dynamics to solve issues to the standard level.	Being able to apply the analysis measurements in environmental engineering and fluid dynamics to solve issues to the minimum level.
	(6)	The area of systems: The ability to apply technical knowledge of systems, information and transportation systems to solve issues relating to the areas of transportation equipment and coexistence with the environment	Being able to fully apply analysis measurements in the area of systems, information, and transportation systems to solve issues.	Being able to apply analysis measurements in the area of systems, information, and transportation systems to solve issues in the standard level.	Being able to apply analysis measurements in the area of systems, information, and transportation systems to solve issues in the minimum level.
Overall Abilities	(1)	Ability of design and action: Ability of constructing designs and getting projects done in related to transportation equipment and coexistence with the environment.	Being able to take initiative and act sufficiently in comprehensive efforts for technical problems related to transportation equipment and coexistence with the environment fields. Concretely, being able to find problems, search solution scientifically and rationally, cultivate ability of project execution and design creation that solve problems logically, harmonically and ethically, learn continuously.	At the standard level, being able to take initiative and act in comprehensive efforts for technical problems related to transportation equipment and coexistence with the environment fields. Concretely, being able to find problems, search solution scientifically and rationally, cultivate ability of project execution and design creation that solve problems logically, harmonically and ethically, learn continuously.	At the minimum level, being able to take initiative and act in comprehensive efforts for technical problems related to transportation equipment and coexistence with the environment fields. Concretely, being able to find problems, search solution scientifically and rationally, cultivate ability of project execution and design creation that solve problems logically, harmonically and ethically, learn continuously.
	(2)	Ability of communication transmission: Communication and information transmission ability necessary for an engineer and researcher.	Being able to take act sufficiently to collect information comprehensively for engineering problems related to transportation equipment and coexistence with the environment fields. Being able to show sufficiently a writing ability based on logical thought, visual technical abilities, debate and expression abilities and a group skill. In addition, by foreign language subject based on English, being able to cultivate reading, writing and conversation abilities, tell sufficiently a idea in foreign language as an engineer and researcher.	At the standard level, being able to take act to collect information comprehensively for engineering problems related to transportation equipment and coexistence with the environment fields. Being able to show sufficiently a writing ability based on logical thought, visual technical abilities, debate and expression abilities and a group skill. In addition, by foreign language subject based on English, being able to cultivate reading, writing and conversation abilities, tell sufficiently an idea in foreign language as an engineer and researcher.	At the minimum level, being able to take act to collect information comprehensively for engineering problems related to transportation equipment and coexistence with the environment fields. Being able to show sufficiently a writing ability based on logical thought, visual technical abilities, debate and expression abilities and a group skill. In addition, by foreign language subject based on English, being able to cultivate reading, writing and conversation abilities, tell sufficiently an idea in foreign language as an engineer and researcher.

Placement of the Liberal Arts Education in the Major Program

The Liberal Arts Education in this Program cultivates the ability to acquire comprehensive knowledge of the three fields of natural science, humanities, and society, and the ability to look at things from various perspectives and to develop an appreciation of ethics. It also offers the opportunity to gain mastery of languages, information subjects, mathematics, and science subjects, and the introductory subjects of this program.

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 and Understanding												Abilities and Skills												Comprehensive Abilities				
					(1)		(2)		(3)		(4)		(5)		(6)		(1)		(2)		(3)		(4)		(5)		(6)		(1)		(2)		
					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	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	1semester	50	1											50	1															100
Liberal Arts Education	Introductory Seminar for First-Year Students	2	Required	1semester	50	1											50	1															100
Liberal Arts Education	Peace Science Courses	2	Elective	1semester	50	1											50	1															100
Liberal Arts Education	CommunicationIA	1	Required	1semester																											100	1	100
Liberal Arts Education	Communication IB	1	Required	1semester																											100	1	100
Liberal Arts Education	Communication IIA	1	Required	2semester																											100	1	100
Liberal Arts Education	Communication IIB	1	Required	2semester																											100	1	100
Liberal Arts Education	Basic language I	1	Elective	1semester																											100	1	100
Liberal Arts Education	Basic language II	1	Elective	1semester																											100	1	100
Liberal Arts Education	Information Courses	2	Elective	1semester					50	1											50	1											100
Liberal Arts Education	Area Courses	8	Elective	1semester	50	1											50	1															100
Liberal Arts Education	Health and Sports Courses	2	Elective	1semester	50	1											50	1															100
Liberal Arts Education	CalculusI	2	Required	1semester			50	1											50	1													100
Liberal Arts Education	CalculusII	2	Required	2semester			50	1											50	1													100
Liberal Arts Education	Linear AlgebraI	2	Required	1semester			50	1											50	1													100
Liberal Arts Education	Linear AlgebraII	2	Required	2semester			50	1											50	1													100
Liberal Arts Education	Seminar in Basic Mathematics I	1	Required	1semester			50	1											50	1													100
Liberal Arts Education	Seminar in Basic Mathematics II	1	Required	2semester			50	1											50	1													100
Liberal Arts Education	General Mechanics I	2	Required	1semester			50	1											50	1													100
Liberal Arts Education	General Mechanics II	2	Required	2semester			50	1											50	1													100
Liberal Arts Education	Basic Electromagnetism	2	Required	2semester			50	1											50	1													100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics I-II	1	Required	2semester			50	1											50	1													100
Liberal Arts Education	General Chemistry	2	Elective	1semester			50	1											50	1													100
Liberal Arts Education	Experimental Methods and Laboratory Work in Chemistry I-II	2	Elective	2semester			50	1											50	1													100
Specialized Education	Applied Mathematics I	2	Required	2semester			50	1											50	1													100
Specialized Education	Applied Mathematics II	2	Required	3semester			50	1											50	1													100
Specialized Education	Applied Mathematics III	2	Required	3semester			50	1											50	1													100
Specialized Education	Engineering Mathematics C	2	Elective	4semester			50	1											50	1													100
Specialized Education	Probability and Statistics	2	Required	3semester			50	1											50	1													100
Specialized Education	Practice of Mechanics	1	Elective	2semester			50	1											50	1													100
Specialized Education	Engineering Mechanics	2	Elective	2semester			50	1											50	1													100
Specialized Education	Introduction of Mechanical and Transportation Engineering	2	Required	2semester																									100	1			100
Specialized Education	Technical English	1	Required	3semester																											100	1	100
Specialized Education	Basic Engineering Computer Programming	2	Required	3semester					50	1											50	1											100
Specialized Education	Mechanics of Material I	2	Required	3semester							50	1											50	1									100
Specialized Education	Thermodynamics I	2	Required	3semester									50	1											50	1							100
Specialized Education	Fluid Dynamics I	2	Required	3semester									50	1											50	1							100
Specialized Education	Control Engineering I	2	Required	3semester											50	1											50	1					100
Specialized Education	An Introduction to Engineering Materials	2	Required	3semester							50	1											50	1									100
Specialized Education	Fundamentals of Materials Processing	2	Required	3semester							50	1											50	1									100
Specialized Education	Computer Programming	2	Required	3semester					50	1											50	1											100
Specialized Education	Machine Design and Drawing	1	Required	2semester																									100	1			100
Specialized Education	Computer Aided Design	1	Required	3semester																									100	1			100
Specialized Education	Machine Shop Training (a)	1	Required	2semester																									100	1			100
Specialized Education	Machine Shop Training (b)	1	Required	3semester																									100	1			100
Specialized Education	Electrical and Electronic Engineering	2	Elective	6semester											50	1											50	1					100
Specialized Education	Instrumentation Engineering	2	Elective	6semester											50	1											50	1					100
Specialized Education	Reliability Engineering	2	Elective	5semester											50	1											50	1					100
Specialized Education	Experiments and Analytical Procedures in Transportation Systems	2	Required	5semester																									100	1			100
Specialized Education	Ship Design and Practice	2	Required	6semester																									50	1	50	1	100
Specialized Education	Transportation Systems Project	4	Required	6semester																									50	1	50	1	100
Specialized Education	Fluid Dynamics for Vehicle and Environmental Systems	2	Required	6semester									50	1											50	1							100
Specialized Education	Structural Mechanics	2	Required	6semester							50	1											50	1									100
Specialized Education	Fundamentals in Dynamics	2	Required	6semester			50	1											50	1													100
Specialized Education	Project Management	2	Required	6semester																									100	1			100
Specialized Education	Aircraft Design and Practice	2	Elective	5semester																									50	1	50	1	100
Specialized Education	Structural Analysis and Design	2	Elective	6semester							50	1											50	1									100
Specialized Education	Theory of Elasticity	2	Elective	5semester							50	1											50	1									100
Specialized Education	Theory of Vibration	2	Elective	5semester							50	1											50	1									100
Specialized Education	Design of large scale systems	2	Elective	6semester											50	1											50	1					100
Specialized Education	Remote sensing	2	Elective	5semester									50	1											50	1							100
Specialized Education	Natural-Energy Utilization Engineering	2	Elective	6semester									50	1											50	1							100
Specialized Education	Viscous fluid and Turbulence	2	Elective	5semester									50	1											50	1							100
Specialized Education	Ocean-Atmosphere Systems	2	Elective	6semester									50	1											50	1							100
Specialized Education	Mathematical Optimization	2	Elective	6semester											50	1											50	1					100
Specialized Education	Transportation Vessels and Vehicles I	1	Elective	5semester											50	1											50	1					100
Specialized Education	Transportation Vessels and Vehicles II	1	Elective	5semester											50	1											50	1					100
Specialized Education	Transportation Vessels and Vehicles III	1	Elective	5semester											50	1											50	1					100
Specialized Education	Logistics Planning and Design	2	Elective	6semester											50	1											50	1					100
Specialized Education	Internship	1	Elective	6semester																									100	1			100
Specialized Education	Graduation Thesis	5	Required	7, 8semester	7	1	7	1	7	1	7	1	7	1	7	1	7	1	7	1	7	1	7	1	7	1	7	1	8	1	8	1	100

Curriculum Map of Transportation Systems

Sheet 4

Academic Achievement Evaluation Itemas		1st grade Spring	1st grade Fall	2nd grade Spring	2nd grade Fall	3rd grade Spring	3rd grade Fall	4th grade Spring	4th grade Fall
Knowledge and Understanding	(1) Liberal Arts Education	Introduction to University Education(◎)						Graduation Thesis(◎)	Graduation Thesis(◎)
		Introductory Seminar for First-Year Students(◎)							
		Peace Science Courses(○)							
		Area Courses (○)	Area Courses (○)						
		Health and Sports Courses(○)	Health and Sports Courses(○)						
	(2) Mathematics and Dynamics Fields	CalculusⅠ(◎)	CalculusⅡ(◎)	Applied Mathematics Ⅱ(◎)	Engineering Mathematics C(◎)			Graduation Thesis(◎)	Graduation Thesis(◎)
		Linear AlgebraⅠ(◎)	Linear AlgebraⅡ(◎)	Applied Mathematics Ⅲ(◎)	Fundamentals in Dynamics(◎)				
		Seminar in Basic Mathematics Ⅰ(◎)	Seminar in Basic Mathematics Ⅱ(◎)	Probability and Statistics(◎)					
		General Mechanics Ⅰ(◎)	General Mechanics Ⅱ(◎)	Probability and Statistics(◎)					
			Basic Electromagnetism(◎)						
			Experimental Methods and Laboratory Work in Physics Ⅰ・Ⅱ(◎)						
			Experimental Methods and Laboratory Work in Chemistry Ⅰ・Ⅱ (○)						
			Applied Mathematics Ⅰ(◎)						
			Practice of Mechanics(△)						
			Engineering Mechanics(△)						
	(3) Information Engineering Fields	Information Courses(○)		Basic Engineering Computer Programming(◎)		Computer Programming(◎)		Graduation Thesis(◎)	Graduation Thesis(◎)
	(4) Structural Engineering Fields			Mechanics of Material Ⅰ(◎)	Structural Mechanics(◎)	Theory of Elasticity(○)	Structural Analysis and Design(○)	Graduation Thesis(◎)	Graduation Thesis(◎)
				An Introduction to Engineering Materials(◎)		Theory of Vibration(○)			
				Fundamentals of Materials Processing(◎)					
	(5) Environmental and Fluid Engineering Fields			Thermodynamics Ⅰ(◎)	Fluid Dynamics for Vehicle and Environmental Systems(◎)	Remote sensing(○)	Natural-Energy Utilization Engineering(○)	Graduation Thesis(◎)	Graduation Thesis(◎)
				Fluid Dynamics Ⅰ(◎)		Viscous fluid and Turbulence(○)	Ocean-Atmosphere Systems(○)		
	(6) System Fields			Control Engineering Ⅰ(◎)	Instrumentation Engineering(○)	Reliability Engineering(○)	Design of large scale systems(○)	Graduation Thesis(◎)	Graduation Thesis(◎)
					Mathematical Optimization(○)	Transportation Vessels and Vehicles Ⅰ(○)	Logistics Planning and Design(○)		
						Transportation Vessels and Vehicles Ⅱ(○)	Electrical and Electronic Engineering(○)		
						Transportation Vessels and Vehicles Ⅲ(○)			
Abilities and Skills	(1) Liberal Arts Education	Introduction to University Education(◎)						Graduation Thesis(◎)	Graduation Thesis(◎)
		Introductory Seminar for First-Year Students(◎)							
		Peace Science Courses(○)							
		Area Courses (○)	Area Courses (○)						
		Health and Sports Courses(○)	Health and Sports Courses(○)						
	(2) Mathematics and Dynamics Fields	CalculusⅠ(◎)	CalculusⅡ(◎)	Applied Mathematics Ⅱ(◎)	Engineering Mathematics C(◎)			Graduation Thesis(◎)	Graduation Thesis(◎)
		Linear AlgebraⅠ(◎)	Linear AlgebraⅡ(◎)	Applied Mathematics Ⅲ(◎)	Fundamentals in Dynamics(◎)				
		Seminar in Basic Mathematics Ⅰ(◎)	Seminar in Basic Mathematics Ⅱ(◎)	Probability and Statistics(◎)					
		General Mechanics Ⅰ(◎)	General Mechanics Ⅱ(◎)	Probability and Statistics(◎)					
			Basic Electromagnetism(◎)						
			Experimental Methods and Laboratory Work in Physics Ⅰ・Ⅱ(◎)						
			Experimental Methods and Laboratory Work in Chemistry Ⅰ・Ⅱ (○)						
			Applied Mathematics Ⅰ(◎)						
			Practice of Mechanics(△)						
			Engineering Mechanics(△)						
	(3) Information Engineering Fields	Information Courses(○)		Basic Engineering Computer Programming(◎)		Computer Programming(◎)		Graduation Thesis(◎)	Graduation Thesis(◎)
	(4) Structural Engineering Fields			Mechanics of Material Ⅰ(◎)	Structural Mechanics(◎)	Theory of Elasticity(○)	Structural Analysis and Design(○)	Graduation Thesis(◎)	Graduation Thesis(◎)
				An Introduction to Engineering Materials(◎)		Theory of Vibration(○)			
				Fundamentals of Materials Processing(◎)					
	(5) Environmental and Fluid Engineering Fields			Thermodynamics Ⅰ(◎)	Fluid Dynamics for Vehicle and Environmental Systems(◎)	Remote sensing(○)	Natural-Energy Utilization Engineering(○)	Graduation Thesis(◎)	Graduation Thesis(◎)
				Fluid Dynamics Ⅰ(◎)		Viscous fluid and Turbulence(○)	Ocean-Atmosphere Systems(○)		
	(6) System Fields			Control Engineering Ⅰ(◎)	Instrumentation Engineering(○)	Reliability Engineering(△)	Design of large scale systems(○)	Graduation Thesis(◎)	Graduation Thesis(◎)
					Mathematical Optimization(○)	Transportation Vessels and Vehicles Ⅰ(○)	Logistics Planning and Design(○)		
						Transportation Vessels and Vehicles Ⅱ(○)	Electrical and Electronic Engineering(○)		
						Transportation Vessels and Vehicles Ⅲ(○)			
Comprehensive Abilities	(1)Ability of design and action		Introduction of Mechanical and Transportation Engineering(◎)	Computer Aided Design(◎)	Project Management(◎)	Experiments and Analytical Procedures in Transportation Systems(◎)	Transportation Systems Project(◎)	Graduation Thesis(◎)	Graduation Thesis(◎)
			Machine Design and Drawing(◎)	Machine Shop Training (b)(◎)	Ship Design and Practice(◎)	Aircraft Design and Practice(○)	Internship(△)		
			Machine Shop Training (a)(◎)						
	(2) Ability of communication transmission	Communication Ⅰ(◎)	Communication Ⅱ(◎)		Ship Design and Practice(◎)	Aircraft Design and Practice(◎)	Transportation Systems Project(◎)	Graduation Thesis(◎)	Graduation Thesis(◎)
		Basic language Ⅰ(○)		Technical English(◎)					
		Basic language Ⅱ(○)							

(Ex) Liberal Arts Education | Basic Specialized Subjects | Specialized Subjects | Graduation Thesis | (◎)Required subject | (○)Compulsory elective subject | (△)Free elective subject