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)	機械システムプログラム
(English)	Program of Mechanical Systems Engineering

1. Academic Degree to be Acquired ：Bachelor’s degree in Engineering

2. Overview

This program offers education in the fundamentals of mechanical system engineering, the structure and function of mechanical systems and the principles of the design and processing of mechanical systems based on new concepts, computer-aided design (CAE and CAD), measurement and control technology, mechatronics technology, the principles of the design and production of new mechanical systems through intelligent numerical simulation and information processing, as well as basic fields such as the mechanics of materials, the dynamics of vibrations, system controls, and other fields. By offering such education, it aims to develop engineers who, having a broader perspective on human-machine relations and environmental issues, are able to assume cutting-edge design and development roles in production engineering.In order to provide an efficient and integrated education, the teachers belonging to the academic society (Science and Engineering Field, Machine Engineering/Science and Technology Unit) are in charge of education for this program. Students are assigned to this program in the second semester of the second year. Then, in the first semester of the fourth year, students are assigned to their respective research laboratories, choose their research topics, and write up their graduation theses.

Around sixty percent of graduates from this program will advance to graduate school. Graduates are employed in the general machinery and automotive fields, as well as in electronics, information & communications, heavy industry, the chemical industry, and a broad range of other industries. Centering on manufacturers in the fields of heavy industry, transportation equipment, machinery, and materials, they work actively in the fields of R&D, design, production engineering, and engineering marketing.

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

The Program of Mechanical Systems Engineering develops professionals capable of taking action and displaying great humanity and rationality, who can contribute to the peace, development, and survival of humankind, and to the realization of happiness while striving for co-existence with nature.

Based upon the above, this program awards a bachelor’s degree in engineering to students who have acquired the following abilities in a balanced manner, as well as the number of credits necessary to meet the standard of the course.

・ Acquisition of the fundamentals of mechanical system engineering, the structure and function of mechanical system and the principles of the design and processing of mechanical systems based on new concepts, computer-aided design (CAE and CAD), measurement and control technology, mechatronics technology, the principles of the design and production of new mechanical systems through intelligent numerical simulation and information processing, as well as basic fields such as the mechanics of materials, the dynamics of vibrations, system controls, and other fields.

・The ability to assume roles in the design and development of cutting-edge production technology, while having a broader perspective about human-machine relations and environmental issues.

4. Curriculum Policy (Policy for Preparing & Implementing Curriculum)

To ensure that students are able to achieve the goals of the program, the program develops and puts into practice a curriculum based on the following policy:

. ・The Program offers not only basic mechanical education but also specialized education in the structure and function of mechanical systems and the principles of the design and processing of mechanical systems based on new concepts, computer-aided design (CAE and CAD), measurement and control technology, mechatronics technology, and the principles of the design and production of new mechanical systems through intelligent numerical simulation and information processing.

・In the first year, the students take Liberal Arts Education subjects such as Peace Science Courses, Basic Courses in University Education, common subjects, and Foundation Courses, as well as specialized basic subjects and specialized practical education, such as machine shop training.

In the first semester of the second year, the students take the specialized basic subjects that are important, together with subjects common to Cluster 1 such as “Mechanics of Materials ” and “Fluid Dynamics ”. Then, from the second semester, the students take specialized subjects, such as highly professional subjects related to advanced technology that reflect the characteristics of this program, and subjects related to integrated systems technology.

In the third year, specialized subjects become major subjects, and the students take subjects required for this program. The program tries, as far as possible, not to allocate multiple specialized subjects to the same time-slot, allowing students to take specialized subjects provided by other programs in Cluster 1 according to their personal interests.

In the fourth year, the students are assigned to their respective research laboratories, choose their research topics, and write their graduation theses.

5. Program Timing/Acceptance Conditions

○ When to start the program

The second semester of the second year

○ Credit Requirements

By the first semester of the second year, students must have acquired the Liberal Arts Education subjects and specialized basic subjects that are commonly specified in Cluster 1. Acceptance conditions for the program are not particularly specified.

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, the evaluation criteria are applied to each academic achievement evaluation item so that the level of attainment is clearly demonstrated. 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 achievement in each subject being evaluated (S = 4, A = 3, B = 2, and C= 1).

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 relationship between evaluation items and evaluation criteria, see the attached Sheet 2 .

* For the relationship between evaluation items and class subjects, see the attached Sheet 3.

* For the curriculum map, see the attached Sheet 4.

9. Graduation Thesis (Graduation Work) (Positioning, When and how it is assigned, etc.)

○ Positioning

The graduation thesis is designed to be one component of the overall evaluation of academic achievement.

It is positioned as one of the major subjects to evaluate the following:

Ability/Skills (2) Developing the ability to solve engineering issues on one's own initiative with flexible thinking and creativity

Collective capacity (1) Developing communication skills and the ability to globally collect and dispatch information.

○ When and how it is assigned

○When it is assigned: At the start of the fourth year. (Only those who satisfy the conditions for embarking on a graduation thesis will be assigned a thesis.)

Conditions for embarking on a graduation thesis

(1) Students must gain 43 credits or more out of 46 credits, the required number for graduation in Liberal Arts Education subjects.

(2) Students must gain 10 credits or more in the first group of specialized basic subjects

(3) Students must gain all of the required credits in Machine Design and Drawing, CAD, Machine Shop Training, Experiments in Mechanical Engineering , Experiments in Mechanical Engineering , and Mechanical Engineering Design and Production.

(4) Students must gain 13 credits or more out of 17 credits, the required number in Liberal Arts Education subjects, in the second group of specialized basic subjects.

(5) Students must gain a total of 68 credits or more in specialized basic subjects and specialized subjects.

○ How it is assigned

The research details of each laboratory to which the students can be assigned are explained by giving out handouts at a briefing held in February, in the second semester of the third year. After the number of students acceptable to each laboratory is given at the start of the fourth year, students who can begin their graduation theses are assigned as requested. In the case that the number of students exceeds the acceptable limit for a laboratory, adjustments may be made.

10. Responsibility-taking System

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

The cluster leader and program leader are responsible for executing this program. Faculty committee members responsible for this program make plans, while self-check/evaluation committee members responsible for this program make evaluations. The cluster and program teachers committee scrutinize the plans and evaluations from time to time for further improvement. When major issues arise, a working group may be established at the discretion of cluster leader and program leader.

(2) Program assessment

Criteria for program assessment

・Whether or not each class subject is properly allocated in light of the goals of the program, and whether course content is appropriate

・Whether or not, on average, students taking the course have achieved or exceeded the goals

・Whether or not the system runs in proper cycles that enable the continuous improvement of the program

How the program is assessed

・Conducting self-assessment for each subject based on class improvement questionnaires from students who have taken course, and based on performance rating results

・Conducting questionnaires (obtained at graduation) in suitable cycles, to evaluate the validity of the goals

○ Position on feedback to students and how it should be conducted

Search records of each student's learning status, prepared by tutors, are kept.

Based on these records, study guidance is given to each student. At the same time, requests from students are discussed at teachers' meetings as needed. Furthermore, based on the results of the course improvement questionnaires obtained from students, subject teachers draw up class improvement plans that reflect the questionnaire results.

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

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
Liberal Arts Education Subjects	Peace Science Courses																					
	Basic Courses in University Education	Introduction to University Education																				
		Introductory Seminar for First-Year Students																				
	Common Subjects	Area Courses							○		○											
					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				◎	◎										
				Communication I	2	CommunicationIA	1	Required	◎	◎												
						Communication IB	1		◎	◎												
				Communication II	2	Communication IIA	1	Required			◎	◎										
						Communication IIB	1				◎	◎										
			Initial Foreign Languages (Select one language from German, French, Spanish, Russian, Chinese, Korean, and Arabic)		2	1 subjects from Basic language I	1	Compulsory elective	○													
						1 subjects from Basic language II	1			○													
		Information and Data Science Courses			2	Introduction to Information and Data Sciencies	2	Required	◎															
		Health and Sports Courses			2		1or2	Compulsory elective	○	○	○	○												
	Basic Subjects				18	CalculusI	2	Required		◎														
						CalculusII	2					◎												
						Linear AlgebraI	2		◎															
						Linear AlgebraII	2				◎													
						Seminar in Basic Mathematics I	1			◎														
						Seminar in Basic Mathematics II	1					◎												
						General Mechanics I	2		◎															
						General Mechanics II	2				◎													
						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 Mechanical Systems Engineering)

◎ Required subject
○Compulsory elective subje
△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	
Dynamics of Vibrations I	2	◎							4										
Experiments in Mechanical Engineering I	1	◎									3	3							
Experiments in Mechanical Engineering II	1	◎											3	3					
Mechanical Engineering Design and Production	1	◎											3	3					
Mechanical Materials I	2	○										4							
Mechanical Materials II	2	○												4					
Fracture Mechanics	2	△												4					
Fusion and Solidification Processings I	2	△										4							
Plastic Working and Powder Metallurgy II	2	△											4						
Materials Science	2	○								4									
Machining	2	◎										4							
Fluid Dynamics II	2	○								4									
Heat Transfer I	2	○							4										
Combustion Engineering Fundamentals	2	△									4								
Internal Combustion Engines	2	△											4						
Data Processing and Numerical Analysis	2	○								4									
Theory of Elasticity and Plasticity	2	○									4								
Computational Solid Mechanics	2	○												4					
Mathematical Optimization	2	△							4										
Mechanics of Materials II	2	○							4										
Mechanism and Kinematics	2	○								4									
Dynamics of Vibrations II	2	○									4								
Control Engineering II	2	○							4										
Electrical and Electronic Engineering	2	○									4								
Mechatronics	2	○											4						
Instrumentation Engineering	2	◎							4										
Mechanical System Control	2	○									4								
Data Structure and Algorithm	2	○												4					
Manufacturing System	2	◎										4							
Machine Elements Design I	2	◎							4										
Machine Elements Design II	2	○									4								
Machine Design	2	○											4						
Reliability Engineering	2	△										4							
Systems Engineering	2	○								4									
Internship	1	○											3	3					
Graduation Thesis	5	◎																	

Academic Achievements in Educational Program for Mechanical Systems Engin

The Relationship between Evaluation Items and Evaluation Criteria

Academic Achievements			Evaluation Criteria		
Evaluation Items			Excellent	Very Good	Good
Knowledge and Understanding	(1)	To develop the ability to work positively and independently on the development of local societies, international society, and business and industries.	To be able to be sufficiently engaged in the development of local societies, international society, and business and industry.	To be able to be engaged in the development of local societies, international society, and business and industry at the standard level.	To be able to be engaged in the development of local societies, international society, and business and industry at the minimum level.
	(2)	Acquiring necessary basic knowledge for an engineer and developing the ability to consider logically.	Acquiring necessary basic knowledge for an engineer and being able to sufficiently and logically consider it.	Acquiring necessary basic knowledge for an engineer and being able to logically consider it at the standard level.	Acquiring necessary basic knowledge for an engineer and being able to logically consider it at the minimum level.
Abilities and Skills	(1)	Acquring basis of mechanical system engineering steadily and developing the applied skill.	Acquring basis of mechanical system engineering steadily, and being able to apply it sufficiently.	Acquring basis of mechanical system engineering steadily, and being able to apply it at the standard level.	Acquring basis of mechanical system engineering steadily, and being able to apply it at the minimum level.
	(2)	Developing the ability of solving the technological issues with flexible ideas and creativity.	Based on flexible ideas and creativity, to be able to sufficiently solve problems related to engineering.	Based on flexible ideas and creativity, to be able to independently solve problems related to engineering to the standard level.	Based on flexible ideas and creativity, to be able to independently solve problems related to engineering at the minimum level.
Overall Abilities	(1)	Cultivating abilities of communication and of internationally collecting information and releasing it	To be able to communicate sufficiently with others, collect and release information internationally.	To be able to communicate with others, collect and release information internationally at the standard level	To be able to communicate with others, collect and release information internationally at the minimum level.

Placement of the Liberal Arts Education in the Major Program

We aim to cultivate a well-rounded character, backed up by a broad range of basic knowledge and an understanding of global environmental issues and problems in the social environment. Furthermore, we aim to cultivate the ability to consider ways to solve problems in the context of the multifaceted relations between people and society, and between nature and engineering. To that end, the following are offered: (1) The acquisition of the necessary abilities and attitudes to see various social issues multilaterally and to understand the complete picture (2) The acquisition of a broader perspective after being exposed to fields outside of one's area of expertise (3)

Relationships between the evaluation items and class subjects

					Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	
Liberal Arts Education	Introduction to University Education	2	Required	1semsester-1T	100	1									100
Liberal Arts Education	Introductory Seminar for First-Year Students	2	Required	1semsester							50	1	50	1	100
Liberal Arts Education	Peace Science Courses	2	Elective	1semsester-2T	100	1									100
Liberal Arts Education	Basic English UsageI	1	Required	1semsester									100	1	100
Liberal Arts Education	Basic English UsageII	1	Required	2semsester									100	1	100
Liberal Arts Education	CommunicationI	1	Required	1semsester									100	1	100
Liberal Arts Education	Communication I	1	Required	1semsester									100	1	100
Liberal Arts Education	Communication II	1	Required	2semsester									100	1	100
Liberal Arts Education	Communication II	1	Required	2semsester									100	1	100
Liberal Arts Education	Basic language I	1	Elective	1semsester-1T									100	1	100
Liberal Arts Education	Basic language II	1	Elective	1semsester-2T									100	1	100
Liberal Arts Education	Area Courses Courses in Arts and Humanities/Social Sc	4	Elective	1,2,3,4semseste	100	1									100
Liberal Arts Education	Area Courses Courses in Natural Sciences	4	Elective	1,2,3,4semseste	100	1									100
Liberal Arts Education	Health and Sports Courses														

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)		(1)		(2)		(1)		
					Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	Weighted values of evaluation items in the subject	Weightsed values of evaluation items	
Specialized Education	Machine Shop Training (a)	1	Required	2semsester							100	1			100
Specialized Education	Machine Shop Training (b)	1	Required	3semsester							100	1			

Curriculum Map of Mechanical Systems Engineering

Sheet 4

Academic achievements / Evaluation Items		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 Understandi	To develop the ability to work positively and independently on the development of local societies, international	Area Courses	Area Courses	Area Courses	Area Courses	Reliability Engineering	Internship		
		Health and Sports Courses	Health and Sports Courses						
		Introduction to University Education							
		Peace Science Courses							
	Acquiring necessary basic knowledge for an engineer and developing the ability to consider logically.	Introduction to Information and Data Sciencies ( )	CalculusII	Basic Electromagnetism		Computer Programming			
		CalculusI ( )	Seminar in Basic Mathematics II	General Chemistry					
		Seminar in Basic Mathematics I (◎)	Linear AlgebraII	Basic Engineering Computer Programming					
		Linear AlgebraI (◎)	General Mechanics II						
		General Mechanics I (◎)	Experimental Methods and Laboratory Work in Physics I						
			Experimental Methods and Laboratory Work in Chemistry I						
Abilitis and Skills	Acquring basis of mechanical system engineering steadily and developing the applied skill.		Practice of Mechani	Applied Mathematics II	Applied Mathematics III	Engineering Mathematics A	Synthesis of Applied Mathematics		
			Introduction of Mechanical and Transportation Engineering	Probability and Statistics	Engineering Mathematics C	Mechanical Materials I	Mechanical Materials II		
			Engineering Mechanics	Mechanics of Material I	Dynamics of Vibrations I	Machining	Fracture Mechanics		
			Applied Mathematics I	Fluid Dynamics I	Fluid Dynamics II	Combustion Engineering Fundamentals	Internal Combustion Engines		
			Machine Design and Drawing	Fundamentals of Materials Processing	Mechanics of Materials II	Manufacturing Systems	Computational Solid Mechanics		
				An Introduction to Engineering Materials	Mechanism and Kinematics	Reliability Engineering	Mechatronics		
				Control Engineering I	Systems Engineering	Electrical and Electronic Engineering	Machine Design		
				Thermodynamics I	Materials Science	Theory of Elasticity and Plasticity	Plastic Working and Powder Metallurgy II		
					Heat Transfer I	Fusion and Solidification Processings I	Data Structure and Algorithm		
					Data Processing and Numerical Analysis	Dynamics of Vibrations II			
					Mathematical Optimization	Mechanical System Control			
					Control Engineering II	Machine Elements Design II			
					Instrumentation Engineering				
					Machine Elements Design I				
	Developing the ability of solving the technological issues with flexible ideas and creativity.	Introductory Seminar for First-Year Students	Machine Shop Training (a)	Machine Shop Training (b)	Systems Engineering	Experiments in Mechanical Engineering I	Experiments in Mechanical Engineering II	Graduation Thesis	Graduation Thesis
				Computer Aided Design			Mechanical Engineering Design and Production		
							Internship		
Comprehensive Abilities	Cultivating abilities of communication and of internationally collecting information and releasing it	Introductory Seminar for First-Year Students	Basic English UsageII			Experiments in Mechanical Engineering I	Experiments in Mechanical Engineering II	Graduation Thesis	Graduation Thesis
		Basic English UsageI	Communication II	Technical English			Internship		
		CommunicationI	Communication II						
		Communication I							
		Basic language I(○)							
		Basic language II							

Color-code: Common subjects | Foundation Courses | Basic Specialized Subjects The first group | Basic Specialized Subjects The second group | Specialized Subjects

Symbol: Required subject | Compulsory elective subject | Free elective subject