

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)	材料加工プログラム
(English)	Program of Material Processing
1.Academic degree to be Acquired : Bachelor's degree in Engineering	

2.Overview

The Program of Material Processing in Cluster 1 aims at nurturing engineers and researchers who, having a broader perspective on human-machine relations such as general machinery, automobiles, electrical machinery, information communication, heavy industry, chemical industry, etc., energy, and environmental issues, are able to assume cutting-edge design and development roles in production engineering. In order for students to develop their perspectives in other related fields, while also gaining in-depth expertise, the program will be run not only by specialists from the closely-related Materials and Processing Program, but also by specialists from the other three programs in Cluster 1, as well as by highly-skilled technical personnel from the Phoenix Workshop.

In particular, this program helps students acquire basic knowledge as mechanical engineers through the learning of basic mechanical subjects, drafting and design, and machine shop training at the Phoenix Workshop. Also, this program offers such materials-related specialized subjects as machine materials and materials science; specialized subjects related to the deformation and destruction of materials, such as material strength and elastic-plastic engineering; and specialized subjects that deal with the technology of forming processes, such as forming processes and machine processes. The program provides students with highly specialized education in the design, development, and use of functional materials, and in the principles of production and processing. 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 f

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

The Program of Material Processing offers not only machine-related basic education, but also specialized education concerning the design and development of new functional materials and utilization technology, as well as the principles of production and processing, and their the application.

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:

- 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, specialized basic subjects such as “Mechanics of Materials I” and “Fluid Dynamics I” become major subjects. In the second semester of the second year, the students are assigned to this program. As a result, specialized subjects in accordance with the program become major subjects to be taken.
- In the third year, specialized subjects tailored to the program continue to become major subjects to be taken.
- In the fourth year, the students are assigned to their respective research laboratories, choose their research topics, and write their graduation theses.

In the curriculum described above, teaching and learning will be implemented by utilizing active learning and online classes, depending on the delivery methods of the program, such as lectures and seminars.

In addition to strict grading using the standards clearly outlined in the syllabus, learning outcomes are evaluated

- * 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.

Academic achievement	Evaluation criteria
Excellent	3.00~4.00
Very Good	2.00~2.99
Good	1.00~1.99

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

Positioning

The graduation thesis is positioned as one of the major subjects to achieve the following learning/educational goals:

- (D) Developing the ability to solve engineering issues on one's own initiative with flexible thinking and creativity
- (E) 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 to those who meet the conditions for embarking on a graduation 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, Mechanical Engineering Design and Production, Machine Shop Training, Experiments in Mechanical Engineering
- (4) Students must gain 11 credits or more out of 15 credits, the required number 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 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														
	Introduction of Mechanical and Transportation Engineering	2	⊙	⊙	⊙	⊙			4															
	Technical English	1	⊙	⊙	⊙	⊙					2	2												
	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													
	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)

(Program of Material Processing)

○Compulsory elective subject

△Free elective subject

[illegible]

Academic Achievements in Educational Program for Materials and Processing

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)	Acquiring basis of mechanical system, material creation and processing engineering steadily, and being able to apply	Acquiring basis of mechanical system, material creation and processing engineering steadily, and being able to apply it	Acquiring basis of mechanical system, material creation and processing engineering steadily, and being able to apply it at the standard level.	Acquiring basis of mechanical system, material creation and processing 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) Through sports, the acquisition of knowledge of health and physical strength that form basis of human living (4) The cultivation of the ability to understand the position of machine system engineers and material creating/processing engineers in society, and to solve ethical problems

Relationships between the evaluation items and class subjects

Sheet 3

[illegible]

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	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	
Specialized Education	Mechanical Materials II	2	Elective	6semester					100	1					100
Specialized Education	Fracture Mechanics	2	Required	6semester					100	1					100
Specialized Education	Fusion and Solidification Processings I	2	Required	5semester					100	1					100
Specialized Education	Plastic Working and Powder Metallurgy II	2	Elective	6semester					100	1					100
Specialized Education	Materials Science	2	Required	4semester					100	1					100
Specialized Education	Machining	2	Required	5semester					100	1					100
Specialized Education	Introduction to Quantum Physics	2	Elective	4semester					100	1					100
Specialized Education	Fluid Dynamics II	2	Elective	4semester-4T					100	1					100
Specialized Education	Thermodynamics II	2	Elective	4semester-4T					100	1					100
Specialized Education	Heat Transfer I	2	Elective	4semester-3T					100	1					100
Specialized Education	Combustion Engineering Fundamentals	2	Elective	5semester					100	1					100
Specialized Education	Internal Combustion Engines	2	Elective	6semester					100	1					100
Specialized Education	Data Processing and Numerical Analysis	2	Required	4semester					100	1					100
Specialized Education	Theory of Elasticity and Plasticity	2	Elective	5semester					100	1					100
Specialized Education	Computational Solid Mechanics	2	Elective	5semester					100	1					100
Specialized Education	Mechanics of Materials II	2	Elective	4semester					100	1					100
Specialized Education	Mechanism and Kinematics	2	Elective	4semester					100	1					100
Specialized Education	Dynamics of Vibrations II	2	Elective	5semester					100	1					100
Specialized Education	Control Engineering II	2	Elective	4semester					100	1					100
Specialized Education	Electrical and Electronic Engineering	2	Elective	5semester					100	1					100
Specialized Education	Mechatronics	2	Elective	6semester					100	1					100
Specialized Education	Measurement and Signal Processing	2	Elective	6semester					100	1					100
Specialized Education	Mechanical System Control	2	Elective	5semester					100	1					100
Specialized Education	Data Structure and Algorithm	2	Elective	6semester					100	1					100
Specialized Education	Manufacturing System	2	Elective	5semester					100	1					100
Specialized Education	Machine Elements Design	2	Elective	4semester					100	1					100
Specialized Education	Machine Design	2	Elective	6semester					100	1					100
Specialized Education	Systems Engineering	2	Elective	4semester					50	1	50	1			100
Specialized Education	Transportation	2	Elective	4semester					100	1					100
Specialized Education	Internship	1	Elective	6semester	40	1					30	1	30	1	100
Specialized Education	Graduation Thesis	5	Required	7,8semester							55	1	45	1	100

Curriculum Map of Materials Processing

Sheet 4

4th grade

Spring		Fall	Spring	Fall	Spring	Fall
Introduction to University Education	Area Courses	Area Courses	Area Courses	Area Courses	Internship	
Peace Science Courses	Health and Sports Courses					
Area Courses						
Health and Sports Courses						
Introduction to Information and Data Sciences	Calculus II	Basic Electromagnetism		Computer Programming		
Calculus I	Linear Algebra II	General Chemistry				
Linear Algebra I	Seminar in Basic Mathematics II	Basic Engineering Computer Programming				
Seminar in Basic Mathematics I	General Mechanics II					
General Mechanics I	Experimental Methods and Laboratory Work in Physics I					
	Applied Mathematics I	Applied Mathematics II	Applied Mathematics III	Engineering Mathematics A	Synthesis of Applied Mathematics	
	Practice of Mechanics	Probability and Statistics	Engineering Mathematics C	Mechanical Materials I	Mechanical Materials II	
	Introduction of Mechanical and Transportation Engineering	Mechanics of Material I	Dynamics of Vibrations I	Fusion and Solidification Processings I	Fracture Mechanics	
	Machine Design and Drawing	Thermodynamics I	Materials Science	Machining	Plastic Working and Powder Metallurgy II	
		Fluid Dynamics I	Introduction to Quantum Physics	Combustion Engineering Fundamentals	Internal Combustion Engines	
		Control Engineering I	Fluid Dynamics II	Theory of Elasticity and Plasticity	Mechatronics	
		An Introduction to Engineering Materials	Thermodynamics II	Dynamics of Vibrations II	Data Structure and Algorithm	
		Fundamentals of Materials Processing	Heat Transfer I	Electrical and Electronic Engineering	Machine Design	
			Data Processing and Numerical Analysis	Mechanical System Control	Measurement and Signal Processing	
			Mechanics of Materials II	Manufacturing System		
			Mechanism and Kinematics	Computational Solid Mechanics		
			Control Engineering II			
			Machine Elements Design			
			Systems Engineering			
			Transportation			
Introductory Seminar for First-Year Students	Machine Shop Training (a)	Machine Shop Training (b)	Systems Engineering	Experiments in Mechanical Engineering-I	Mechanical Engineering Design and Production	Graduation Thesis
	Computer Aided Design				Internship	Graduation Thesis
Introductory Seminar for First-Year Students	Basic English Usage II			Experiments in Mechanical Engineering-II	Internship	Graduation Thesis
Basic English Usage I	Communication II	Technical English				Graduation Thesis
Communication I	Communication II					
Communication I						
Basic language I						
Basic language II						
Common subjects	Foundation Courses	Basic Specialized Subjects The first group	Basic Specialized Subjects The second group	Specialized Subjects		
Required subject	Compulsory Subject	Free elective subject				

Cultivating abilities of communication and
of internationally collecting information
and releasing it