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)	
(English)	Program of Energy Transform Engineering

1.Academic degree to be Acquired

2. Overview

(1) -

This program aims to foster and produce future members of a global society who have the knowledge to be innovative, creative, take leadership, and possess language abilities that will help them play an important role in the international world.

This program focuses specifically on producing individuals who are capable of addressing various global issues from an engineering perspective and contribute to the creation of new and valuable solutions that are significant to both the industrial and academic societies.

Students enrolled in the program will begin the curriculum from the first semester of their first year.
In the second year, students will set off on their major programs and take the designated courses which are offered at each cluster. Major program overview is as (2).

Program of Energy Transform Engineering

This Program (Energy Transform Engineering) in Cluster 1 helps students acquire the basic knowledge and perspective needed by engineers through the study of design and drafting, as well as through practical training at the Phoenix Workshop. Also, this program offers education in such fields as thermodynamics, basic physics related to quantum physics, fluid dynamics, combustion engineering, and heat-transfer engineering, all of which are indispensable for engineers.

Through such education, this program aims at nurturing engineers and researchers who, contributing to solving energy and environmental problems from a global perspective, being able to assume cutting-edge design and development roles in engineering. In order for students to develop their perspectives in other related fields with also gaining in-depth expertise, this program will be run not only by specialists from the closely-related program of Energy Transform Engineering, but also by specialists from the other three programs in Cluster 1, as well as by highly-skilled technical personnel from the Phoenix Workshop.

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. For your reference, as of last year about sixty percent of graduates from Cluster 1 in the School of Engineering had advanced 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 research, design, production engineering, and engineering marketing.

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

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

balanced manner as well as the number of credits necessary to meet the standard of the course.

- The ability with the basic technological knowledge and perspectives required by engineers, centering on

mechanical/material-related subjects as well as with the fundamentals of engineering associated with energy and of indispensable for such fields of engineering as thermodynamics, basic physics related to quantum physics, fluid dynamics, combustion engineering, and heat-transfer engineering.

- 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 and Implementing the Curriculum)

Achievement in learning is measured by performance rating in each subject and by the goals set by the Education Program. To ensure that students are able to achieve the goals of the program, the Program of Energy Transform Engineering 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.
- I and Thermodynamics I become major subjects. The students choose one of four programs in Cluster 1(Mechanical Systems Engineering, Transportation Systems, Material Processing, or Energy Transform Engineering) and are assigned to that program.
- In the third year, specialized subjects become major subjects. The students take required classes in accordance with the program they belong to.
- 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

The English- e first semester of the first year. Enrollment in Program of Energy Transform Engineering occurs in the second semester of the second year.

Additional Requirements : To determine acceptance into the English- applicants are required to have an individual consultation with the faculty committee members.

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.

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.
* All class subjects are taught in Japanese. Course materials will be written in both Japanese and English or only English.

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.

given in one of three

to the numerically-converted values of their academic achievement in each subject being evaluated (S = 4, A = 3, B = 2, and C= 1).

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* 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 Research) (Positioning, when and how it is assigned, etc.)

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:

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

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.)

(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 Ⅰ, Experiments in Mechanical Engineering Ⅱ, 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.

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.

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10. Responsibility-taking System
(1) PDCA Responsibility-
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

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

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

tutors, are kept in the office. Based on these records, study guidance is given to each student. At the same time, requests from students are discussed at res

obtained from students, subject teachers draw up class improvement plans that reflect the questionnaire results.

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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 Energy Transform Engineering

Required subject
Compulsory elective subject
Free elective subject

Class Subjects	Credits	Type of course registration	Class Hours/Week																Note
			1st grade				2nd grade				3ed 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					
Elementary Electromagnetism	2								4										
Introduction to Quantum Physics	2									4									
Introduction to chemical physics	2											4							
Fluid Dynamics II	2									4									
Compressible Fluid Dynamics	2										4								
Computational Fluid Dynamics	2												4						
Fluid Machinery	2													4					
Thermodynamics II	2									4									
Statistical and Thermal Physics	2												4						
Heat Transfer I	2								4										
Heat Transfer II	2										4								
Combustion Engineering Fundamentals	2										4								
Basic Chemical Kinetics	2											4							
Internal Combustion Engines	2												4						
Steam Power	2												4						
Plasma Engineering	2											4							
Data Processing and Numerical Analysis	2									4									
Radiation Engineering	2													4					
Nuclear Engineering	2													4					
Theory of Elasticity and Plasticity	2										4								
Computational Solid Mechanics	2													4					
Electrical and Electronic Engineering	2										4								
Instrumentation Engineering	2								4										
Optical Measurement Techniques	2													4					
Machine Elements Design I	2								4										
Natural-Energy Utilization Engineering	2													4					
Internship	1												3	3					
Mechanism and Kinematics	2									4									
Systems Engineering	2									4									
Mechanics of Materials II	2								4										
Transportation	2								4										
Control Engineering II	2								4										
Materials Science	2									4									
Machine Elements Design II	2										4								
Mechanical Materials I	2											4							
Dynamics of Vibrations II	2										4								
Machining	2											4							
Reliability Engineering	2											4							
Manufacturing System	2											4							
Fusion and Solidification Processings I	2											4							
Plastic Working and Powder Metallurgy II	2												4						
Mechanical System Control	2										4								
Machine Design	2												4						
Mechanical Materials II	2													4					
Fracture Mechanics	2													4					
Mechatronics	2												4						
Graduation Thesis	5																		

Academic Achievement in Educational Program for Energy Transform Engineer

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) Through sports, the acquisition of knowledge of health and physical strength that form basis of human living (4) The cultivation of the ability to

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