

Akashi College		Year	2022		Course Title	Energy Technology II	
Course Information							
Course Code		4033		Course Category		Specialized / Elective	
Class Format		Lecture		Credits		Academic Credit: 2	
Department		Mechanical and Electronic System Engineering		Student Grade		Adv. 2nd	
Term		First Semester		Classes per Week		2	
Textbook and/or Teaching Materials							
Instructor		TANAKA Seiichi					
Course Objectives							
The course objectives are as follows: (1) Can recognize future problems and discuss measures for energy conversion technologies that support livelihoods. (2) Understand and can explain the principles of structural and energy conversion of thermal engines and fluid machinery. (3) Understand the basic issues of each thermo-fluid machine and plan, conduct, and evaluate performance tests. To achieve these goals, students will need to do the following self-study: (a) Solve each week's exercise questions and research the relevant topics to enhance understanding. (b) Describe the appropriate experimental results and considerations by citing various literature to prepare experimental reports for performance evaluation tests of internal combustion engines.							
Rubric							
		Ideal Level		Standard Level		Unacceptable Level	
Achievement 1		Can accurately recognize future problems and discuss measures for energy conversion technologies that support livelihoods.		Can recognize future problems and discuss measures for energy conversion technologies that support livelihoods.		Cannot recognize future problems and discuss measures for energy conversion technologies that support livelihoods.	
Achievement 2		Accurately understand and logically explain the principles of structural and energy conversion of thermal engines and fluid machinery.		Understand and explain the principles of structural and energy conversion of thermal engines and fluid machinery.		Do not understand and cannot explain the principles of structural and energy conversion of thermal engines and fluid machinery.	
Achievement 3		Accurately understand the basic issues of each thermo-fluid machine and can properly plan, conduct, and evaluate performance tests.		Understand the basic issues of each thermo-fluid machine and can plan, conduct, and evaluate performance tests.		Do not understand the basic issues of each thermo-fluid machine and cannot plan, conduct, and evaluate performance tests.	
Assigned Department Objectives							
Teaching Method							
Outline		Students will understand the system of thermal and fluid energy conversion technologies and will practically learn the approaches to performance calculation and experimental evaluation that designing requires. More specifically, they will understand the structures and principles of thermal engines and fluid machinery in practical use and learn the approaches to performance evaluations. To do these things, students will actually plan and implement performance evaluations through labs.					
Style		Classes will be focused around lectures that use slides and notetaking. There will be assignment exercises for each unit and two labs. In order to achieve the goals, students should ensure their understanding by following the questions and answers and work in class as well as the exercises assigned in each class. If a student is having difficulty following, they should go back to the basics. If they don't understand, they should ask questions to faculty member and learn from their peers.					
Notice		This course is a practical application course for the subjects covered in Thermodynamics, Fluid Mechanics, and Heat Transfer. Therefore, keep the textbooks for those subjects at hand and review them. However, this does not mean that students who have not taken those courses are unable to take this course. In these cases, students should come and discuss it with the faculty as much as possible. Students need to submit a lab report as part of a prerequisite for earning the credit. They will be evaluated based on the results of the planned experiment. Other detailed evaluation criteria will be explained during the first class. This course's content will amount to 90 hours in total. These hours include the learning time guaranteed in classes and the standard self-study time required for pre-study / review, and completing assignment reports. Students who miss 1/3 or more of classes will not be eligible for a passing grade.					
Characteristics of Class / Division in Learning							
<input type="checkbox"/> Active Learning		<input type="checkbox"/> Aided by ICT		<input type="checkbox"/> Applicable to Remote Class		<input type="checkbox"/> Instructor Professionally Experienced	
Course Plan							
			Theme		Goals		
1st Semester	1st Quarter	1st	Energy conversion		Understand and explain types of energy conversions, especially thermal engine classification.		
		2nd	Cycle and thermal efficiency of thermal engines (1)		Understand an air theory cycle hypothesis and calculate the thermal efficiency of a cycle for a typical thermal engine.		
		3rd	Cycle and thermal efficiency of thermal engines (2)		Can calculate the thermal efficiency of a cycle for a typical thermal engine and explain the difference between the thermal efficiency required in an air theory cycle, after comparing their thermal efficiencies.		

		4th	Analysis and measurement of thermal engine performance (1)	Understand and can apply information such as the indicated power and diagram factors and net power and mechanical efficiency that are required to evaluate a thermal engine's performance.
		5th	Analysis and measurement of thermal engine performance (2)	Understand and can apply information such as the methods of measuring power and thermal accounting that are required to evaluate a thermal engine's performance.
		6th	Performance evaluation of thermal engines (Lab 1)	Can plan a comprehensive performance evaluation experiment for an internal combustion engine that is in line with objectives presented by members of the class in order to gain a hands-on understanding of the items learned up to week 5.
		7th	Performance evaluation of thermal engines (Lab 1)	Can conduct the performance evaluation experiment for an internal combustion engine that was planned the previous week, and compile it into a report. (Report assignment)
		8th	Energy conversion in fluid machinery	Can introduce fluid machinery such as pumps, water vehicles, windmills, etc., and understand and explain their principles and structure.
	2nd Quarter	9th	Performance and efficiency of turbo machines (1)	Understand and can apply the turbo machines types and their general theory.
		10th	Performance and efficiency of turbo machines (2)	Understand and can explain the operation and the specific phenomena of fluid machinery.
		11th	Analysis and measurement of fluid machinery performance	Understand and can apply information such as the specific speed, performance curve, and similarity laws that are required to evaluate a thermal engine's performance.
		12th	Performance evaluation of fluid machinery (Lab 2)	Can plan a pump performance evaluation experiment that is in line with objectives presented by members of the class in order to gain a hands-on understanding of the items learned up to week 11.
		13th	Performance evaluation of fluid machinery (Lab 2)	Can conduct the performance evaluation experiment for an internal combustion engine that was planned the previous week, and compile it into a report. (Report assignment)
		14th	Principles and power generation systems of fuel cells (1)	Understand and can explain the principles and types of fuel cells and their systems.
		15th	Principles and power generation systems of fuel cells (2)	Understand fuel cells' thermal and material balance and can calculate the theoretical efficiency of real ones. (Report assignment)
		16th	Final exam	

Evaluation Method and Weight (%)

	Exercise	Report	Final exam	Total
Subtotal	20	40	40	100
Basic Proficiency	0	0	0	0
Specialized Proficiency	20	40	40	100
Cross Area Proficiency	0	0	0	0