Akashi College	Year	2022	Course Title	Advanced Heat Transfer

Course Information

Course Code	4025	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Mechanical and Electronic System Engineering	Student Grade	Adv. 1st
Term	Second Semester	Classes per Week	2
Textbook and/or Teaching Materials			
Instructor	KUNIMINE Kanji		

Course Objectives

(1) Can theoretically handle steady and unsteady state heat conduction.
(2) Can theoretically handle convective heat transfer.
(3) Can theoretically handle phase change heat transfer.
(4) Can theoretically handle material transfer.
(5) Can theoretically handle heat exchangers.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Can theoretically handle steady and unsteady state heat conduction sufficiently.	Can theoretically handle steady and unsteady state heat conduction.	Cannot theoretically handle steady and unsteady state heat conduction.
Achievement 2	Can theoretically handle convective heat transfer sufficiently.	Can theoretically handle convective heat transfer.	Cannot theoretically handle convective heat transfer.
Achievement 3	Can theoretically handle phase change heat transfer sufficiently.	Can theoretically handle phase change heat transfer.	Cannot theoretically handle phase change heat transfer.
	Can theoretically handle material transfer sufficiently.	Can theoretically handle material transfer.	Cannot theoretically handle material transfer.
	Can theoretically handle heat exchangers sufficiently.	Can theoretically handle heat exchangers.	Cannot theoretically handle heat exchangers.

Assigned Department Objectives

Teaching Method

Outline	This course focuses on the theoretical handling of heat transfer engineering. It will cover the more advanced issues that the Heat Transfer class in the Regular Course did not.
Style	This course is based on Heat Transfer (year 5, elective) taught in Akashi Kosen Mechanical Engineering Department, and assumes that students have learned the knowledge of the subject.
Notice	This course's content will amount to 90 hours. These hours include the learning time guaranteed in classes and the standard self-study time required for pre-study / review, and completing assignment reports. To achieve the goals, students should thoroughly pre-study and review class content for each week. Evaluations will be based on two periodic exams. Students who miss 1/3 or more of classes will not be eligible for a passing grade.

Characteristics of Class / Division in Learning

☐ Active Learning	☐ Aided by ICT	☐ Applicable to Remote Class	☐ Instructor Professionally Experienced

Course Plan

			Theme	Goals
2nd Semester	3rd Quarter	1st	Basic theory	Understand the differential equations and their solutions, the basic laws of heat transfer, and the equation for heat conduction.
		2nd	Steady heat state conduction	Can understand the problems of two-dimensional steady heat conduction.
		3rd	Unsteady state heat conduction (1)	Understand the problems of a lumped heat capacity system.
		4th	Unsteady state heat conduction (2)	Understand approximation solutions for unsteady state heat conduction and the thermal conduction problems that accompany phase changes.
		5th	Forced convective heat transfer theory	Understand the governing equation for forced convective heat transfer.
		6th	Approximation solutions for forced convective heat transfer (1)	Understand the laminar heat transfer of the flow across a plate.
		7th	Approximate solutions for forced convective heat transfer (2)	Understand the laminar heat transfer of the flow across a plate.
		8th	Midterm exam	Can solve problems related to weeks 2 to 7.
	4th Quarter	9th	Natural convective heat transfer theory	Understand natural convective heat transfer.
		10th	Phase change heat transfer theory (1)	Understand the film condensation theory.
		11th	Phase change heat transfer theory (2)	Understand the film boiling theory.
		12th	Material transfer	Understand Fick's law, diffusion coefficient, and one-dimensional diffusion phenomena.
		13th	Heat exchangers (1)	Understand an overview of heat exchangers.

		14th	Heat exchangers (2)	Understand logarithmic mean temperature difference.
		15th	Heat exchangers (3)	Understand temperature efficiency ratio.
		16th	Final exam	Can solve problems related to weeks 9 to 15.

Evaluation Method and Weight (%)

	Examination						Total
Subtotal	100	0	0	0	0	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	100	0	0	0	0	0	100
Cross Area Proficiency	0	0	0	0	0	0	0