Akashi College	Year	2024	Course Title	Computational Mechanics

Course Information

Course Code	6030	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	Original Text		
Instructor	KUNIMINE Kanji		

Course Objectives

(1) Understand the basics of differential methods.
(2) Can determine numerical solutions for two-dimensional steady-state problems.
(3) Can determine numerical solutions for one-dimensional unsteady-state problems.
(4) Can determine numerical solutions for moving boundary problems.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Fully understand the basics of differential methods.	Understand the basics of differential methods.	Do not understand the basics of differential methods.
Achievement 2	Can fully determine numerical solutions for two-dimensional steady-state problems.	Can determine numerical solutions for two-dimensional steady-state problems.	Cannot determine numerical solutions for two-dimensional steady-state problems.
Achievement 3	Can fully determine numerical solutions for one-dimensional unsteady-state problems.	Can determine numerical solutions for one-dimensional unsteady-state problems.	Cannot determine numerical solutions for one-dimensional unsteady-state problems.
	Can fully determine numerical solutions for moving boundary problems.	Can determine numerical solutions for moving boundary problems.	Cannot determine numerical solutions for moving boundary problems.

Assigned Department Objectives

Teaching Method

Outline	Computational mechanics is designed to find governing equations that represent physical phenomena with the assistance of computers. In this course, students will be guided through the basic formula of heat conduction problems. The course will explain the basic theory and specific ways to calculate differential methods, which are typica numerical solutions. It will also explain how to apply them to moving boundary problems, such as coagulation.
Style	The course assumes students have a basic knowledge of Heat Transfer (selected for year 5) at the Mechanical Engineering Department and Advanced Heat Transfer from the school's advance courses, as the study contents are based on them. Students will also work on exercise assignments to meet the Course Objectives and Aims at the information center.
Notice	This course's content will amount to 90 hours of study 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. In order to achieve the goals, students are advised to thoroughly pre-study and review each week's class. The evaluation will be based on four assignments and two quizzes. Students who miss 1/3 or more of classes will not be eligible for evaluation.

Characteristics of Class / Division in Learning

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

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Heat conduction equations	Can derive a thermal conduction equation of a cylindrical coordinate system.
		2nd	Basics of the difference method	Can derive the differential formula for the derivatives of the first and second floors graphically and mathematically.
		3rd	Quiz on two-dimensional steady-state problems	Understand the differential formula for two-dimensional steady-state problems and how to solve them. Can do a quiz on content from Week 2.
		4th	Exercise (1)	Can create a program for two-dimensional steady-state problems.
		5th	Exercise (2)	Can determine numerical solutions using the program created in Week 4.
		6th	One-dimensional unsteady-state problems (1)	Understand the solution by the forward differential method and its algorithm.
		7th	One-dimensional unsteady-state problems (2)	Can understand the solution by reverse differential method and its algorithm.
		8th	Exercise (3)	Can create programs for one-dimensional unsteady-state problems.
	2nd Quarter	9th	Exercise (4)	Can determine numerical solutions using the program created in Week 8.

		10th	Moving boundary problem	Understand the basic equations and initial and boundary conditions, and can find an approximate solution for heat conduction problems with phase changes.
		11th	Quiz on the handling moving boundary surfaces (1)	Understand the fixed temperature point method as a typical example of handling boundary surfaces that may move over time. Can do a quiz on content from Week 10.
		12th	Handling moving boundary surfaces (2)	Understand the algorithm of a fixed temperature point method.
		13th	Exercise (5)	Can create a program using a fixed temperature point method.
		14th	Exercise (6)	Can create a program using a fixed temperature point method.
		15th	Exercise (7)	Can determine numerical solutions using the program created in Weeks 13 and 14.
		16th	No final exam	0

Evaluation Method and Weight (%)

	Report	Short Tests					Total
Subtotal	70	30	0	0	0	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	70	30	0	0	0	0	100
Cross Area Proficiency	0	0	0	0	0	0	0