Anan College	Year	2024	Course Title	Engineering Mechanics

Course Information

Course Code	1514B01	Course Category	Specialized / Compulsory
Class Format	Lecture	Credits	Academic Credit: 2
Department	Course of Mechanical Engineering	Student Grade	4th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Kikai Rikigaku no Kiso (SuuriKougaku)		
Instructor	Kawabata Nariyuki		

Course Objectives

1. Able to describe position, velocity, and acceleration using algebraic and analytical methods, and to calculate their mutual transformations
2. Able to formulate problems related to particle using algebraic and analytical methods, to derive analytical and numerical solutions, and to examine the physical meaning of the results.
3. Able to formulate problems related to systems of particles using algebraic and analytical methods, derive analytical and numerical solutions, and physically examine the meaning of the results.
4. Able to formulate problems related to rigid bodies using algebraic and analytical methods, derive analytical and numerical solutions, and physically examine the meaning of the results.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Able to describe position, velocity, and acceleration using algebraic and analytical methods. Able to also calculate mutual transformations in a polar coordinate system.	Able to describe position, velocity, and acceleration using algebraic and analytical methods. Able to also calculate mutual transformations.	Able to calculate position, velocity, acceleration, and their interconversions using algebraic and analytical methods with example-based solutions.
Achievement 2	Formulate particle problems using algebraic and analytical methods, derive analytical and numerical solutions, and physically discuss the results.	Formulate particle problems using algebraic and analytical methods and derive analytical and numerical solutions.	Formulate problems related to particle using algebraic and analytical methods with example-based solutions.
Achievement 3	Formulate system of particles problems using algebraic and analytical methods, derive analytical and numerical solutions, and physically discuss the results.	Formulate system of particles problems using algebraic and analytical methods and derive analytical and numerical solutions.	Formulate problems related to system of particles using algebraic and analytical methods with example-based solutions.
Achievement 4	Formulate rigid body problems using algebraic and analytical methods, derive analytical and numerical solutions, and physically discuss the results.	Formulate rigid body problems using algebraic and analytical methods and derive analytical and numerical solutions.	Formulate problems related to rigid body using algebraic and analytical methods with example-based solutions.

Assigned Department Objectives

学習・教育到達度目標 B-3 学習・教育到達度目標 D-1

Teaching Method

Outline	This course focuses on mechanics, one of the earliest established branches of classical physics, which is the basis of natural science, covering masses, systems of masses, and rigid bodies, and reinforces mathematical means to grasp it as a coherent logical system. By incorporating many exercises, students will develop problem-solving skills and acquire the ability to apply them to engineering fields.
Style	Classes will be developed with a focus on exercises based on the premise of preparatory study. Group work will be introduced in the exercises, and students will be encouraged to teach each other in order to promote their own understanding. Since most of the content is already known, it is necessary to review the textbook and previous class notes and understand the basic formulas in advance. The materials presented in class and answers to assignments will be distributed on the LMS, so students are encouraged to refer to them as necessary. At the end of each class, exercises will be provided for self-study. Each student is required to solve the exercises and submit them as a review. In addition, online assignments via manaba will be provided as knowledge confirmation questions and preliminary assignments. The students are expected to review or check the contents of the next session in advance and answer the questions. [30 hours of class time + 60 hours of self-study]
Notice	The content of mathematics up to the third grade and physics learned up to "Physics" and "Machine dynamics 1" will be used as prerequisites, so students should review these contents thoroughly. In addition, self-study is essential, including the completion of the assignments given in each class session. It is not possible to give sufficient explanations of the self-study assignments during class time, so if you have any questions, please come to the class to ask questions. When asking questions, please do your own research and think about it first, and clarify what you did not understand before coming to ask questions. The portfolio evaluation includes the evaluation of [reports (self-study assignments)] and [online assignments].

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	Fundamentals of Dynamics I	Able to calculations based on the basic laws concerning vectors.

		2nd	Fundamentals of Dynamics II	Able to describe position, velocity, and acceleration analytically.
		3rd	Particle Dynamics I	Able to analyze forces numerically.
		4th	Particle Dynamics II	Understand the laws of motion and solve equations of motion algebraically or analytically.
		5th	Particle Dynamics III	Uniformly accelerated motion: analytically solve for motion in a uniform gravitational field.
		6th	Particle Dynamics IV	Varying acceleration motion: analytically solve for simple harmonic motion and simple pendulum.
		7th	Particle Dynamics V	Able to derive the relationship between work, kinetic energy, potential energy and force.
		8th	Midterm examination	Understand the law of conservation of mechanical energy and apply it to problem solving.
	2nd Quarter	9th	Particle Dynamics VI	
		10th	Dynamics of Mass System I	Able to calculate the relationship between the momentum and impulse of a particle.
		11th	Dynamics of Mass System II	Understand the equations of motion and conservation of momentum of a mass system, and be able to perform analytical calculations.
		12th	Dynamics of Mass System III	Understand the angular momentum of a mass and the torque equation, and be able to perform analytical calculations.
		13th	Dynamics of Mass System IV	Understand and analytically calculate angular momentum of a mass system and rigid body. Able to solve the torque equation and angular momentum conservation laws for mass systems and rigid bodies, and perform analytical calculations.
		14th	Dynamics of Rigid Body I	Able to solve problems of equilibrium and motion of rigid bodies. Understand the motion of rigid bodies with fixed axes and perform analytical calculations.
		15th	Dynamics of Rigid Body II	Able to calculate moments of inertia in figures of good symmetry.
		16th	Reflection of Final examination	Able to formulate equations of motion for plane motion of rigid bodies and solve them analytically.

Evaluation Method and Weight (%)

	midterm / final exam	quiz	portfolio	presentation / attitude	other	Total
Subtotal	70	0	30	0	0	100
Basic Proficiency	10	0	0	0	0	10
Specialized Proficiency	60	0	30	0	0	90
Cross Area Proficiency	0	0	0	0	0	0