Tsuyama College	Year	2024	Course Title	Analytical Mechanics

Course Information

Course Code	0152	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Department of Integrated Science and Technology Communication and Informations System Program	Student Grade	4th
Term	Second Semester	Classes per Week	2
Textbook and/or Teaching Materials	Textbook : Seiji Miyashita, Analytical Mechanics (Shokabo), Reference Book : Mitsuhiro Asato, Basics of Analytical Mechanics (Gijyutsuhyouronsya)		
Instructor	SASAI Yuji		

Course Objectives

Learning purposes :
Understand Lagrange's equation of motion and solve applied problems as the basis of analytical mechanics. In addition, by understanding Hamilton's canonical equations and solving applied problems, students will learn calculation methods.

Course Objective :
1. Understand Lagrange's equation of motion and solve related problems.
2. Understand Hamilton's canonical equations and solve related problems.

Rubric

	Ideal Level	Standard Level	Unacceptable Level
Achievement 1	Can create answers to most of the problems dealt with in class about Lagrange's equation of motion.	Can create answers to problems dealt with in class about Lagrange's equation of motion.	Has not reached the left.
Achievement 2	Can create answers to most of the problems dealt with in class about Hamilton's canonical equations.	Can create answers to problems dealt with in class about Hamilton's canonical equations.	Has not reached the left.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : Specialized Field of learning : Physics Basic disciplines: Mathematical science / physics / general physics Relationship with Educational Objectives : This subject corresponds to the learning objective of each engineering department, "(1) Acquire knowledge about natural science subjects centered on mathematics and physics, and acquire the ability to apply it as basic knowledge about each engineering." Class outline : Analytical mechanics provides a method for systematically dealing with classical mechanics, and is also important for studying quantum mechanics and the theory of relativity in earnest. This course focuses on the basics of analytical mechanics, including the Lagrangian and Hamiltonian forms.
Style	Course method: Lecture-style lessons will be conducted and exercises will be conducted as appropriate. In the exercise, students will be asked to write a board and explain the answers. Impose an assignment report and proceed with the lesson while confirming the degree of understanding of the students. Grade evaluation method: Exams (60%) + Exercises (40%) . Supplementary classes and re-taking exams will be imposed on those with poor grades, and the results of the regular exam will be replaced with a maximum of 60 points.
Notice	Precautions on the enrollment : This subject is a "subject that requires study outside of class hours". Classes are offered for 15 credit hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of teacher for these studies. Course advice : Read the textbook well. Also, be sure to submit the assignment report by the deadline. Basic subjects : General Physics (3rd year), Differential and Integral I (2), Differential and Integral II (3), Fundamental Differential Equations (3) Related subjects : Quantum Science (5th year), Electromagnetism (4), Modern Physics (4), Condensed Matter Physics (4), Mathematics subject Attendance advice : Calculate and understand the mathematical formulas. If students are operating e-mail etc. during class, may be asked to leave the room. If student join the class starts within 25 minutes, it will be lateness, and 3 times lateness will result in 1 absence.

Characteristics of Class / Division in Learning

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

Elective must complete subjects

Course Plan

			Theme	Goals

2nd Semester	3rd Quarter	1st	・ Other than mathematics and physics science programs: Not offered ・ Mathematics and Physics Program: Guidance	Guidance
		2nd	Virtual Work Principle and D'Alembert's Principle	Understand the principles of virtual work and D'Alembert's principles.
		3rd	Hamilton's principle	Understand Hamilton's principle, action integral, and Lagrangian.
		4th	Polar coordinate format	Understand the relationship between Cartesian coordinates and polar coordinates, and derive a transformation formula.
		5th	Lagrange's equation of motion	Understand Lagrange's equation of motion and generalized coordinates.
		6th	Example using Lagrange's equation of motion	Work on some examples.
		7th	Hamilton's equations	Understand generalized momentum, Hamiltonian, Hamilton's equations, and canonical variables.
		8th	2nd term midterm exam (above content)	Requires a score of 60 points or higher.
	4th Quarter	9th	Return of answers for the 2nd term midterm exam. exam commentary.	Review.
		10th	Canonical transformation	Understand canonical transformation.
		11th	Variational principle by Hamiltonian	Understand the variational principle and generating function.
		12th	Infinitesimal canonical transformation	Understand infinitesimal canonical transformation.
		13th	Conserved quantity and generating function	Understand conserved quantities and generating functions.
		14th	Noether's theorem	Understand Noether's theorem.
		15th	2nd term final exam (contents after the 2nd term midterm exam)	Requires a score of 60 points or higher.
		16th	Return of answers for the 2nd term final exam. exam commentary.	Review.

Evaluation Method and Weight (%)

	Examination	Presentation	Mutual Evaluations between students	Behavior	Portfolio	Other	Total
Subtotal	60	0	0	0	40	0	100
Basic Proficiency	35	0	0	0	25	0	60
Specialized Proficiency	25	0	0	0	15	0	40
Cross Area Proficiency	0	0	0	0	0	0	0