View Syllabus Information

Course Information

Year	2024	School	School of Fundamental Science and Engineering	
Course Title	Dynamics A English-based Undergraduate Program			
Instructor	SAITO, Kiyoshi／TEZUKA, Asei／PENG, Linyu／YANAO, Tomohiro／YAMAGUCHI, Seiichi／YOSHIMURA, Hiroaki			
Term/Day/Period	spring quarter Fri.3			
Category	Elective Courses in the Major	Eligible Year	3rd year and above	Credits 1
Classroom	53-104	Campus	Nishi-Waseda(Former: Okubo)	
Course Key	26MA022002	Course Class Code	01	
Main Language	English			
Class Modality Categories	[On-campus]			
Course Code	MECX22ZL			
First Academic disciplines	Mechanical Engineering			
Second Academic disciplines	Mechanical Engineering			
Third Academic disciplines	Dynamics			
Level	Intermediate, developmental and applicative	Types of lesson	Lecture	

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Subtitle	Variational Systems
Course Outline	Note: The eligible year for EBSE September enrollees is different from the above. Please make sure to check “Students HANDBOOK”. In the course Dynamics divided into Dynamics A and Dynamics B, an elementary introduction to the mathematical theory of mechanical systems will be discussed, i ncluding work, momenta, energy, variational principles, Lagrangian and Hamiltoni an formalisms, symmetries, conserved quantities, etc. In particular in Dynamics A, we will mainly be focused on variational systems. *Starting from 2024, please note that the contents of Dynamics A and Dynamics B have been swapped.
Objectives	Objectives of Dynamics A are as follows: 1) to understand Lagrangian and Hamiltonian formalisms of dynamical systems and 2) to gain a basic knowledge about symmetries and conserved quantities. *Note that the syllabus is tentative and may be subject to changes.
before/after course of study	Check the contents of the previous lecture before the next lecture and do homework when it is given until the next lecture.
Course Schedule	1: 第1回：Course introduction（彭 林玉） An introduction of the course will be given. 2: 第2回：Variational principles and examples（彭 林玉） We will introduce the fundamental theories of variational principles and study several well-known examples. 3: 第3回：Legendre transformations and Hamilton’s equations（彭 林玉） Legendre transformations will be defined and Hamiltonians will be derived from non-degenerate Lagrangians. Hamilton’s equations will be derived. 4: 第4回：Exercises（彭 林玉） In-class exercises. 5: 第5回：Simple symmetries of mechanical systems（彭 林玉） We will introduce some simple symmetries of mechanical systems, e.g. time translation and space translation. 6: 第6回：Noether’s theorem and conserved quantities（彭 林玉） Conserved quantities will be derived using symmetries via the Neother’s theorem. 7: 第7回：Examples（彭 林玉） We will study symmetries and conserved quantities of some examples.
Textbooks	There is no required textbook for this course. References will be recommended during lectures.
Reference	V.I. Arnold, Mathematical Methods of Classical Mechanics, 2nd ed., Springer, New York, 1989. J.E. Marsden and T.S. Ratiu, Introduction to Mechanics and Symmetry, 2nd ed., Springer, New York, 1999. P.J. Olver, Applications of Lie Groups to Differential Equations, 2nd ed., Springer, New York, 1993. S.H. Strogatz, Nonlinear Dynamics and Chaos, Perseus Books, 1994.
Evaluation	40%: Assignments & Attendance 60%: Examination or Report

Note / URL	