Module name	Advanced Mechanics
Module level, if applicable	Bachelor of Physics
Code, if applicable	18H02121503
Subtitle, if applicable	-
Course, if applicable	-
Semester(s) in which the module is taught	4th
Person responsible for the module	Drs. Bansawang BJ., M.Si
Lecturer	1. Drs. Bansawang BJ., M.Si 2. Prof. Dr. Paulus Lobo G, M.Sc
Language	Indonesian Language [Bahasa Indonesia]
Relation to Curriculum	Undergraduate degree program, mandatory, 4th semester
Type of teaching, contact hours	**Teaching methods** : [direct teaching], [problem-based learning]. **Teaching forms** : [lecture] **Schedule** : Tuesday, 13.01 - 15.30

	- 40.00 hours for lecture, - 48.00 hours for structured assignments, - 48.00 hours for private study
Credit points	3 credit points (equivalent with 5.1 ECTS)
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit on the final examination.
Mandatory prerequisites	Basic Physics 1, Mathematical Physics 1
Module objectives/intended learning outcomes	After completing the course, Students are able: **Intended Learning Outcomes (ILO):** **ILO 1 :** Students have relatively deep understood in classical and basic quantum physics. [ILO 1] **ILO 6 :** Students are able to use the mathematical method to solve the physical related-problem. [ILO 6] **Course Learning Objective (CLO):** After completing this course, students are expected to be able to **1.** Derive the equations of motion through the Lagrangian and Hamiltonian of several discrete and continuous physical systems. **2.** Explain the relationship between the property of symmetry and the law of conservation and apply several methods of canonical transformation. **Sub CLO :**

	through Newton's law and d'Alembert principle. ILO 6 ⇒ CLO 2 : Being able to correctly apply the principle of variation to the shortest distance and shortest time problem. ILO 6 ⇒ CLO 3 : Being able to formulate and apply the Lagrange equation with constraints. ILO 1 ⇒ CLO 4 : Being able to explain the relationship between Lagrangian and Hamiltonian as well as the nature of symmetry and conservation law. ILO 1 ⇒ CLO 5 : Being able to calculate the inertia tensor, Euler angles and the motion equation of a symmetrical top. ILO 1 ⇒ CLO 6 : Being able to calculate the frequency of small vibrations in one dimension, forced vibrations, damped vibrations, molecular vibrations and resonance processes. ILO 6 ⇒ CLO 7 : Being able to apply at least 3 ways (methods) to know whether a transformation is canonical or not and to solve the equation of motion of a Hamiltonian using the Hamilton-Jacobi method. ILO 1 ⇒ CLO 8 : Being able to formulate Lagrangian and Lagrange equations for continuous systems.
Content	Students will learn about : 1. Lagrange Formulation 2. The Principle of Variation (Lagrange Equation) 3. The Euler-Lagrange Equation of Motion with Constraints 4. The Hamilton Equation and Symmetry Properties 5. Motion of Rigid Objects 6. Small Vibrations 7. Canonical Transformation and Hamilton-Jacobi Theory 8. Continuous System
Forms of Assessment	Assessment techniques: [participation], [written test]

	Assessment forms: [assignment], [midterm exam], [final term exam] Assignment = 40%, Mid term exam = 30%, Final term exam = 30% CLO 1 => ILO 1: 7% (Question number 1 in mid examination) CLO 2 => ILO 6: 7% (Question number 2 in mid examination) CLO 3 => ILO 6: 10% (Assignment 1) CLO 3 => ILO 6: 8% (Question number 3 mid examination) CLO 4 => ILO 1: 10% (Assignment 2) CLO 4 => ILO 1: 8% (Question number 4 in mid examination) CLO 5 => ILO 1: 7% (Question number 1 in final examination) CLO 5 => ILO 1: 10% (Assignment 3) CLO 6 => ILO 1: 7% (Question number 2 in final examination) CLO 7 => ILO 6: 10% (Assignment 4) CLO 7 => ILO 6: 8% (Question number 3 in final examination) CLO 8 => ILO 1: 8% (Question number 4 in final examination)
Study and examination requirements and forms of examination	**Study and examination requirements:** - Students must attend 15 minutes before the class starts. - Students must switch off all electronic devices. - Students must inform the lecturer if they will not attend the class due to sickness, etc. - Students must submit all class assignments before the deadline. - Students must attend the exam to get final grade.

	Written exam: Essay
Media employed	LCD Projector, Whiteboard, Learning Management System (SIKOLA)
Reading list	**Main :** ● Arya, P.Atam, 1990, Introduction to Classical Mechanics, Prentice Hall, Englewood Cliffs, New Jersey ● Takwale, R.G and Puranik, P.S, 1983, Introduction to Classical Mechanics, Tata McGraw-Hill Publising Company Ltd, New Delhi ● Goldstein, Herbert, 1980, Classical Mechanics, 2nd Ed, Addison-Wesley Publishing Company, Massachusetts