Module Description

Module Name	**Thermodynamics**
Modul Level	Undergraduate
Code	18H02120703
Courses (if applicable)	Mandatory Courses
Semester	3rd
Person responsible for the module	Dr. Sri Dewi Astuty Ilyas, S.Si., M.Si
Lecturer	Prof. Dr. Paulus Lobo Gareso, M.Sc. Dr. Sri Dewi Astuty Ilyas, S.Si., M.Si.
Language	Indonesian Language
Relation to Curriculum	Undergraduate degree program, mandatory, 3rd semester
Type of Teaching, Contact Hours	**Teaching methods**: [group discussion], [collaborative learning] [problem-based learning]. **Teaching forms**: [lecture], [tutorial] **Schedule**: Wednesday, 09.10 – 11.50
Workload	For this course, students are required to meet a minimum of 136.00 hours in one semester, which consist of: - 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	-
Module objectives/intended learning outcomes	**Intended Learning Outcomes (ILO):** ILO 1: Student are able to have relatively deep understood in classical and basic quantum physics. ILO 3: Students are able to use the basic principles of physics in technology application. ILO 6: Student are able to use the mathematical method to solve the physical related- problem **Course Learning Objective (CLO):** After completing this course, students are able to describe the basic concepts and principles of thermodynamics and its applications, especially the things that related to the thermodynamics laws, environment and system interaction, entropy and disorder, kinetic theory of gas, thermal properties of material, ann all the necessary skill to take the more advanced course like statistical mechanics.

	ILO-1 ⇒ CLO-1: Describe macroscopic and microscopic phenomena and property state of gases, principles of The Zeroth Law principles, system-environment interactions, concepts of work-heat-energy in thermodynamics systems. ILO-6 ⇒ CLO-2: Use mathematical methods to deriving some equation in ideal gases compare with the real-gases to find the state of general equation. ILO-6 ⇒ CLO-3: Identify cases of the behaviour of substances or mechanical systems The First Law thermodynamics. ILO-3 ⇒ CLO-4: Analyze problem sets related to the the Second Law of thermodynamics Carnot cycle, entropy systems and the kinetic theory of gases. ILO-6 ⇒ CLO-5: Analyze mathematical models for solving problem sets related to the potential thermodynamic, Maxwell equation and transport phenomena. ILO-3 ⇒ CLO-6: Classify the thermal properties of metals and non-metals and their application in research and technology of industry.
Content	Students will learn about: 1. Macroscopic and microscopic overview in thermodynamics. 2. The zeroth law of thermodynamics. 3. System Interaction with Environment. 4. Mechanical work in thermodynamic studies. 5. Ideal Gas Equation of State. 6. First Law of Thermodynamics. 7. The Carnot Cycle and the Consequences of the Second Law of Thermodynamics 8. Entropy and the Third Law of Thermodynamics. 9. Thermodynamic Potential. 10. Transport Phenomena in Thermodynamics. 11. Chemical Equilibrium 12. Thermal Properties of Materials.
Forms of Assessment	Assessment techniques: [participation], [written test] Assessment forms: [quiz], [mid-term exam], [final term exam], [assignment], [presentation] Assignment = 35%, Mid-term exam = 30%, Final-term exam = 20% Presentation = 15%. CLO 1 => ILO 1: 7% (Assignment 1) CLO 1 => ILO 1: 10% (Mid Test: Number 1) CLO 2 => ILO 6: 7% (Assignment 2) CLO 2 => ILO 6: 10% (Mid Test: Number 2)

	CLO 4 => ILO 3: 7% (Assignment 4) CLO 4 => ILO 3: 10% (Final Test: Number 1) CLO 5 => ILO 6: 7% (Assignment 5) CLO 5 => ILO 6: 10% (Final Test: Number 2) CLO 6 => ILO 3: 15% (Presentation)
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. **Form of examination:** ● Written and Quiz exam: Essay
Media Employed	Text book, Video and Power Point Presentation.
Reading List	1. Zemansky MW & Dittman RH, Heat and Thermodynamics, 7th ed., McGraw-Hill, New york, 1997. 2. Nainggolan WS, Termodinamika: Teori dan Soal Penyelesaian, Armico, Bandung, 1992. 3. Abbott MM & Van Ness HC, Seri Buku Schaum: Teori dan Soal-soal Termodinamika, edisi kedua, translate by Darmadi Kusno dkk, Penerbit 3 Erlangga, Jakarta, 1994. 4. Welty JR, Wicks CE, Wilson RE & Rorrer G, Fundamentals of Momentum, Heat and Mass Transfer, edisi ke 4, translate by Gunawan Prasetio “Dasar-Dasar Fenomena Transport”, Penerbit Erlangga, Jakarta, 2004. 5. Jeans S.J, An Introduction to the Kinetic Theory of Gases, Cambrige, University Press, 1967.