UNIVERSITY OF LAMPUNG
FACULTY OF TEACHER TRAINING AND EDUCATION
Department of Physics Education
Jl. Prof. Dr. Soemantri Brodjonegoro No. 1 Bandar Lampung 35145

MODULE HANDBOOK

Bachelor in Physics education

Module name	Thermodynamics
Module level	Undergraduate
Code	KFI620212
Courses	Thermodynamics
Description	This course is a compulsory advanced course which is a stabilisation and deepening of the material obtained in the Basic Mechanics and Thermodynamics course. This lecture discusses advanced thermodynamic concepts, thematic theories in thermodynamics and some simple thermodynamic systems, quasi-static processes and the formulation of the First Law of Thermodynamics, introduction to the equation of state of ideal gas and real gas systems, review of Kinetic Theory. Macroscopic gases, applicability of the Second Law of Thermodynamics and some cyclic processes, thermodynamic potential, entropy, enthalpy, Helmholtz function, Gibbs function.
Semester	Odd
Lecturer	Prof. Dr. Abdurrahman, M.Si Novinta Nurulsari, S.Pd., M.Pd.
Contact Person	+62 812-7911-494
Language	Indonesian
Relation to curriculum	Undergraduate degree program, Mandatory, 4rd semester
Type of teaching, contact hours	Expositories, discussions, experiments, case methods, and team based projects.
Workload	Contact hours: 14 weeks x 100 minutes Structured learning: 14 weeks x 120 minutes Independent study: 14 weeks x 120 minutes Practicum session: 14 week x 170 minutes

Credit points	3 (2-1) CP or 4.8 (ECTS) ((14 weeks x 100 minutes) + (14 weeks x 120 minutes) + (14 weeks x 120 minutes) + (14 week x 170 minutes) : 60 minutes/hour = 119 hours : 25 hours of study/ECTS = 4.8 (ECTS)
Requirements according to the Examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.
Learning outcomes (course outcomes) and their corresponding PLOs	After completing this module, a student is expected to: 1. KNO-1: Demonstrate knowledge of classical physics (mechanics, electrodynamics, thermodynamics, oscillations, waves and optics) and are familiar with the fundamentals of quantum, atomic and molecular, nuclear, elementary particle and solid state physics. 2. KNO-2:Formulate physical systems using mathematics to solve physics problems. 3. KNO-4: Using research methodology knowledge to solve physics education and learning problems. 4. SKI-2 : Able to develop physics learning resources according to the needs and development of science and technology.
Competencies/ Course Learning Outcomes	1. Students are able to analyze the basic concepts of thermodynamics and mathematics for thermodynamics (Euler's requirement which includes differential and integral exact and non-exact in thermodynamics). 2. Students are able to analyze the process diagram of phase change of pure substances through the P-V-T surface diagram and thermodynamic coordinate changes. 3. Students are able to analyze the principles of the Zero Law of Thermodynamics in everyday life. 4. Students are able to analyze the equations of state of several thermodynamic systems (hydrostatic systems, paramagnetic systems, dielectric systems, and other thermodynamic systems). 5. Students are able to analyze the concept of external business, inner business, quasistatic processes, efforts in changing the volume of chemical systems. 6. Students are able to apply the principles of Law I thermodynamics to closed systems. 7. Students are able to analyze thermodynamic processes on ideal gases.

	8. Students are able to analyze the principles of Law II Thermodynamics and their application in everyday life. students are able to Analyze the differences in the Carnot cycle, the Otto cycle - the ideal cycle for gasoline engines, and the Diesel cycle - the ideal cycle for diesel fuel engines. 9. Applying the principle of entropy change to various processes.
Contents	This course is a compulsory advanced course which is a strengthening and deepening of the material obtained in the Basic Mechanics and Thermodynamics course. This lecture discusses advanced thermodynamic concepts, thematic theorems in thermodynamics and some simple thermodynamic systems, quasi-static processes and the formulation of the First Law of Thermodynamics, introduction to the equations of state of ideal gas systems and real gases, a review of Kinetic Theory. Gas macroscopically, the applicability of the Second Law of Thermodynamics and some cyclical processes, thermodynamic potentials, entropy, enthalpy, Helmholtz function, Gibbs function.
Study and examination requirements and forms of examination	Participants are evaluated based on ; 1. Participation Activities (10%) 2. Assessment (20%) 3. Product (40%) 4. Final Semester Exams (15%) 5. Midterm exams (15%)
Media employed	LCD, whiteboard, and online resources
Assessments and Evaluation	Test and essay
Reading list	1. Reif F., 1985, Fundamental of Statistical and Thermal Physics, International Edition, London: McGraw-Hill Book Company. 2. Sears F.W., 1963, An Introduction to Thermodynamics, The Kinetic Theory of Gases, and Statistical Mechanics, First Printed, Reading: Addison-Wesley Publishing Company. 3. Sears F.W. and Gerhard L. Salinger, 1975, Thermodynamics, Kinetic Theory, and Statistical Thermodynamics, Third Edition, Reading: AddisonWesley Publishing Company. 4. Zemansky M.W., and R.H. Dittman, 1982, Heat and Thermodynamics,Sixth Edition, London: McGraw-Hill Book Company. 5. Abdurrahman, 2016, Seri Buku Ajar Guru: Termodinamika. Bandar Lampung: Aura.

	6. Abdurrahman, 2007, Termodinamika, Diktat Kuliah, Bandar Lampung: Jurusan Pendidikan MIPA FKIP Unila. 7. B. Darmawan, 1990, Termodinamika, Bandung: Jurusan Fisika FMIPA ITB.