



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	Modern Physics
Module level	Undergraduate
Code	KFI620210
Courses	Modern Physics
Description	The Modern Physics course is a bridge between classical physics courses to Quantum Physics. This course explains the development of scientific concepts that developed from the beginning of the 20th century to the present and an overview of the limitations of classical physics when applied to microscopic objects at the atomic or sub-atomic level.
Semester	Odd
Lecturer	Prof. Dr. Abdurrahman, M.Si Dr. Wayan Distrik, M.Si
Contact Person	+62 812-7911-494
Language	Indonesian
Relation to curriculum	Undergraduate degree program, Mandatory, 4rd semester
Type of teaching, contact hours	Lecture and discussion (Recitatio, Discussion, Presentation and Virtual lab experiment)
Workload	Contact hours: 14 weeks x 150 minutes Structured learning: 14 weeks x 180 minutes Independent study: 14 weeks x 180 minutes
Credit points	3 (3-0) CP or 4.8 (ECTS)

	$((14 \text{ weeks} \times 150 \text{ minutes}) + (14 \text{ weeks} \times 180 \text{ minutes}) + (14 \text{ weeks} \times 180 \text{ minutes})) : 60 \text{ minutes/hour} = 119 \text{ hours} : 25 \text{ hours of study/ECTS} = 4.8 \text{ (ECTS)}$
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.
Competencies/ Course Learning Outcomes	Students are able to Understand the Theory of Special Relativity, Mastering the Particle Properties of Waves, Understanding the Wave Properties of Particles Illustrating the Particle Diffraction picture, Understand the concept of atomic structure, understand the concept of the Bohr Atom, Understanding various equations in Quantum Mechanics, Understanding the Quantum Theory of Hydrogen Atoms, Understanding multi-electron atomic systems such as spin electrons and the principle of exclusion, Understand many unpaired atomic systems such as: Periodic table, Total angular momentum and coupling, Understand the concepts of Atomic Nuclei such as: Atomic period, Steady core and Nuclear form., Understand atomic nucleus concepts such as: Binding energy and core model models, understand the concepts of Nuclear transformation such as: Radioactive decay and Radioactive series aand Understand the concept of Nuclear transformation such as:Nuclear reaction and nuclear fission.
Contents	1. Special Theory of Relativity 2. Particle Properties of Waves 3. Wave Properties of Particles 4. Particle Diffraction 5. Atomic Structure 6. Bohr Atom 7. Quantum Mechanics

	8. Quantum Theory of Hydrogen Atoms. 9. Multi-Electron Atoms. 10. Atomic nucleus. 11. Nuclear Transformation
Study and examination requirements and forms of examination	participants are evaluated based on ; 1. Participation Activities (5%) 2. Quizzes (20%) 3. Assignment (20%) 4. Final Semester Exams (30%) 5. Midterm exams (25%)
Media employed	LCD, whiteboard, and online resources
Assessments and Evaluation	Test and essay
Reading list	1. Beiser, Arthur. 1989. Concepts of Modern Physics, 3rd Edition. Aucland.: McGraw-Hill International Book co. 2. Patil, S.H. 1984. Elements of Modern Physics. New Delhi: Tate McGraw-Hill Pub. Co Ltd. 3. Krane , Kenneth S. 1988. Introductory Modern Physic. Amerika: John Willey & Sons. 4. Kusminarto.1993. Pokok-Pokok Fisika Modern. Yogyakarta: Universitas Gajah Mada. 5. Tipler, Paul A. Dan Llewellyn, Ralph A. 2012. Modern Physics. New York: W.H. Freeman and Company.