

PHYSICS MODULE HANDBOOK - 2023

Module Description

Module Name	Quantum Mechanics
Modul Level	Undergraduate
Code	18H02130803
Courses (if applicable)	Elective Courses
Semester	5 th
Person responsible for the module	Drs. Bansawang BJ., M.Si .
Lecturer	Drs. Bansawang BJ., M.Si., Prof. Dr. rer-nat Wira Bahari Nurdin
Language	Indonesian Language and English
Relation to Curriculum	Undergraduate degree program, elective, 5 th semester
Type of Teaching, Contact Hours	Teaching methods: [group discussion], [collaborative learning], [problem-based learning]. Teaching forms: [lecture], [tutorial] Schedule: Tuesday, 10.30 – 13.00 WITA
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	After completing the course, Students are able: Intended Learning Outcomes (ILO): ILO 1: Students have a relatively deep understanding in classical and basic quantum physics. ILO 6: Students are able to use the mathematical method to solve the physical related-problem. Course Learning Objective (CLO): After completing this course, students are expected to be able to master material about symmetry in quantum mechanics, orbital and spin angular momentum operators, perturbation theory, interaction of charges with magnetic and electric fields, scattering theory, elastic scattering within the Born approximation , and quantum dynamics.

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	Sub CLO ILO-1 $\Rightarrow$ CO-1: Students explain conservative law and symmetrical behavior. ILO-6 $\Rightarrow$ CO-2: Students calculate angular momentum operator and spin ILO-6 $\Rightarrow$ CO-3: Students calculate eigenvalue in perturbation theory. ILO-6 $\Rightarrow$ CO-4: Students calculate particle interaction with electromagnetic fields. ILO-6 $\Rightarrow$ CO-5: Students calculate kinematic equations in scattering theory. ILO-1 $\Rightarrow$ CO-6: Students explain Schrodinger and Heisenberg representation in quantum dynamics.
Content	Students will learn about: 1. Symmetry in Quantum Mechanics. 2. Orbital and Spin Angular Momentum Operators. 3. Perturbation Theory. 4. Interaction of Charges with Magnetic and Electric Fields. 5. Scattering Theory. 6. Elastic Scattering within the Born Approximation. 7. Quantum Dynamics.
Forms of Assessment	Assessment techniques: [observation], [participation], [written test]-13.00 Assessment forms: [mid-term exam], [final term exam], [assignment] The number of Assessment and Evaluation: Assignment 1, 2, 3; Evaluation (Mid-Term and Final term). Assignment = 30%, Mid-term exam = 40%, Final-term exam = 30%. CO 1 $\Rightarrow$ ILO 1: 5% (Assignment 1 number 1) CO 1 $\Rightarrow$ ILO 1: 10% (Mid examination number 1) CO 2 $\Rightarrow$ ILO 6: 5% (Assignment 1 number 2) CO 2 $\Rightarrow$ ILO 6: 15% (Mid examination number 2) CO 3 $\Rightarrow$ ILO 6: 5% (Assignment 1 number 3) CO 3 $\Rightarrow$ ILO 6: 15% (Mid examination number 3) CO 4 $\Rightarrow$ ILO 6: 5% (Assignment 2 number 1) CO 4 $\Rightarrow$ ILO 6: 10% (Final examination number 1) CO 5 $\Rightarrow$ ILO 6: 5% (Assignment 2 number 2) CO 5 $\Rightarrow$ ILO 6: 10% (Final examination number 2) CO 6 $\Rightarrow$ ILO 1: 5% (Assignment 2 number 3) CO 6 $\Rightarrow$ ILO 1: 10% (Final examination number 3)

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Study and examination requirements and forms of examination	● Assignment 1 ● Mid examination ● Final examination
Media Employed	LED, Whiteboard, Learning Management System (SIKOLA).
Reading List	1. Liboff, R, 1980, Introductory Quantum Mechanics, Addison Wesley Pub. Company, Inc. Singapore 2. Renreng, 2010, Asas-asas Fisika Matematika dan Teori, LPMTK, Gowa, Indonesia 3. Schiff, 1985, Quantum Mechanics, Mc-Graw Hill Book Company, Singapore 4. Sakurai, J. J., 1985, Modern Quantum Mechanics, Benjamin Pub. Company, Singapore.