

PHYSICS MODULE HANDBOOK - 2023

Module Description

Module Name	Solid State Physics
Module Level	Bachelor of Physics
Code	18H02131503
Courses (if applicable)	
Semester	Odd (5 th)
Person responsible for the module	Dr. Nurlaela Rauf, M.Sc
Lecturer	1. Dr. Nurlaela Rauf, M.Sc 2. Prof. Dr. Paulus Lobo Gareso
Language	Indonesian and English
Relation to Curriculum	Undergraduate program, compulsory, semester 5
Type of Teaching, Contact Hours	Teaching methods: [group discussion], [case study] Teaching forms: [lecture] 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	Mechanics, Waves, Mathematical Physics, Thermodynamics, Statistical Physics, Quantum Physics. The basic things about the theories of Classical Physics and Modern Physics are well understood.
Module objectives/intended learning outcomes	After completing the course, Students are able: Intended Learning Outcomes (ILO): ILO 3: Students are able to use the basic principles of physics in technology application. ILO 6: Students are able to use the mathematical method to solve the physical related- problem. ILO 7: Students are able to identify the physical problems based on the experimental results. Course Learning Objective (CLO):

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	<p>scattering waves in crystals, determine the heat of crystal types. Additionally, students are expected to understand the dynamics of the crystal lattice and the concept of energy bands in crystals.</p> <p>Sub CLO</p> <p>ILO-3⇒CO-1 (three weeks): Students are able to explain the type of Bravais lattice based on its structure and can also explain the defects that arise in crystals.</p> <p>ILO-6 CO-2⇒ (two weeks): Students are able to explain the type of scattering in crystals and atomic vibrations in crystals.</p> <p>ILO-7⇒CO-3 (one week): Students were able to determine the heat type of a crystal according to the theories of Dulong-Petit, Einstein, and Debye.</p> <p>ILO-3⇒CO-4 (eight weeks): Students are able to explain inelastic scattering in crystals, to explain the physical properties of crystals according to the free electron model and quantized models, to apply Bloch's theorem and the Kronig-Penney model to the energy bands of crystals, and to explain the dynamics of crystal electrons based on the LCAO model.</p>
Content	<p>Students will learn about:</p> <p>Lattice structure of Bravais, Miller index lattice of Bravais, simple crystal structure, crystal defects, Bravais lattice scattering, Bragg diffraction, specific heat capacity according to Einstein and Debye, dynamics of the crystal lattice, inelastic scattering, classical and quantized free electron models, Bloch's theorem, the energy band model of Kronig-Penney, and the dynamics of electron crystals based on the LCAO (Linear Combination of Atomic Orbitals) method.</p>
Forms of Assessment	<p>Assessment techniques: [participation], [written test]</p> <p>Assessment forms: [quiz], [mid-term exam], [final term exam], [assignment], [presentation]</p> <p>The number of Assesment and Evaluation: Assignment 1, 2, 3; Evaluation (Mid-Term, Quiz, and Final-Term); Presentation and discuss</p> <p>Quiz = 10%, Mid-term exam = 25%, Assignment = 15%, Final-Term = 30%, Presentation = 20%.</p> <p>CO 1 => ILO 3: 5% (Assignment 1) CO 2 => ILO 6: 5% (Assignment 2) CO 2 => ILO 6: 5% (Quiz: problem set analysis) CO 1 => ILO 3: 25% (Mid-Term: written test) CO 3 => ILO 7: 5% (Quiz: problem set analysis)</p>

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Study and examination requirements and forms of examination	<p>CO 4 => ILO 3: 30 % (Final-term: written test)</p> <p>Study and examination requirements:</p> <ul style="list-style-type: none"> - 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. <p>Form of examination:</p> <ul style="list-style-type: none"> ● Written and Quiz exam: Essay
Media Employed	<p>LED, Whiteboard, Learning Management System (SIKOLA), WA, and/or Email.</p>
Reading List	<p><u>Main:</u></p> <ol style="list-style-type: none"> 1. Introduction to Solid State Physics karangan C.Kittel 2. Elementary Solid State Physics karangan M.A.Omar 3. Fundamentals of Materials Science and Engineering <p><u>Supporter:</u></p> <p>Textbooks, international journals, and other internet-based resources.</p>