Module Handbook

Module Name:	Quantum Physics
Module Level:	Bachelor
Abbreviation, if applicable:	FI 3102
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	Third year
Module coordinator(s):	
Lecturer(s):	
Language:	Bahasa Indonesia
Classification within the curriculum:	~~General Studies~~ / Major Subject / ~~Elective Studies~~
Teaching format / class hours per week during the semester:	4 hours lectures
Workload:	4 hours lectures, 8 hours individual study and structured activities, 16 weeks per semester, and total 192 hours a semester
Credit Points:	4
Requirements:	FI2102 Mathematical Physics I FI2202 Mathematical Physics II FI2203 Mechanics FI3101 Wave
Learning goals/competencies:	Knowledge 1. Demonstrate knowledge of problems in classical physics that serve as the basis for the emergence of quantum theory and early quantum theory 2. Demonstrate knowledge fundamental concepts of quantum physics 4. Demonstrate ability to formulate in operator formalism Skill 3. Demonstrate ability to solve and analyze a simple quantum physics problems such barrier potential, particle in a box, 1 dimensional harmonic oscillator 5. Demonstrate ability to identify, formulate and solve standard 3 dimensional quantum problems 6. Demonstrate ability to formulate and apply time independent perturbation theory 7. Demonstrate ability to apply and analyze real situation problems
Content:	Background on the emergence of quantum theory: black body radiation, photoelectric effect, Compton scattering, atomic models, uncertainty relation; Fundamental concepts of quantum theory: wave-particle dualism, wave packets, postulates of quantum theory, Schrodinger's equation, expectation value and measurement; Time independent Schrodinger's equation: barrier potentials, particles in a box, 1 dimensional harmonic oscillators; Operator Formalism: linear operators, operators of quantum theory, eigenvalue problems, Heisenberg uncertainty principle; Angular Momentum: orbital angular momentum operators, spin angular momentum operators, eigenfunctions of angular momentum operators, addition of angular momenta; 3 Dimensional Problems: Hydrogen atom, 3 dimensional Harmonic oscillator; Time independent perturbation theory: energy shift and perturbed eigenstates, degeneracy, Stark effect; Real Hydrogen atom: Relativistic effect, spin-orbit coupling, anomalous Zeeman effect, hyperfine

	structure; Helium Atom (Atom with more than one electron) : Parahelium and Orthohelium as aplication of first order perturbation theory and fermion. Identical Particle. Symmetric and anti-symmetric wave function (Slater determinant). Pauli Principle and its application for Boson and Fermion. Overlap Integral. Application of many particles sistem to find Fermi Energy of simple system, Bulk modulus and Degeneration pressure
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, and quiz.
Forms of Media:	Slides and LCD projectors, blackboards, lab.
Literature:	1. Gasiorowicz, S, Quantum Physics, , John Wiley & Sons, 1995 2. Zettili N, Quantum Mechanics, , John Wiley & Sons, 2009 3. Morrison, M. A, Understanding Quantum physics,, , Englewood Cliffs, Prentice Hall,, 4. Rohlf, J. W., Modern Physcis, , John Wiley & Sons, 1994
Notes	