	COURSE SYLLABUS OF PHYSICS EDUCATION STUDY PROGRAMME FACULTY OF EDUCATIONAL SCIENCES UIN SYARIF HIDAYATULLAH JAKARTA					Document Code MH-PFIS
COURSE	**CODE**	**CORE MODULE**	**WEIGHT (CREDITS)**	**WORKLOAD FOR EACH MODULE (IN MINUTES)**	**SEMESTER**	**COMPILATION DATE**
ADVANCED QUANTUM PHYSICS (Option 4)	FTK6019312	Elective	2 SKS 3 ECTS	• Lecture : 100.0 • Laboratory course: • Project work: • Independent task: 120.0 • Structured task: 120.0 • Internship: **Total : 340**	5	September 4, 2023

Language details	Indonesian
Teaching methods	Discovery Learning (DL), Self-Directed Learning (SDL)
Type of Examination	• Participation (Attendance / Quiz): 10% • Observation (Practice / Assignment): 40% • Performance (Presentation): • Oral Test (Group Assignment): 50% • Midterm Exam: • Final Exam:
Module Coordinator	Erina Hertanti, S.Si, M.Si
Lecturer	Erina Hertanti, S.Si, M.Si
Course Requirements	FTK6019125 Quantum Mechanics
Learning Outcomes	**PROGRAMME LEARNING OUTCOME (PLO)**
	PLO1 Graduates have expertise in physics and physics learning with an approach that is appropriate to Indonesia's social, cultural and environmental context. PLO2 Graduates have the ability to manage, develop and utilize technology in physics learning PLO3 Graduates have the ability to solve physics education problems using scientific methods
	Intended Learning Outcome (ILO)
	CPL01 Mastering Professionalism skills in Physics Education: Mastering basic educational concepts, learning theories, and physics and mathematics concepts to design, implement, and evaluate innovative physics learning by utilizing information technology and the environment; able to plan, implement and evaluate innovative physics learning, utilize ICT and the surrounding environment to develop students' critical thinking skills and scientific attitudes, apply mathematical models in explaining physical phenomena, demonstrate independent and quality performance, be responsible for achieving group work results, carry out supervision and evaluation, as well as communicating effectively both written and verbally in educational and research contexts, as well as demonstrating good leadership and administrative skills; and demonstrate faith and devotion to God Almighty and uphold religious, moral and ethical values in every action.
	Course Learning Outcome (CLO)
	CPMK01.74.51 Mastering the principles and concepts of Electron Spin and Pauli Principle, Related Particle Systems, Perturbations in Quantum Mechanics, Identification and Quantum Spectroscopy, Hilbert Space Mathematics, Particles in Magnetic Potential, Introduction to New Material Quantum Statistics: Fermi-Dirac and Bose-Einstein, Quantum Field Theory, Relativity and Quantum Mechanics, Applications of Quantum Physics in Technology, Quantum Mechanics of Many Particles, Non-Locality and Bell Experiments, Advanced Concepts in Quantum Physics with logical, critical and independent thinking and upholding religious values, morals and ethics.
	Sub-CLO
	SUB-CPMK01.74.51.02.01 Students can explain the concept of spin and the Pauli Principle in quantum mechanics. SUB-CPMK01.74.51.02.02 Students can explain the characteristics of related particle systems and their behavior in quantum potential. SUB-CPMK01.74.51.02.03 Students can apply perturbation theory in solving quantum mechanics problems. SUB-CPMK01.74.51.02.04 Students can understand spectroscopy techniques based on the principles of quantum mechanics. SUB-CPMK01.74.51.02.05 Students can apply the concept of Hilbert space in the context of quantum physics.

	SUB-CPMK01.74.51.02.06 Students can explain the dynamics of quantum particles in the presence of magnetic potential. SUB-CPMK01.74.51.02.07 Students can differentiate between Fermi-Dirac and Bose-Einstein statistics and their applications. SUB-CPMK01.74.51.02.08 Students can explain the basics of interactions in quantum field theory. SUB-CPMK01.74.51.02.09 Students can explain the basics of Relativity and Quantum Mechanics. SUB-CPMK01.74.51.02.10 Students can explain the Application of Quantum Physics in Technology. SUB-CPMK01.74.51.02.11 Students can explain Quantum Mechanics of Many Particles. SUB-CPMK01.74.51.02.12 Students can explain Non-Locality and Bell Experiments. SUB-CPMK01.74.51.02.13 Students can explore cutting-edge concepts that are the focus of current research in quantum physics. SUB-CPMK01.74.51.01.01 Students can demonstrate religious awareness regarding the greatness of God Almighty. SUB-CPMK01.74.51.01.02 Students can demonstrate an attitude of responsibility and independence in carrying out tasks and work in their field of expertise. SUB-CPMK01.74.51.03.01 Students can use mathematical models to explain physical phenomena. SUB-CPMK01.74.51.03.02 Students can display independent and measurable work performance of adequate quality. SUB-CPMK01.74.51.03.03 Students can make appropriate and effective decisions based on information and data analysis.
Brief Description of the Course	This course is a Elective course in the Physics Education Program. The topics covered in this course include Modern physics and quantum physics. The type of lecture used is 60% Lectures, Tutorials, Responses (40% conducted synchronously and asynchronously) with the method Discovery Learning (DL), Self-Directed Learning (SDL), conducted through Scientific, Contextual.
Scientific Integration	2. develop and enrich the theories, substances and objects of scientific study; 3. change or create a new theory; 4. reconstructing auxiliary sciences; 5. direct research topics;
Research and Community Service Integration	
Learning Materials	Modern physics and quantum physics
References	Siregar, R. E. (I984). Pendahuluan Mekanika Kuantum. Bandung: FMIPA UNPAD