School of Engineering and Physical Sciences
Department of Mathematics and Physics

Course Name	Modern Physics II
Course Code	PHY 350
Course Credit Hours	3
Prerequisite	PHY 250
Course Objective	The objective of this course is to introduce the quantum mechanical description of the microscopic world. By then end of this course, students will have the ability to apply quantum mechanical machineries to different systems
Course Description	Students develop an understanding of the quantum mechanical description for different systems. They learn to apply Schrödinger's Equation and understand the behavior of quantum mechanical systems. Students also learn the properties of nucleuses, solids, relativistic properties of free particles
Method(s) of Instruction(s)	Interactive lectures

COURSE CONTENT BY TOPIC

Module #1	**Machinery of Quantum Mechanics:** Hilbert Space, Kets, Bras, Operators, Matrix Representation, Measurements, Observables, Position, Momentum, Wave Functions in Position and Momentum Space, Angular Momentum and Spin
Module #2	**Harmonic Oscillator:** Quantum Mechanical Harmonic Oscillator, Energy Quantization, Eigen Values and Eigen Functions, Number Operator
Module #3	**Symmetry in Quantum Mechanics:** Symmetries, Conservation Laws, Degeneracies, Discrete Symmetries, Parity, Lattice Translation, Time-Reversal Discrete Symmetry
Module #4	**Nuclear Physics:** Nuclear Composition, Nuclear Properties, Stable Nuclei, Nuclear Binding Energy, Liquid-Drop Model, Shell Model, Meson Theory of Nuclear Forces, Radioactive Decay, Half-Life
Module #5	**Solid State Physics:** Crystalline and Amorphous Solids, Ionic Crystals, Covalent Crystals, Van der Waals Bond, Metallic Bond, Band Theory of Solids, Energy Bands, Semiconductors, Superconductors
Module #6	**Relativistic Quantum Mechanics:** Relativistic Schrödinger's Equation, Klein-Gordon and Dirac Equations for Free Particles, Relativistic Co-variance
Actual contact hours: Lecture : 3 hours per week, 36 hours per semester	

TEXTBOOK REQUIREMENT

1. Introduction to Quantum Mechanics, David J. Griffith
2. Modern Quantum Mechanics, Jun J. Sakurai
3. Concepts of Modern Physics, Arthur Beiser

ASSESSMENT STRATEGY AND GRADING SCHEME

NSU's grading and performance evaluation policies will be followed in assigning your grade. Please note that all final grades are subject to departmental review and approval. A guideline of course assessment is as follows-

Class Attendance	Assignments	Quiz	Midterm	Final
5%	10%	20%	30%	35%

MAPPING OF COURSE OUTCOMES

CLO-#	Outcome Types	Bloom's Taxonomy level (C- Cognitive, A- Affective, P- Psychomotor)	Delivery Method	Assessment Tools	
CLO #1	Understand the basics of quantum mechanics.	C2, P2	Lecture and Discussion	Quiz and Assignment	Midterm Exam
CLO #2	Analyze the quantum mechanical behavior of a harmonic oscillator.	C4, P2	Lecture and Discussion	Quiz and Assignment	
CLO #3	Apply the symmetries in quantum mechanics.	C3, P3	Lecture and Discussion	Quiz and Assignment	
CLO #4	Explain the behavior and properties of nuclei.	C2, P3	Lecture and Discussion	Quiz and Assignment	Final Exam
CLO #5	Understand the nuclear transformation and radioactivity.	C2, P2	Lecture and Discussion	Quiz and Assignment	
CLO #6	Analyze the structures and behaviors of solids.	C4, P2	Lecture and Discussion	Quiz and Assignment	
CL0 #7	Explain the relativistic description of free particles.	C2, P3	Lecture and Discussion	Quiz and Assignment	