

Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisites
		Theoretical	Laboratory	Credit			
Modern Physics 1	341PHYS	3	----	3	3 rd	5 th	----

(1) **Brief Course Description**

Modern Physics involves the extremes of very small distances and velocities close to the speed of light. These extremes demanded new theories in the early part of the 20th century and yielded the weird and wonderful results of Einstein's relativity theory and Schrodinger's equation in quantum mechanics. The course covers the birth of modern physics before launching into Einstein's theory of special relativity, and introducing quantum mechanics for the description of atomic physics.

(2) **Course Objectives**

This course is designed to provide students with:

- The changes in physics that took place near the end of 19th century.
- Special Theory of Relativity.
- Experimental Basis of Quantum Physics.
- Solve problems related to the main physical concepts and theories of the 20th century.
- Structure of the Atom and Wave Properties of Matter.

(3) **Course Contents**

- **The Birth of Modern Physics:** Classical Physics of the 1890s (Mechanics, Electromagnetism, Thermodynamics), The Kinetic theory of gases, Waves and Particles, Conservation Laws and Fundamental Forces.
- **Special Theory of Relativity:** The Michelson-Morley Experiments, Einstein's postulates, The Lorentz Transformation, Space – time, Doppler Effect, Relativistic Momentum, and Relativistic Energy.
- **Experimental Basis of Quantum Physics:** Discovery of the X ray and the Electron, Blackbody Radiation, Photoelectric Effect (*Experimental results of Photoelectric effect, Classical Interpretation, and Quantum Interpretation*), X-Ray Production, Compton Effect, and Pair Production and Annihilation.
- **Structure of the Atom:** The Atomic Models of Thomson and Rutherford, The Classical Atom Model, The Bohr Model of the Hydrogen Atom, and Success and Failures of the Bohr Model.
- **Wave Properties of Matter and Quantum Mechanics:** X-Ray Scattering, De Broglie Waves, Wave Motion, Uncertainty principle, The Schrodinger Wave Equation, Application of Schrodinger Equation to the Hydrogen Atom.

(4) **Assessment Criteria**

- Periodic Exams: 30%
- Oral, Student Activity and Essay: 20%
- Final Exam: 50%

(5) **Course Teaching Strategies**

Lectures, Reports and Essay Assignments, Homeworks, Web-based assignments.

(6) **Text Book**

- Concepts of Modern Physics; Arthur Beiser, 6th Edition, McGraw–Hill, 2002.

(7) **Reference Books**

- Modern Physics, P. A. Tipler, and R. A. Llewellyn, Freeman, 4th edition 2002.
- Modern Physics; K. S. Krane, Wiley, John & Sons, Inc., 1995.