

Course discipline/number/title: PHYS 2227: Modern Physics

- A. CATALOG DESCRIPTION
1. Credits: 3
 2. Hours/Week: 3 Lecture
 3. Prerequisites (Course discipline/number): Permission of Instructor
 4. Other requirements: None
 5. MnTC Goals (if any): NA
- B. COURSE DESCRIPTION: This course is a one-semester overview of modern physics. Topics studied include special relativity, the experimental basis of quantum mechanics, wave-particle duality, introduction to wave mechanics, the Schrodinger Equation, application of the Schrodinger equation to the hydrogen atom and the development of the atomic structure, molecular structure, solid state and nuclear structure.
- C. DATE LAST REVISED (Month, year): February, 2025
- D. OUTLINE OF MAJOR CONTENT AREAS:
1. Special theory of relativity
 - a) Reference frames
 - b) Relativistic momentum
 - c) Relativistic energy
 2. Basis of quantum mechanics
 - a) Wave/particle duality
 - b) De Broglie waves
 - c) Heisenberg uncertainty principle
 - d) Wave mechanics
 - e) Expectation values
 3. The Schrodinger equation
 - a) One dimensional
 - b) Three dimensional
 - c) Quantum numbers
 4. Applications of quantum mechanics
 - a) Hydrogen atom
 - b) Atomic physics and atomic structure
 - c) Statistical physics
 - d) Physics of solids
- E. LEARNING OUTCOMES (GENERAL): The student will be able to:
1. Use common definitions of terms found in modern physics.
 2. Explain and apply physics principles to their everyday lives.
 3. Use critical thinking and problem-solving skills to evaluate physical systems and predict future behavior.
 4. Solve the Schrodinger equation for common systems and interpret the results.
- F. LEARNING OUTCOMES (MNTC): NA
- G. METHODS FOR EVALUATION OF STUDENT LEARNING: Methods may include but are not limited to:
1. Objective exams
 2. Research papers
 3. Quizzes
 4. Written homework
 5. Online homework
 6. Small group projects
 7. Oral presentations

- H. RCTC CORE OUTCOME(S). This course contributes to meeting the following RCTC Core Outcome(s):
Critical Thinking. Students will think systematically and explore information thoroughly before accepting or formulating a position or conclusion.
- I. SPECIAL INFORMATION (if any):
 - 1. A scientific calculator is required