INTRODUCTION TO MODERN PHYSICS

Course No. 21:750:316

Textbook

Syllabus

Learning Goals: This course intends to introduce students to some of the most important physics developed since 1900. Students are expected to learn special relativity and quantum physics. They will learn the elements of quantum mechanics. Emphasis is placed on helping students develop a physical understanding of the less intuitive concepts than those they have been accustomed to in the General Physics. This course will give students a good preparation to move on to subsequent more advanced courses in physics. The course will be assessed by exams and quizzes together with the homework.

CHAPTER 1 SPECIAL RELATIVITY I

(Topics covered: The Michelson-Morley Experiment. Postulates of Special Relativity. Consequences of Special Relativity: Moving clocks run slow, length contraction, relativity of simultaneity (front clock lags), The Lorentz Transformation.)

Homework: # 5, 7*, 9*, 11, 16*, 17, 19*

CHAPTER 2 SPECIAL RELATIVITY II


Homework: # 5, 9*, 11*, 15, 17, 20*, 23*

Quiz # 1 (chs. 1, 2)

CHAPTER 3 THE QUANTUM THEORY OF LIGHT.


Homework: # 2*, 4*, 11*, 13, 20*, 23
CHAPTER 4 THE PARTICLE NATURE OF MATTER.


Homework: #15, 19*, 21, 24*

CHAPTER 5 MATTER WAVES.


Homework: # 1*, 3, 9*, 11*, 17, 19, 23*, 25

Midterm Exam (chs. 1, 2, 3, 4, 5)

CHAPTER 6 QUANTUM MECHANICS IN ONE DIMENSION.


Homework: # 3*, 7, 11*, 13, 31*, 33

CHAPTER 7 TUNNELING PHENOMENA.

(Topics covered: The Square Barrier. Barrier Penetration, Examples of Tunneling in Quantum Mechanics.)

Quiz # 2 (chs. 6, 7)

CHAPTER 8 QUANTUM MECHANICS IN THREE DIMENSIONS.

(Topics covered: Particle in a Three-Dimensional Box. Central Forces and Angular Momentum. Space Quantization. Quantization of Angular Momentum and Energy. Hydrogen atom.)

Homework: # 1*, 5*, 7, 11, 13*, 17*, 19

CHAPTER 9 ATOMIC STRUCTURE.


Homework: # 3*, 9*, 11*, 13*
CHAPTER 10  STATISTICAL PHYSICS

(Topics covered: Indistinguishability. Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac Distributions. Pauli Exclusion Principle.)

Homework: # 6*, 7*

CHAPTER 11  MOLECULAR STRUCTURE.

(Topics covered: Bonding Mechanisms. Molecular Rotation and Vibration.)

Homework: # 5*, 11*

CHAPTER 12  THE SOLID STATE.


Final Exam

Asterisked homework problems will be collected.
Final grade = homework (5%) + quizzes (15% each) + midterm exam (30 %) + final exam (35%).