

Physics 31  
Spring Semester 2004  
LL 316, MWF 9:10 – 10:00

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Course Website: <http://www.lehigh.edu/~jph7/website/Physics31/Physics31Spring2004.html>

Textbook: Stephen T. Thornton and Andrew Rex, “Modern Physics for Scientists and Engineers”, 2<sup>nd</sup> Edition, Harcourt Brace, 2000

Grading: Homework – 20%  
Midterm I – 20%  
Midterm II – 20%  
Final Exam – 40%

Topics Covered:

- Special Theory of Relativity
  - Michelson-Morley Experiment
  - Lorentz Transformation
  - Time-Dilation and Length Contraction
  - Relativistic Addition of Velocities
  - Experimental Verification of Relativity Theory
  - Twin Paradox
  - Spacetime and the Light Cone
  - Doppler Effect
  - Relativistic Momentum
  - Relativistic Energy

- Experimental Foundations of Quantum Theory
  - Discovery of X-Rays and the Electron
  - Determination of the Charge on the Electron
  - Line Spectra
  - Blackbody Radiation
  - Photoelectric Effect
  - X-Ray Production
  - Compton Effect
  - Pair Production and Pair Annihilation

- Structure of the Atom
  - Atomic Models of Thomson and Rutherford

Rutherford Scattering  
Bohr Model of the Hydrogen Atom

Wave Properties of Matter

X-Ray Scattering  
De Broglie Waves  
Electron Scattering  
Wave Motion  
Relationship Between the Wave Function and Probability  
Uncertainty Principle

Quantum Theory

Schrodinger Equation  
Expectation Values  
Infinite Square Well  
Finite Square Well  
Simple Harmonic Oscillator  
Barriers and Tunneling

Hydrogen Atom

Solution of the Schrodinger Equation for Hydrogen  
Quantum Numbers  
Electron Probability Distribution Functions  
Magnetic Effects on Atomic Spectra – Normal Zeeman Effect  
Electron Spin

Many Electron Atoms

Atomic Structure and the Periodic Table  
Total Angular Momentum  
Anomalous Zeeman Effect