

Course Syllabus  
UNM Physics 330  
Spring 2007

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Textbook: **Modern Physics from alpha to Z0**, Rohlf, ISBN 0-471-57270-5, John Wiley & Sons, 1994.

**Course Contents:**

Quantum Particles and Quantum Mechanics (Chapters 5,7)

Review of relativistic energy and momentum (Chapter 4), de Broglie wavelength, probability amplitude, elements of classical probability (Chapter 2.1), diffraction of matter, uncertainty principle, Schrödinger equation: probability amplitudes, expectation values. Free particle wave equation: superposition, wave packets, uncertainty principle. Energy eigenstates: particle in a box, harmonic oscillator, tunneling.

Atomic Physics (Chapters 8,9,10)

Quantization of angular momentum, energy eigenstates, spin, fine structure of Hydrogen atomic transitions, Zeeman effect, Lamb shift, Pauli exclusion principle, multielectron atoms and the periodic table, the hydrogen molecule.

Classical and Quantum Statistics (Chapter 2,3,12)

Ideal gas law, Maxwell-Boltzmann distribution, density of states, Fermi-Dirac distribution, Bose-Einstein distribution, black body radiation, radiation pressure, Bose-Einstein condensation.

Conductors, Insulators, Semi-conductors (Chapter 14)

Electronic energy bands, Fermi energy, heat capacity, Ohm's law, semiconductors, diode junction.

Lasers (Chapter 13)

Photon-Atom interactions, stimulated emission, Amplification of radiation, examples of modern Lasers

Nuclear Physics (Chapters 6,11)

Scattering and the cross section, the nuclear force: range, charge-independence, spin-dependence (the deuteron), nuclear structure, radioactive decays and nuclear interactions, Mossbauer effect, interaction of radiation and bulk matter.

Elementary Particles (Chapters 16,17,18)

Particle accelerators, particle detectors, particles and antiparticles, quarks, QCD, weak interactions, Standard Model of Particle Physics, current topics in high energy physics.

Astroparticle Physics and Cosmology (Chapter 19)

What is General Relativity?, the Big Bang, particle physics and the early universe, dark matter, dark energy

**Grading:** Best 2 out of 3 midterm exams: 50%. Homework: 25%, Final Exam: 25%  
Homework will be assigned on Wednesdays and be due the following Wednesday, no late homework accepted.