

Course Number

PHY-310-01

Course Description

Course topic for each year to be chosen from the following: Computational Physics: A laboratory-based course providing practical tools to solve computational physics problems drawn from a wide range of areas, including classical mechanics, electromagnetism, special relativity, and quantum mechanics. Algorithms include root-finders, integration techniques, Monte Carlo methods, ordinary and partial differential equation solvers, numerical Fourier transforms, minimization tools, and numerical linear algebra algorithms. Condensed Matter Physics: An introduction to the microscopic structures and to the electrical and thermal properties of metals, insulators, and semiconductors. Topics include the description of crystal lattices, electrons in a periodic potential, electronic band theory, phonons and their interactions with electrons, cohesive energy of solids, defect states, and superconductivity. Modern Physical Optics: Interference, diffraction and polarization of light, interaction of light and matter, classical and quantum description of optics, and lasers. Three-hour lab each week. Nuclear/Elementary Particle Physics: An introduction to both nuclear and particle physics covering basic nuclear structure and properties, nuclear models, nuclear decay and radioactivity, nuclear reactions, fission, fusion, accelerators, elementary particle physics, and the quark model. Statistical Mechanics: Probability theory, laws of thermodynamics, kinetic theory of gases and the statistical basis of thermodynamics, Bose Einstein and Fermi Dirac distributions, applications to simple fluids, magnetic systems, metals, photons, and superfluid helium. Advanced Electromagnetism: Relativistic electrodynamics, electromagnetic radiation and waves. Quantum Optics: The study of the interaction of light and matter in systems where the wave nature of matter and the particle nature of light must be taken into account. Topics may include single-photon interference, correlated photons and the EPR paradox, quantum computing, quantum cryptography and quantum teleportation, atom optics and atom interferometry, laser cooling and Bose-Einstein Condensation, and implications of quantum mechanics for nanomaterials and nanodevices. Electronics: A laboratory course in basic electronics and instrumentation for science majors. Topics include AC and DC circuits, diodes, rectifiers, transistors, operational amplifiers, binary logic, Boolean algebra, digital circuits, analog-digital conversion, transducers, and computer interfacing. Six hours of lab each week. Others depending upon student interest. Course open to juniors and seniors only. Enrollment by permission of the instructor.

Academic Term

21/WI

Instructor

Amanuel, Samuel

Location & Meeting Time

Integrated Science & Engineering Complex-018 T/TH 02:25PM-04:10PM LEC

Integrated Science & Engineering Complex-018 T/TH 04:35PM-05:25PM LEC

Hybrid-D LEC

Petition

N

Credits

1.00

Capacity

18

Total Students

0

Additional Information

<http://www.union.edu/Physics>

Interdisciplinary Programs

Environmental Science & Policy

Academic Department

Physics and Astronomy

Field Of Study  
Physics (PHY)