PHYSICS (PHYS)

Courses

**PHYS 202. Experimental Physics II. 3 Credits.**
Experiments in classical and modern physics. Prerequisites: PHYS 128; MATH 121; Junior standing.

**PHYS 211. Classical Mechanics. 3 Credits.**
Newtonian dynamics of particles and systems of particles, with applications to problems of special importance, such as driven and coupled harmonic oscillators and central field trajectories. Prerequisites: PHYS 152, MATH 121.

**PHYS 213. Electricity & Magnetism. 3 Credits.**
Fundamental principles of electricity and magnetism; electrostatic fields, and magnetic fields of steady currents. Electric and magnetic properties of matter and electromagnetic energy. Prerequisites: PHYS 152 or PHYS 125 and MATH 121. Credit not given for more than one of PHYS 213 or EE 241.

**PHYS 214. Electromagnetism. 3 Credits.**
Introduction to time dependent electromagnetic fields. Maxwell’s equations in vacuum and in matter. Electromagnetic waves and radiation. Prerequisite: PHYS 213. Credit not given for more than one of PHYS 214 or EE 241.

**PHYS 222. Intro Biological Physics. 3 Credits.**
General survey course in biological physics. Introduction to biological building blocks (proteins, lipids and nucleic acids) and macromolecular structure, thermostatistics of biological systems and two-state models, random walks and polymers, elasticity and mechanics of filaments and membranes, physics of water and molecular solvation, brownian motion and diffusion. Prerequisites: PHYS 012 or PHYS 152, MATH 121.

**PHYS 242. Intro to Solid State Physics. 3 Credits.**
Introduction to crystal structures, reciprocal lattices, lattice vibrations. Thermal properties of solids and free electron theory of metals and semiconductors. Elementary band theory and introduction to electronic transport theory. Prerequisite: PHYS 128.

**PHYS 264. Nuclear & Elem Particle Physic. 3 Credits.**
Introduction to theoretical and experimental aspects of nuclear and elementary particle physics. Prerequisite: PHYS 128; Junior standing.

**PHYS 265. Thermal & Statistical Physics. 3 Credits.**
Thermodynamics, kinetic theory, statistical mechanics. Prerequisites: PHYS 152 or PHYS 125 and MATH 121.

**PHYS 273. Quantum Mechanics I. 3 Credits.**
Introduction to nonrelativistic quantum mechanics. Schrodinger equation and applications to simple systems. Prerequisite: PHYS 128, PHYS 211.

**PHYS 274. Applincts of Quantum Mechanics. 3 Credits.**
Applications of Quantum Mechanics including Quantum Statistical Mechanics, Time-Independent and Time- Dependent Perturbation Theory, WKB Approximation, Variational Principle and Scattering. Prerequisite: PHYS 273.

**PHYS 301. Mathematical Physics. 3 Credits.**
Introduction to basic mathematical methods of theoretical physics; vector and tensor analysis, partial differential equations, orthogonal functions, complex variables and variational techniques. Prerequisites: PHYS 211, PHYS 214. Alternate years.

**PHYS 305. Teaching of College Physics. 1 Credit.**
Instructional strategies and techniques with application to the teaching of laboratories and recitations. Prerequisites: Undergraduate degree in Physics; Instructor permission.

**PHYS 311. Advanced Dynamics. 3 Credits.**
Classical mechanics presented as the basis of the concepts and methods of modern physics. Variational, Lagrangian, and Hamiltonian formulations, canonical transformations, continuous systems. Prerequisite: PHYS 211. Alternate years.

**PHYS 313. Electromagnetic Theory. 3 Credits.**
Development of Maxwell’s theory of electromagnetism emphasizing its physical basis and the modes of mathematical description. Prerequisite: PHYS 214. Alternate years.

**PHYS 323. Contemporary Physics. 0-6 Credits.**
Topics of current interest in physics to be offered as student and faculty interest warrants. May be repeated for credit with department approval. Prerequisite: Instructor permission.

**PHYS 333. Biological Physics. 3 Credits.**
Physical principles of biological systems including advanced techniques in macromolecular structure (experimental and computational), molecular solvation and hydration models, thermostatistics, two-state models and cooperativity, elasticity and mechanics of soft tissues, chemical equilibria and reaction kinetics including enzymes. Prerequisites: PHYS 152, MATH 121, or Instructor permission.

**PHYS 341. Solid State Physics. 3 Credits.**
Introduction to crystal symmetry and the reciprocal lattice. Crystal binding and lattice vibrations. Thermal, electrical, and magnetic properties of solids, free electron theory of metals, and band theory. Prerequisites: PHYS 214, PHYS 265, PHYS 273 or their equivalents; Instructor permission.

**PHYS 356. Computational Physics II. 3 Credits.**
Advanced computational physics methods including classical and ab-initio molecular dynamics, classical and quantum Monte Carlo, variational methods, density functional theory, and others. May also include other topics such as high-performance computing and parallelization with MPI/OpenMP and GPUs. Prerequisites: PHYS 256, PHYS 265, PHYS 273.

**PHYS 362. Quantum Mechanics II. 3 Credits.**
Mathematical and physical foundations of nonrelativistic quantum mechanics from the unifying point of view of Dirac. Symmetry operations and the algebraic structure of quantum mechanics are emphasized. Prerequisite: PHYS 273. Alternate years.
PHYS 365. Statistical Mechanics. 3 Credits.
Following a review of thermodynamics, we study the fundamentals of classical and quantum statistical mechanics including ensembles, identical particles, Bose and Fermi statistics, phase-transitions and critical phenomena, renormalization group, irreversible processes and fluctuations. Prerequisites: PHYS 265 or equivalent.

PHYS 391. Master's Thesis Research. 1-12 Credits.

PHYS 491. Doctoral Dissertation Research. 1-18 Credits.