PHYSICS (PHYS)

Courses

**PHYS 201. Experimental Physics I. 3 Credits.**
Experiments in classical and modern physics. Prerequisites: PHYS 128; MATH 121; Junior standing.

**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 141.

**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. Biological Physics. 3 Credits.**
Physical laws, processes, and interactions pertaining to biological systems. 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 257. Modern Astrophysics. 3 Credits.**
Stellar structure and evolution, compact objects, the interstellar medium, galactic structure, gravitational theory, and cosmology, the formation of our solar system and terrestrial life. Prerequisite: One 100-level course in physics or engineering. Cross-listed with: ASTR 257.

**PHYS 258. Relativity. 3 Credits.**
Development of Einstein’s theory of special relativity. Lorentz transformation, time dilation, length contraction, mass variation, relative velocities. Introduction to four-dimensional space. Concepts of general relativity. Applications selected from astrophysics, elementary particles, etc. 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. Schrödinger equation and applications to simple systems. Prerequisite: PHYS 128, PHYS 211.

**PHYS 274. Applictns 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 295. Advanced Special Topics. 1-18 Credits.**
See Schedule of Courses for specific titles.

**PHYS 296. Advanced Special Topics. 1-18 Credits.**
See Schedule of Courses for specific titles.

**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 321. Theoretical Physics. 1-6 Credits.**
For research students interested in pursuing topics of general and departmental research interest in theoretical physics. Prerequisite: Instructor permission. Offered as occasion warrants.

**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 331. Biological Physics. 1-3 Credits.**
For research students in the field of biological physics. Lectures, reports, and directed readings related to the research of the Department and the field generally. May be repeated for credit with departmental approval. Prerequisite: Instructor permission. Offered as occasion warrants.
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 351. Seminar: Physics of Materials. 1-3 Credits.
For research students in the field of the physics of materials. Lectures, reports, and directed readings related to the research for the department and the field generally. May be repeated for credit with departmental approval. Prerequisite: Instructor permission. Offered as occasion warrants.

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.