

PHYSICS (PHYS)

PHYS 1000. Physics Orientation. 1 Credit Hour.

Guest lectures will describe career opportunities in physics; the role physicists play in education, government, and industrial laboratories; and programs available to physics majors.

PHYS 1111K. Introductory Physics I. 4 Credit Hours.

An introductory course which will include mechanics (kinematics, dynamics, work and energy, momentum and collisions, and rotational motion and statics), and will include thermodynamics and waves. Elementary algebra and trigonometry will be used.

PHYS 11X1. Transfer Non-Calc Phys I. 1-21 Credit Hours.

PHYS 11X2. Transfer Non-Calc PhysII. 1-21 Credit Hours.

PHYS 1804. Special Topics. 4 Credit Hours.

PHYS 1XXX. Physics Elective. 1-21 Credit Hours.

PHYS 2021. The Solar System. 3 Credit Hours.

This course covers Ancient and Renaissance astronomy, gravity, sky phenomena, telescopes, and the solar system.

PHYS 2022. Stars, Galaxies, and the Universe. 3 Credit Hours.

This course covers optics, telescopes, stellar characteristics and evolution, galaxies, the universe, and the big bang. Physics topics include mechanics, optics, atomic physics, nuclear physics, and relativity.

PHYS 2030. Physics Of Music. 2 Credit Hours.

An introduction to the physical principles underlying the production, transmission, and detection of musical sounds.

PHYS 2210. Introduction to Astrophysics. 3 Credit Hours.

This course provides an overview of modern astrophysics including stars, galaxies, black holes and other dense stellar remnants, and the physics of the expanding Universe.

PHYS 2211. Principles of Physics I. 4 Credit Hours.

An introductory course which will include mechanics (kinematics, dynamics, work and energy, momentum and collisions, and rotational motion and statics), and may also include oscillations and computational methods. This is a calculus-based course.

PHYS 2212. Principles of Physics II. 4 Credit Hours.

An introductory course which will include electrostatics, electric current and circuits, electromagnetism, and may also include light and computational methods. This is a calculus-based course.

PHYS 2213. Introduction to Modern Physics. 3 Credit Hours.

A survey of twentieth century physics. Developments of several branches of physics up to their present frontiers, including historical and philosophical perspectives.

PHYS 2231. Honors Physics I. 5 Credit Hours.

Parallels introductory Physics I (PHYS 2211). Some topics treated in more depth or more extensively. A rigorous physics foundation requiring demonstrated competence in mathematics.

PHYS 2232. Honors Physics II. 5 Credit Hours.

Parallels introductory Physics II (PHYS 2212). Some topics treated in more depth or more extensively. No modern physics content. A rigorous physics foundation requiring demonstrated competence in mathematics.

PHYS 25X1. Transfer Physics I. 4 Credit Hours.

PHYS 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

PHYS 2699. Undergraduate Research. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

PHYS 2750. Physics of the Weather. 3 Credit Hours.

An introductory treatment applying basic physical laws to understanding weather phenomena. Crosslisted with EAS 2750.

PHYS 2801. Special Topics. 1 Credit Hour.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 2802. Special Topics. 2 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 2803. Special Topics. 3 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 2804. Special Topics. 4 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 2814. Special Topics. 4 Credit Hours.

Courses in special topics of current interest in physics.

PHYS 2900. Special Problems. 1-21 Credit Hours.

Course involving special problems in physics are offered from time to time.

PHYS 2901. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 2902. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 2XXX. Physics Elective. 1-21 Credit Hours.

PHYS 3022. Stars and Planets. 3 Credit Hours.

This course covers stellar atmospheres, interiors and evolution, as well as the formation and physical properties of planetary systems.

PHYS 3120. Computational Physics. 3 Credit Hours.

Introduction to computational methods in physics, including numerical integration and solving ordinary and partial differential equations. Applications to a range of physics problems are presented.

PHYS 3122. Electrostatics and Magnetostatics. 3 Credit Hours.

First of two courses on the physics of electromagnetism. Topics include Coulomb's Law, Ampere's Law, scalar and vector potentials, Laplace's equation and electric and magnetic fields in matter.

PHYS 3123. Electrodynamics. 3 Credit Hours.

Second of two courses on the physics of electromagnetism. Topics include time-dependent phenomena including Faraday's Law, the Maxwell equations, electromagnetic radiation, and electromagnetic waves.

PHYS 3141. Thermodynamics. 3 Credit Hours.

Introduction to the basic concepts of thermodynamics. Thermodynamic laws will be developed with an emphasis on the macroscopic point of view. Applications of the basic principles will be considered briefly.

PHYS 3143. Quantum Mechanics I. 3 Credit Hours.

First of two courses that develop the principles of quantum mechanics. Topics include the state vector concept. Heisenberg and Schrodinger pictures, uncertainty relations, and exact solvable models in one dimension.

PHYS 3151. Mathematical Physics. 3 Credit Hours.

A review of the mathematical techniques required for the description of physical systems encountered in mechanics, electromagnetism, thermal physics, and quantum mechanics.

PHYS 3201. Classical Mechanics I. 3 Credit Hours.

Fundamental topics in classical mechanics including oscillations, planetary motion, and Lagrangian and Hamiltonian techniques.

PHYS 3202. Classical Mechanics II. 3 Credit Hours.

A continuation of PHYS 3201. Topics include many body mechanics, rotation of rigid bodies and collisions.

PHYS 3207. Living Systems Laboratory. 3 Credit Hours.

Introduces students to the field of Physics of Living Systems via experimental studies of diverse biological systems, including molecular nanomachines, organism locomotion and ecological dynamics.

PHYS 3208. Modern Optics Laboratory. 3 Credit Hours.

Measurement of parameters of optical surfaces, lenses, and systems using a variety of modern optics techniques.

PHYS 3209. Electronics I. 3 Credit Hours.

A first course in both theoretical and applied electronics that is based on a thorough grounding in circuit as well as device physics.

PHYS 3210. Astronomy & Astrophysics Lab. 2 Credit Hours.

An introduction to astronomical and astrophysical data reduction and analysis, drawing on instrumentation and telescopes from across modern astrophysics.

PHYS 3232. Optics I. 3 Credit Hours.

Optics principles, including waves, reflection, refraction, absorption, scattering, group velocity, lasers, polarization geometrical optics, the Fourier transform, coherence, interference, and diffraction.

PHYS 3250. Principles of the Physics of Living Systems. 4 Credit Hours.

Hands-on lecture/lab undergraduate survey course enabling discovery of principles of Physics of Living Systems across scales.

PHYS 3801. Special Topics. 1 Credit Hour.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 3802. Special Topics. 2 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 3803. Special Topics. 3 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 3804. Special Topics. 4 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 3806. Special Topics. 2 Credit Hours.

Special Topics.

PHYS 3807. Special Topics. 3 Credit Hours.

Special Topics.

PHYS 3814. Special Topics. 4 Credit Hours.

Special Topics.

PHYS 3900. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 3901. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 3902. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 3XXX. Physics Elective. 1-21 Credit Hours.**PHYS 4142. Statistical Mechanics. 3 Credit Hours.**

The statistical basis of thermodynamics is developed. Topics include entropy and the second law, partition functions and free energy, systems of variable particle number, and quantum statistics.

PHYS 4143. Quantum Mechanics II. 3 Credit Hours.

Second of two courses that develop the principles of quantum mechanics. Topics include angular momentum, hydrogen atom, variation methods, perturbation theory, matter-radiation interactions, identical particles.

PHYS 4147. Relativity. 3 Credit Hours.

The course provides an introduction to the special and general theories of relativity that govern gravitational physics including experimental tests, astrophysical applications, black holes and gravitational waves.

PHYS 4206. Electronics II. 5 Credit Hours.

A course in electronic instrumentation with an emphasis on signal processing, both analog and digital, and computer interfacing.

PHYS 4247. Cosmology and Galaxies. 3 Credit Hours.

Modern cosmology of the universe, with the emphasis on the origin and evolution of galaxies and clusters of galaxies, inflation, the cosmic microwave background, dark matter and dark energy.

PHYS 4250. Neurophysics. 4 Credit Hours.

Hands-on lecture/lab undergraduate course connecting theory and experiment to understand principles of neuron, brain, and heart function. Draws upon nonlinear dynamics, basic electrostatics, and electrophysiology.

PHYS 4251. Biophysics. 3 Credit Hours.

Physical principles applied to molecular and cellular biology. Topics include chemiosmosis, self-assembly, protein biosynthesis, and the mechanisms of muscle and nerve function.

PHYS 4260. Quantum Technologies. 3 Credit Hours.

Introduction to quantum information systems, with an emphasis on the physics (superconductivity, ion and atom trapping, quantum dots) behind the leading candidate platforms.

PHYS 4261. Atomic Physics. 3 Credit Hours.

Course provides an introduction to the fundamentals of atomic physics, the structure of atoms, and their interaction with static and radiation fields.

PHYS 4262. Solid-state Physics. 3 Credit Hours.

A first course in the physics of crystalline solids. Core topics include crystal lattices, diffraction, bonding, elastic properties, band theory, as well as others.

PHYS 4263. Nuclei, Particles, and Fields. 3 Credit Hours.

An introduction to nuclear and subnuclear systems. Topics include nuclear models, radioactive decay, nuclear reactions, quarks, accelerators, reactors, and stellar nucleosynthesis.

PHYS 4267. Nonlinear Dynamics and Chaos. 3 Credit Hours.

A modern introduction to nonlinear phenomena. Topics include driven oscillators, entrainment, bifurcation, fractals, and control of chaos. Examples are drawn from physical systems.

PHYS 4301. Cell and Tissue Biophysics. 3 Credit Hours.

The physical principles that govern cell biological phenomena such as cell sensing, cell mechanics, migration, phase separation in cells, and bacterial navigation.

PHYS 4321. Advanced Laboratory I. 3 Credit Hours.

Experiments are conducted that demonstrate basic principles from various fields of physics. An emphasis is placed on contemporary concepts in modern physics.

PHYS 4322. Advanced Laboratory II. 3 Credit Hours.

A continuation of PHYS 4321. Experiments are conducted that demonstrate basic principles from various fields of physics. An emphasis is placed on contemporary concepts in modern physics.

PHYS 4347. Theoretical Astrophysics. 3 Credit Hours.

Theoretical investigation of astrophysical objects and processes, with an emphasis on the interstellar medium, extragalactic astrophysics, gas dynamics, and radiative transfer, and radiation processes.

PHYS 4421. Introduction to Continuum Physics. 3 Credit Hours.

A modern introduction to continuum physics. Topics include elastic theory, dislocations and waves, fluid mechanics and dynamics, and instabilities in fluids.

PHYS 4601. Senior Seminar I. 1 Credit Hour.

Representative research programs in the School are described by advanced graduate students, post-doctoral fellows and faculty members.

PHYS 4602. Senior Seminar II. 1 Credit Hour.

Representative research programs in the school are described by advanced graduate students, post-doctoral fellows, and faculty members.

PHYS 4604. Professional Development. 1 Credit Hour.

Professional development for physics undergraduate students. Topics include writing a resume, writing a proposal, applying for jobs, and choosing a graduate school.

PHYS 4605. Scientific Communication. 1 Credit Hour.

Scientific communication for physics undergraduate students, with a particular focus on the development of oral communication skills.

PHYS 4655. Introductory Diffraction Studies. 4 Credit Hours.

Introductory theory and practice of x-ray and neutron diffraction techniques, including single crystals and powders. Laboratory work is strongly correlated with principles developed in the lectures.

PHYS 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

PHYS 4699. Undergraduate Research. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

PHYS 4740. Estimation and Approximation in Physics. 3 Credit Hours.

Applications of order-of-magnitude estimates, dimensional analysis, scaling arguments, and perturbation theory in different areas of physics.

PHYS 4745. Physics of Cognition. 3 Credit Hours.

The course delves into perception, memory, and learning through physical principles. Students study cognition's physical basis, modern neural recording, and data interpretation.

PHYS 4751. Laser Theory and Applications. 3 Credit Hours.

Provides an introduction to the theory and applications of laser principles and related instrumentation. Emphasis is on the fundamental principles underlying laser action. Crosslisted with ECE 4751.

PHYS 4782. Quantum Information and Quantum Computing. 3 Credit Hours.

Introduction to quantum computing and quantum information theory, formalism of quantum mechanics, quantum gates, algorithms, measurements, coding, and information. Physical realizations and experiments. Crosslisted with MATH 4782.

PHYS 4801. Special Topics. 1 Credit Hour.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4802. Special Topics. 2 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4803. Special Topics. 3 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4804. Special Topics. 4 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4813. Special Topics. 3 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4823. Special Topics. 3 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4833. Special Topics. 3 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4854. Special Topics. 4 Credit Hours.

Courses in special topics of current interest in physics are presented from time to time.

PHYS 4900. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 4901. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 4902. Special Problems. 1-21 Credit Hours.

Courses involving special problems in physics are offered from time to time.

PHYS 4XXX. Physics Elective. 1-21 Credit Hours.