PHYSICS (PHYS)

Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

PHYS 805 - Experimental Physics
Credits: 4
Experiments in nuclear, solid-state, and surface physics. Includes discussion of laboratory techniques, data analysis, and data presentation. Special projects assigned to individual students.
Repeat Rule: May be repeated up to 1 time.
Grade Mode: Letter Grade

PHYS 806 - Introduction to Physics Research and Teaching
Credits: 1
This course introduces new graduate students to both research and teaching. The teaching portion focuses on facilitating group work, problem solving, and deeper student thinking. The research portion focuses on research currently conducted at UNH, library resources, responsible conduct in research, how research differs from coursework, and how research results are presented in the research community. Cr/F.
Grade Mode:

PHYS 810 - Astrophysics I
Credits: 4
A comprehensive review of modern astrophysics. Topics covered include the celestial sphere, celestial mechanics, the tools of the modern astronomer (including different types of telescopes for studying the electromagnetic radiation from space), stellar spectra, stellar atmospheres, stellar interiors, the formation of stars, stellar evolution, and the stellar graveyard (white dwarfs, neutron stars, and black holes).
Equivalent(s): EOS 810
Grade Mode: Letter Grade

PHYS 811 - Astrophysics II
Credits: 4
A continuation of the comprehensive review of modern astrophysics. Topics covered include the degenerate stellar remnants (white dwarfs, neutron stars, black holes), the interstellar medium, the Milky Way Galaxy, the nature of galaxies, the evolution of galaxies, the structure of the Universe, active galaxies, cosmology, and the early Universe. Prereq: Phys 810 or permission.
Grade Mode: Letter Grade

PHYS 812 - Introduction to Space Plasma Physics
Credits: 4
Introduction to the subject of space plasma physics including solar physics, heliospheric physics, magnetospheric physics, and ionospheric physics. The course provides an overview of the basic phenomena and processes (e.g. particle acceleration and transport, shock formation, magnetic structures and reconnection, wave propagation, wave-particle interactions, instabilities), theoretical techniques (e.g. single-particle orbits, kinetic and fluid descriptions), and experimental techniques. (Also offered as EOS 812.) (Alternate years only.)
Equivalent(s): EOS 812
Grade Mode: Letter Grade

PHYS 818 - Introduction to Solid-State Physics
Credits: 4
Crystal structure, diffraction, lattice vibrations, electronic and optical properties of metals and semiconductors; selected topics in modern condensed matter physics. Prereq: introduction to quantum mechanics I, electricity and magnetism I or equivalent. (Normally offered every other year.)
Grade Mode: Letter Grade

PHYS 820 - Nuclear Physics
Credits: 4
Nuclear phenomenology, reactions, models, radiation, interaction of radiation with matter; accelerators; properties and interactions of elementary particles; symmetries and symmetry breaking standard model. Prereq: introduction to quantum mechanics I and II; electricity and magnetism I and II; or permission of instructor.
Grade Mode: Letter Grade

PHYS 864 - General Relativity and Cosmology
Credits: 4
Review of special relativity, and the motivation for considering gravity in terms of curvature of space time. Introduction to Riemannian geometry, general relativity and Einstein's equations. Application of general relativity in the study of black holes, gravitational waves, cosmology, as well as recent results on inflation and quantum gravity. (Alternate years only.)
Grade Mode: Letter Grade

PHYS 895 - Independent Study
Credits: 1-8
Individual project under direction of a faculty adviser.
Grade Mode: Letter Grade

PHYS 899 - Master's Thesis
Credits: 1-6
May be repeated up to a maximum of 6 credits. Cr/F.
Repeat Rule: May be repeated for a maximum of 6 credits.
Grade Mode:

PHYS 931 - Mathematical Physics
Credits: 3
Complex variables, differential equations, asymptotic methods, integral transforms, special functions, linear vector spaces and matrices, Green's functions, and additional topics selected from integral equations, variational methods, numerical methods, tensor analysis, and group theory. (Also offered as MATH 931.)
Equivalent(s): MATH 931
Grade Mode: Letter Grade

PHYS 935 - Statistical Physics
Credits: 3
Review of thermodynamics and kinetic theory, followed by an introduction to classical and quantum statistical mechanics. Microcanonical, canonical, and grande canonical ensembles; ideal Fermi and Bose gases and applications of statistical mechanics to selected physical problems. Prereq: PHYS 931; 939; 943.
Grade Mode: Letter Grade

PHYS 939 - Classical Mechanics
Credits: 3
Newtonian, Lagrangian, and Hamiltonian formulation of the classical mechanics of particles and rigid bodies. Topics that serve as background for the study of modern physical theories are emphasized.
Grade Mode: Letter Grade

PHYS 941 - Electromagnetic Theory I
Credits: 3
The formulation and detailed application of electromagnetic theory to physical problems. The material covered is at the level of the text by J.D. Jackson, "Classical Electrodynamics".
Grade Mode: Letter Grade

PHYS 942 - Electromagnetic Theory II
Credits: 3
The formulation and detailed application of electromagnetic theory to physical problems. The material covered is at the level of the text by J.D. Jackson, "Classical Electrodynamics".
Grade Mode: Letter Grade

PHYS 943 - Quantum Mechanics I
Credits: 3
Introduces non-relativistic quantum theory, covering wave mechanics, Dirac notation, angular momentum, the use of perturbation theory to calculate atomic energy levels, the interaction of atoms with radiation, and various approaches to calculating the differential scattering cross-section.
Grade Mode: Letter Grade

PHYS 944 - Quantum Mechanics II
Credits: 3
See description for PHYS 943.
Grade Mode: Letter Grade

PHYS 951 - Plasma Physics
Credits: 3
Kinetic theory of plasmas; plasma waves, instabilities, turbulence, diffusion, adiabatic motion of charged particles, nonlinear plasma phenomena. Prereq: PHYS 935; PHYS 941; PHYS 941. (Normally offered every other year.)
Grade Mode: Letter Grade

PHYS 953 - Magnetohydrodyamics of the Heliosphere
Credits: 3
Introduction to solar physics, with emphasis on gas dynamics and magnetic fields. Interior structure, the theory of convection, wave motions in the presence of magnetism and gravity, coronal heating theories, steady and nonsteady flows, dynamo theory, and the theory of solar flares and other transient phenomena. Salient observational data are reviewed. (Normally offered every other year.)
Grade Mode: Letter Grade

PHYS 954 - Heliospheric Physics
Credits: 3
The solar wind and its effects on cosmic rays. The basic equations of the solar wind: mass, momentum, angular momentum, and energy balance. Transport processes. Waves, shocks, and instabilities in the solar wind. The basic equations of energetic particle transport. Solar modulation of solar and galactic cosmic rays. Interaction of energetic particles with shock waves. Salient data are reviewed. (Normally offered every other year.) Also offered as EOS 954.
Equivalent(s): EOS 954
Grade Mode: Letter Grade

PHYS 961 - Advanced Quantum Mechanics I
Credits: 3
Relativistic wave equations, propagator theory and Feynman diagrams, quantum theory of radiation, second quantization, introduction to quantum field theory and related topics. Prereq: PHYS 939; PHYS 944. (Normally offered every other year.)
Grade Mode: Letter Grade

PHYS 962 - Advanced Quantum Mechanics II
Credits: 3
Relativistic wave equations, propagator theory and Fyenman diagrams, quantum theory of Radiation, second quantization, introduction to quantum field theory and related topics.
Grade Mode: Letter Grade

PHYS 965 - Advanced Solid-State Physics
Credits: 3
Theory of crystalline metals, semiconductors, and insulators. Selected topics from the following: surfaces, films, quantum dots, clusters, solid-state devices. Prereq: PHYS 935; PHYS 941; PHYS 943. (Normally offered every other year.)
Grade Mode: Letter Grade

PHYS 987 - Magnetospheres
Credits: 3
Introduces plasma of physics of the interaction of solar and stellar winds with planets having internal magnetic fields, most predominately, the Earth. Both MHD and kinetic descriptions of internal and boundary processes of magnetospheres as well as treatment of the interaction with collisional ionospheres. Flow of mass, momentum, and energy, through such systems. Prereq: PHYS 951; PHYS 952;/or permission. (Also offered as EOS 987.) (Normally offered every other year.)
Equivalent(s): EOS 987
Grade Mode: Letter Grade

PHYS 995 - Special Topics
Credits: 1-3
Any special fields of study not covered by the above courses may be included. Topic choices in previous years: astrophysics; elementary particles; lasers/masers; many-body theory; general relativity and cosmology; group theory; atomic physics; quantum theory of light; nonlinear equations, and chaos. May be taken more than once. (Not offered every year.)
Grade Mode: Letter Grade

PHYS 999 - Doctoral Research
Credits: 0
Cr/F.
Grade Mode: