PHYSICS (PHYS)

PHYS 801 Computational Physics
Crosslisted with: PHYS 401
Prerequisites: A grade of P, C or better in PHYS 311.
Description: Re-formulation of physics problems for solution on a computer, control of errors in numerical work, and programming.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 811 Methods of Theoretical Physics I
Description: Fundamentals of applications of linear algebra, tensor analysis, complex analysis, ordinary differential equations and special functions to problems in theoretical physics with emphasis on special relativity, electrodynamics and nonrelativistic quantum mechanics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 812 Methods of Theoretical Physics II
Description: Green's functions and integral transforms to solve boundary value problems in various physical systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 813 Methods of Theoretical Physics III
Description: Application of discrete and continuous groups to various problems in solid state physics, atomic physics, high-energy physics and classical mechanics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 822 Introduction to Physics and Chemistry of Solids
Crosslisted with: PHYS 422, ECEN 422, ECEN 822
Prerequisites: PHYS 213 or CHEM 481/881, MATH 221/821.
Description: Introduction to structural, thermal, electrical, and magnetic properties of solids, based on concepts of atomic structure, chemical bonding in molecules, and electron states in solids. Principles underlying molecular design of materials and solid-state devices.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 831 Thermal Physics
Crosslisted with: PHYS 431
Prerequisites: PHYS 213.
Description: Thermal phenomena from the point of view of thermodynamics, kinetic theory, and statistical mechanics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 841 Experimental Physics I
Crosslisted with: PHYS 441
Prerequisites: PHYS 213, 223 and 231
Notes: Lab fee required.
Description: Methods and techniques of modern experimental physics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 442, PHYS 842
Course and Laboratory Fee: $55

PHYS 842 Experimental Physics II
Crosslisted with: PHYS 442
Prerequisites: PHYS 441/841 or permission
Notes: Lab fee required.
Description: Continuation of PHYS 441/841.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 443, PHYS 843
Course and Laboratory Fee: $55

PHYS 843 Experimental Physics III
Crosslisted with: PHYS 443
Prerequisites: PHYS 442/842 or permission.
Description: Continuation of PHYS 442/842.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Course and Laboratory Fee: $55

PHYS 851 Electromagnetic Theory
Crosslisted with: PHYS 451
Prerequisites: PHYS 213; MATH 221/821.
Description: Theory of electric and magnetic fields and their interaction with charges and currents, Maxwell's equations, electric and magnetic properties of matter.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 852 Optics and Electromagnetic Waves
Crosslisted with: PHYS 452
Prerequisites: A grade of P, C or better in PHYS 451/851
Description: Production of electromagnetic waves, wave guides and cavities, properties of waves, plane waves, reflection and refraction, interference and coherence phenomena, polarization. Optical properties of matter.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 861 Quantum Mechanics
Crosslisted with: PHYS 461
Prerequisites: A grade of P, C or better in PHYS 213 and 311.
Description: Basic concepts and formalism of quantum mechanics with applications to simple systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 862 Atoms, Nuclei, and Elementary Particles
Crosslisted with: PHYS 462
Prerequisites: A grade of P, C or better in PHYS 461
Description: Basic concepts and experimental foundation for an understanding of the physics of atoms, nuclei, and elementary particles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 880 Introduction to Lasers and Laser Applications
Crosslisted with: ECEN 480, ECEN 880, PHYS 480
Prerequisites: PHYS 213/(UNO) PHYS 2130.
Description: Physics of electronic transition production stimulated emission of radiation. Threshold conditions for laser oscillation. Types of lasers and their applications in engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 892 Special Topics in Physics
Crosslisted with: PHYS 492
Prerequisites: PHYS 213 and permission.
Description: Topics vary.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

PHYS 899 Masters Thesis
Prerequisites: Admission to masters degree program and permission of major adviser
Credit Hours: 1-10
Min credits per semester: 1
Max credits per semester: 10
Max credits per degree: 99
Grading Option: Pass No-Pass

PHYS 911 Classical Mechanics
Description: Lagrangian and Hamiltonian formulations of the laws of motion; variational principles; dynamics of rigid bodies; other advanced topics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 912; PHYS 928

PHYS 912 Statistical Physics
Prerequisites: or parallel: PHYS 911 and 916, or permission
Description: The laws of thermodynamics and thermodynamic functions; ensembles; Boltzmann, Fermi-Dirac, and Bose-Einstein statistics; kinetic theory and transport phenomena. Application to macroscopic systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 927

PHYS 913 Electromagnetic Theory I
Description: Electrostatics, magnetostatics, and Maxwell's equations; solutions to boundary value problems and Green's functions; electromagnetic radiation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 914; PHYS 918; PHYS 928

PHYS 914 Electromagnetic Theory II
Prerequisites: PHYS 913 or permission
Description: Special relativity and covariant formulation of electrodynamics; kinematics and dynamics of charged particles; radiation from moving charges; multipole radiation fields.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 928

PHYS 916 Quantum Mechanics I
Prerequisites: Permission
Description: Introduction to the formalism of quantum mechanics; applications to elementary systems; angular momentum; scattering theory.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 912; PHYS 917; PHYS 925; PHYS 927

PHYS 917 Quantum Mechanics II
Prerequisites: PHYS 916 or permission
Description: Hilbert-space formulation of quantum mechanics; stationary and time-dependent perturbation theory; variational methods; spin; many-particle systems and identical particles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: PHYS 918; PHYS 926

PHYS 918 Quantum Mechanics III
Prerequisites: PHYS 913 and 917, or permission
Description: Introduction to relativistic electron theory; formal scattering theory; semi-classical radiation theory; second quantization and application to many-particle systems, elements of quantum electrodynamics.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 925 Introduction to Atomic and Molecular Physics
Prerequisites: PHYS 916 or permission
Description: Selected topics in atomic and molecular physics with emphasis on experimentally observed phenomena, including atomic and molecular spectra and scattering phenomena, and molecular structure.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 926 Introduction to Nuclear and Elementary-Particle Physics
Prerequisites: PHYS 917 or permission
Description: Selected topics in nuclear and elementary particle physics with emphasis on experimentally observed phenomena, including nuclear forces, energy levels, nuclear models, decay of unstable nuclei, fundamental interactions and classification schemes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 927 Introduction to Solid-State Physics
Prerequisites: PHYS 912 and 916, or permission
Description: Selected topics in solid-state physics with emphasis on experimentally observed phenomena, including the structure and thermal, electric, magnetic, and elastic properties of metals, semiconductors, and insulators.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

PHYS 928 Introduction to Plasma Physics
Prerequisites: PHYS 911, 913, and 914
Description: Fundamentals of plasma physics. Motion of charged particles, basic plasma models, waves in plasma, laser-plasma interactions. Applications such as magnetic and inertial confinement fusion, astrophysics, plasma-based accelerators, advanced light sources, and semiconductor materials processing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

PHYS 951 Advanced Topics in Solid-State Physics
Prerequisites: Advanced graduate standing and permission
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 9
Grading Option: Grade Pass/No Pass Option

PHYS 955 Advanced Topics in Atomic Physics
Prerequisites: Permission
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 9
Grading Option: Grade Pass/No Pass Option

PHYS 996 Research Other Than Thesis
Description: Research leading to PhD
Credit Hours: 1-9
Min credits per semester: 1
Max credits per semester: 9
Max credits per degree: 18
Grading Option: Pass No-Pass

PHYS 998 Special Topics in Physics
Prerequisites: Permission
Description: Offered as the need arises to treat special topics not covered in other 900-level courses.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 9
Grading Option: Pass No-Pass

PHYS 999 Doctoral Dissertation
Prerequisites: Admission to doctoral degree program and permission of supervisory committee chair
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 99
Grading Option: Pass No-Pass