PHYSICS (PHYS)

PHYS 5010. Independent Study. (1-6 Credits)
A special reading course.
May be repeated for a total of 10 credits
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205010)

PHYS 5020. Research in Physics. (1-6 Credits)
Experimental and theoretical research in selected topics in physics.
May be repeated for a total of 18 credits
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205020)

PHYS 5094. Physics Seminar. (1 Credit)
The treatment of special topics, primarily by individual readings and
reports.
May be repeated for a total of 2 credits
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205094)

PHYS 5101. Methods of Theoretical Physics I. (3 Credits)
Vector and tensor analysis, curvilinear coordinates, linear algebra,
functions of complex variables, differential equations, special functions,
elements of Green's functions.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205101)

PHYS 5201. Theoretical Mechanics I. (3 Credits)
Classical mechanics: Lagrange equations, central force motion, rigid
body motions, small oscillations, Hamilton equations, canonical
transformation.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205201)

PHYS 5301. Electrodynamics I. (3 Credits)
Differential formulations of electrostatics and magnetostatics,
electromagnetic induction. Maxwell equations, electromagnetic waves,
application to wave guides, cavities, and dispersive media. Foundations
of special relativity.
Enrollment Requirements: PHYS 5101 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205301)

PHYS 5302. Electrodynamics II. (3 Credits)
Maxwell's equations with time dependent sources; radiation from
relativistic charged particles; dynamical laws for charged particles;
diffraction of electromagnetic waves.
Enrollment Requirements: PHYS 5201 and 5301 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205302)

PHYS 5350. Introduction to Computational Physics. (3 Credits)
Introduction to computational physics, including programming in C, C++,
and Python. Topics include numerical integration of ordinary differential
equations, finite differences and stability analysis, numerical solution
of partial differential equations (e.g., the Schroedinger and diffusion
equations) in more than one dimension, Krylov space methods (e.g.,
eigensystem solvers and matrix inversion), and Monte Carlo integration.
Introductory machine learning and high-performance computing methods
may be covered. Writing code to solve current problems from selected
areas of physics and astrophysics.
Enrollment Requirements: Recommended preparation: Python, C, C++,
Unix.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205350)

PHYS 5401. Quantum Mechanics I. (3 Credits)
Mathematical formulation and interpretation of quantum mechanics.
Illustrative examples. Hydrogen atom. Dirac ket and bra vectors, matrix
methods. Scattering theory.
Enrollment Requirements: PHYS 5101 and 5201 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205401)

PHYS 5402. Quantum Mechanics II. (3 Credits)
Symmetry and angular momentum. Approximation methods for
stationary and time-dependent problems, with applications. Relativistic
theory of the electron.
Enrollment Requirements: PHYS 5401 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205402)

PHYS 5403. Quantum Mechanics III. (3 Credits)
Occupation number representation, electron gas, Hartree-Fock
approximation, correlation energy, superconductivity, perturbation theory,
Green's functions, Feynman diagrams.
Enrollment Requirements: PHYS 5402 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205403)

PHYS 5500. Statistical Mechanics. (3 Credits)
Ensembles, distribution function, partition function. Bose-Einstein and
Fermi-Dirac distributions, fluctuations, applications to the properties of
solids and liquids and to the kinetic theory of gases.
Enrollment Requirements: PHYS 5401 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205500)

PHYS 5698. Advanced Topics in Physics I. (1-6 Credits)
Selected topics in theoretical and experimental physics.
May be repeated for a total of 24 credits
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%205698)

PHYS 6110. Atomic Physics. (3 Credits)
Coupling of angular momenta. Hartree-Fock theory of many electron
atoms, fine structure and hyperfine structure. Introduction to group
theory.
Enrollment Requirements: PHYS 5402.
View Classes (https://catalog.uconn.edu/course-search/?
details&code=PHYS%206110)

PHYS 6120. Molecular Physics. (3 Credits)
Heitler-London and molecular orbital theories for diatomic molecules, semi-empirical methods of poly-atomic molecules.
Enrollment Requirements: PHYS 6110.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206120)

PHYS 6140. Principles of Lasers. (3 Credits)
The physics of lasers, including optical pumping and stimulated emission, laser rate equations, optical resonators, non-linear optics, the Kerr effect and Faraday rotation. Applications to gas, crystal, glass, liquid, dye, semiconductor, chemical and ultraviolet lasers, Q-switching, mode-locking, and parametric devices.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206140)

PHYS 6201. Fundamentals of Solid State Physics I. (3 Credits)
Crystal structure, phonons, electronic band structure, metals, insulators and semiconductors.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206201)

PHYS 6211. Condensed Matter Physics I. (3 Credits)
Crystal structure; lattice vibrations; electronic band structure of solids; transport theory; basic properties of metals, semi-conductors and insulators; magnetism; super-conductivity.
Enrollment Requirements: PHYS 5402.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206211)

PHYS 6212. Condensed Matter Physics II. (3 Credits)
Crystal structure; lattice vibrations; electronic band structure of solids; transport theory; basic properties of metals, semi-conductors and insulators; magnetism; super-conductivity.
Enrollment Requirements: PHYS 6211.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206212)

PHYS 6320. Nuclei and Particles. (3 Credits)
Properties of nuclei and particles, conserved quantities, isospin, quark model, Fermi gas model, electroweak interaction, high energy scattering.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206320)

PHYS 6341. Quantum Theory of Fields I. (3 Credits)
Local gauge invariance, Lagranian formulation, Noether currents, spontaneous breakdown of symmetry, Higgs mechanism and superconductivity, canonical quantization, Feynman diagrams, Green's functions.
Enrollment Requirements: PHYS 5403.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206341)

PHYS 6342. Quantum Theory of Fields II. (3 Credits)
Topics chosen from the following: Path integral formalism, generating functionals, renormalization, abelian and non-abelian gauge theories (QED and QCD), electroweak theory, solitons, instantons.
Enrollment Requirements: PHYS 6341.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206342)

PHYS 6710. Stars and Compact Objects. (3 Credits)
The structure and evolution of stars. Gravitational collapse, hydrostatic equilibrium, novae and shocks, and compact objects with degenerate matter.
Enrollment Requirements: Not open for credit to students who have passed PHYS 4710.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206710)

PHYS 6720. Galaxies and the Interstellar Medium. (3 Credits)
Galaxy formation and evolution in the hierarchical expanding Universe. Properties of the interstellar medium, including star formation and radiative transfer; stellar populations, structure, kinematics and dynamics of galaxies.
Enrollment Requirements: Recommended preparation: proficiency in calculus. May be taught with PHYS 4720. Not open for credit to students who have passed PHYS 4720.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206720)

PHYS 6730. General Relativity and Cosmology. (3 Credits)
Gravity and the problem of motion from the ancient Greeks to Newton to Einstein. Special relativity. General relativity. Curvature. Classic tests of general relativity. Gravitational waves. Black holes. Newtonian cosmology. Big Bang theory. Inflation. Dark matter. Dark energy. Accelerating universe.
Enrollment Requirements: Not open for credit to students who have passed PHYS 4730.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206730)

PHYS 6740. Advanced Methods in Astrophysics. (3 Credits)
Basic principles and techniques of observational and computational astrophysics. Statistical techniques for data analysis and interpretation of astronomical data. Data mining, visualization, and numerical techniques in simulations of astrophysical systems. Includes short research projects using data from observations and/or simulations.
Enrollment Requirements: Open to Physics graduate students; others by permission. Not open for credit to students who have passed PHYS 4740.
View Classes (https://catalog.uconn.edu/course-search/?details&code=PHYS%206740)