DEPARTMENT OF PHYSICS

https://www.uvm.edu/cas/physics (https://www.uvm.edu/cas/physics/)

An education in physics provides students with the foundation for a variety of careers. In addition to preparation for graduate study in physics and related fields, undergraduate study in physics is an excellent preparation for professional careers in engineering, management, teaching, law, and medicine.

The curriculum consists of core courses on the fundamentals of physics, such as mechanics, electromagnetism, and quantum theory. Students can then choose from an array of electives to explore subfields in physics, such as astrophysics, biological physics, condensed matter physics, general relativity, nanotechnology, quantum optics, and nuclear and particle physics.

Under the guidance of faculty members, many physics majors become active in research in their second or third year of study. For eligible students, this experience can lead to college honors with the completion of a senior thesis project.

MAJORS

PHYSICS MAJORS

Physics B.A. (http://catalogue.uvm.edu/undergraduate/artsandsciences/physics/physicsba/)

Physics B.S. (http://catalogue.uvm.edu/undergraduate/artsandsciences/physics/physicsbs/)

MINORS

PHYSICS MINORS

Astronomy (http://catalogue.uvm.edu/undergraduate/artsandsciences/physics/astronomyminor/)

Physics (http://catalogue.uvm.edu/undergraduate/artsandsciences/physics/physicsminor/)

GRADUATE

Physics AMP

Physics M.S.

Physics Ph.D.

See the online Graduate Catalogue (http://catalogue.uvm.edu/graduate/) for more information.

Courses

PHYS 009. SU: Energy and the Environment. 3 Credits.
Forms of energy as defined in physics; sources, uses, and transformations of energy: introductory seminar will place emphasis on environmental issues. Limited use of algebra and geometry.

PHYS 011. Elementary Physics. 0 or 4 Credits.
Algebra-based survey of mechanics, oscillations, waves and thermal physics. Appropriate for students in health and life sciences. Accompanying lab: PHYS 021. Prerequisites: High school algebra and trigonometry.

PHYS 012. Elementary Physics. 0 or 4 Credits.
Algebra-based survey of electricity, magnetism, optics and modern physics. Appropriate for students in health and life sciences. Accompanying lab: PHYS 022. Prerequisites: PHYS 011 or PHYS 031 or PHYS 051.

PHYS 013. Conceptual Physics. 3 Credits.
One-semester conceptual survey. Topics selected from mechanics, electricity, magnetism and modern physics. For students in the College of Nursing and Health Sciences only.

PHYS 021. Introductory Lab I. 1 Credit.
Accompanying lecture PHYS 011. Prerequisite: Concurrent enrollment or credit in PHYS 011.

PHYS 022. Introductory Lab II. 1 Credit.
Accompanying lecture PHYS 012. Prerequisite: Concurrent enrollment or credit in PHYS 012.

PHYS 030. Physics Problem Solving I. 1 Credit.
Problem-solving techniques for first semester Physics with calculus. Accompanying lecture PHYS 031.

PHYS 031. Physics for Engineers I. 0 or 4 Credits.
Mechanics including oscillations and waves. With lab. Accompanying optional problem-solving session: PHYS 030. Prerequisite: MATH 021 or MATH 023.

PHYS 044. The Physics of Music. 3 Credits.
Basic physical principles underlying the production, transmission and perception of musical sound. Vibrations, waves, elementary acoustics with applications to a wide range of musical topics. Prerequisite: High school algebra.

PHYS 051. Fundamentals of Physics I. 0 or 4 Credits.
Calculus-based introduction to kinematics, dynamics, oscillations, thermal physics. For students in the natural sciences. With lab. Credit not given for both PHYS 051 and PHYS 031. Pre/co-requisite: Credit or concurrent enrollment in MATH 021.

PHYS 090. Internship. 1-3 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

PHYS 095. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

PHYS 096. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

PHYS 097. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

PHYS 123. Physics Problem Solving II. 1 Credit.
Problem-solving techniques for second semester Physics with calculus. Accompanying lecture PHYS 125.

PHYS 125. Physics for Engineers II. 0 or 3 Credits.
Electricity, magnetism, electromagnetic waves, optics. Without lab. Accompanying optional problem-solving session: PHYS 123. Prerequisites: PHYS 031 and MATH 022 or MATH 023; concurrent enrollment in MATH 121.

PHYS 128. Waves and Quanta. 0-4 Credits.
Classical and electromagnetic waves, relativity, wave-particle phenomenology, wave mechanics, and applications of the Schrodinger equation. With laboratory. Prerequisites: PHYS 152 or PHYS 125. Co-requisite: MATH 121.

PHYS 152. Fundamentals of Physics II. 0 or 4 Credits.
Calculus-based introduction to electricity, magnetism and optics. For students in the natural sciences. With lab. Credit not given for both PHYS 125 and PHYS 152. Prerequisites: PHYS 031 or PHYS 051, credit or concurrent enrollment in MATH 022.

PHYS 175. Topics in Modern Physics. 1-3 Credits.
Research seminar that exposes Physics majors to modern research topics in physics. The course will be offered every semester by different faculty to maintain engagement with students. Prerequisites: PHYS 128, Physics majors, Instructor permission.

PHYS 190. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

PHYS 191. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

PHYS 195. Intermediate Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles. Prerequisites: PHYS 128; Department permission.

PHYS 196. Intermediate Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles. Prerequisites: PHYS 128; Department permission.

PHYS 197. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion. Prerequisites: PHYS 128; Department permission.

PHYS 198. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion. Prerequisites: PHYS 128; Department permission.

PHYS 199. Experimental Physics I. 3 Credits.
Classic physics experiments with a strong emphasis on experimental setup, data collection and analysis, error estimation, and writing/presentation of results. The laboratory work is centered around three experiments: Poisson statistics, Cavendish balance, and Kater pendulum. Prerequisite: PHYS 152 or PHYS 125.

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. Intro Biological Physics. 3 Credits.
General survey course in biological physics. Introduction to biological building blocks (proteins, lipids and nucleic acids) and macromolecular structure, thermostatistics of biological systems and two-state models, random walks and polymers, elasticity and mechanics of filaments and membranes, physics of water and molecular solvation, brownian motion and diffusion. 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 256. Computational Physics. 3 Credits.
Introduction to modern computational techniques focusing on the simulation or solution of the behavior of physical systems. Examples will be drawn from classical, statistical, and quantum mechanics, electromagnetism, and chaos. Prerequisites: PHYS 125 or PHYS 152; MATH 121.

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. Schrodinger 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 290. Internship. 1-18 Credits.
On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

PHYS 291. Teaching Assistantship. 1-3 Credits.
Undergraduate student service as a teaching assistant, usually in an introductory level course in the discipline, for which credit is awarded. Offered at department discretion.

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 297. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

PHYS 298. Undergraduate Research. 1-18 Credits.
Undergraduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.