PHYSICS

https://www.physics.as.miami.edu

Dept. Code: PHY

Degree Programs

All graduate students in physics must plan their entire program with the advice and approval of a departmental advisor.

The program of graduate studies in physics emphasizes research work, but also includes teaching experience as an essential element. Research and thesis opportunities are at present available in the fields of astrophysics and cosmology, atmospheric, ocean and quantum optics, biological physics, complexity, condensed matter/energy materials physics, elementary particle theory.

Masters Program in Physics

- M.S. in Physics (http://bulletin.miami.edu/graduate-academic-programs/arts-sciences/physics/physics-ms/)

Doctoral Program in Physics

- Ph.D. in Physics (http://bulletin.miami.edu/graduate-academic-programs/arts-sciences/physics/physics-phd/)

PHY 606. Advanced Laboratory. 1-2 Credit Hours.
Advanced experiments such as properties of the electron, optical spectra, electrical measurements, radioactive decay, absorption, etc.
Components: LAB.
Grading: GRD.
Typically Offered: Spring.

PHY 613. Mathematical Techniques in Physics. 3 Credit Hours.
Complex variables and applications. Infinite series and their uses, particularly in differential equations. Multiple integrals and Fourier series.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 616. Special Topics in Physics. 1-3 Credit Hours.
Special topics in Physics. Topics vary by semester.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 617. Special Topics in Physics. 1-3 Credit Hours.
Special topics in Physics. Topics vary by semester.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 618. Special Topics in Astrophysics. 1-3 Credit Hours.
Special topics in Physics. Topics vary by semester. The course includes the use of modern tools used in astrophysics.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 621. Thermodynamics and Kinetic Theory. 3 Credit Hours.
An intermediate course in thermal phenomena, from both macroscopic and microscopic points of view.
Prerequisite: PHY 222 or PHY 206 and MTH 211 or MTH 310 or PHY 315.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 622. Solid State Physics. 3 Credit Hours.
Crystal structure, quantum theory of the electronic structure of solids, mechanical, electric, magnetic and optical properties of solids.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 625. Biological Physics 1. 3 Credit Hours.
Applications of fundamental principles from fluids, electrostatics, statistical physics to biological phenomena at molecular and neuronal levels; emphasis on quantitative picture of well-known biological systems; discussion of current research at the interface of biology and physics.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 630. Plasma Physics I. 3 Credit Hours.
Kinetic theory of plasmas, adiabatic motion of charged particles magneto fluid dynamics, transport properties of plasmas in electromagnetic fields.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 640. Classical Mechanics II. 3 Credit Hours.
Lagrangian formulation, rigid body dynamics. Topics selected from fluid dynamics, non-linear oscillations, normal modes, phase plane analysis.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

PHY 645. Introduction to Astrophysics. 3 Credit Hours.
Celestial mechanics, solar models, galaxies, distance scales, instruments.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 650. Electricity and Magnetism I. 3 Credit Hours.
The integral and differential forms of Maxwell's equations, circuit theory, and boundary value problems.
PHY 350: PHY 202 or PHY 212 Or PHY 222 and PHY 223 Or PHY 230 And MTH 211 or MTH 310 And Pre/Corequisite: MTH 311 Or Prerequisite: PHY 315.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 651. Electricity and Magnetism II. 3 Credit Hours.
A continuation of PHY 350/650. Further applications of Maxwell's equations with emphasis on radiation theory.
PHY 350/650.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 652. Optical Physics. 3 Credit Hours.
Geometric optics, interference and diffraction, polarized light, optical pumping, coherence phenomena, applications to modern physical research.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 660. Quantum Mechanics and Modern Physics I. 3 Credit Hours.
Introductory theory with applications to simple systems. Perturbation theory and atomic structure.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

PHY 661. Quantum Mechanics and Modern Physics II. 3 Credit Hours.
Applications of quantum mechanics to atomic and molecular spectroscopy, quantum statistical mechanics, and nuclear physics.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

PHY 701. Condensed Matter Physics Seminar. 1 Credit Hour.
Seminars on hot topics in Condensed Matter Physics.
Components: SEM.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 713. Methods of Mathematical Physics I. 3 Credit Hours.
A continuation of PHY 515.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 717. Special Topics in Physics. 1-3 Credit Hours.
Topics are typically selected from fluid dynamics, applied mathematics, particle theory, nuclear physics.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 718. Special Topics in Physics. 1-3 Credit Hours.
Topics are typically selected from fluid dynamics, applied mathematics, particle theory, nuclear physics.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 722. Advanced Solid State Physics. 3 Credit Hours.
Electronic structure, electron-electron interactions, phonons, many-body problems, transport properties, magnetism, superconductivity.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 723. Statistical Mechanics I. 3 Credit Hours.
Equilibrium state, irreversibility, statistical description of an ensemble, entropy, partition functions.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 724. Statistical Mechanics II. 3 Credit Hours.
Statistical description of many body problems, specific heats, Brownian motion in liquids and fields, non-equilibrium states, super-conductivity.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 752. Electromagnetic Theory I. 3 Credit Hours.
Electrostatics, magnetostatics, Maxwell's equations, continuous media, waves, antennas, resonant cavities, wave guides.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 753. Electromagnetic Theory II. 3 Credit Hours.
Relativistic effects, interaction of radiation with matter, multiple radiation, radiation reaction.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 766. Elementary Particles. 3 Credit Hours.
The Standard Model of elementary particles. Classical theory of fields for spin 0, 1/2, 1; Feynman rules. The Standard Model Lagrangian is postulated, and some of its basic consequences are explored.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 770. Quantum Theory I. 3 Credit Hours.
Transformation theory, linear operators and vector spaces. Schrodinger's equation, rotation group and angular momentum, statistics (Bose-Einstein and Fermi- Dirac), isotopic spin, multiple structure of levels, approximation methods.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 771. Quantum Theory II. 3 Credit Hours.
One particle relativistic theory; Lorentz group; symmetries of particles; elementary scattering theory; many body problems; Green's function techniques; S-matrix.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 780. Directed Readings or Research. 1-4 Credit Hours.
Research in Physics.
Components: THI.
Grading: GRD.
Typically Offered: Fall & Spring.

PHY 810. Master's Thesis. 1-6 Credit Hours.
The student working on his/her master's thesis enrolls for credit, in most departments not to exceed six, as determined by his/her advisor. Credit is not awarded until the thesis has been accepted.
Components: LEC.
Grading: SUS.
Typically Offered: Offered by Announcement Only.

PHY 820. Research in Residence. 1 Credit Hour.
Used to establish research in residence for the thesis for the master's degree after the student has enrolled for the permissible cumulative total in PHY 710 (usually six credits). Credit not granted. May be regarded as full time residence.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 825. Continuous Registration--Master's Study. 1 Credit Hour.
To establish residence for non-thesis master's students who are preparing for major examinations. Credit not granted. Regarded as full time residence.

Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 830. Pre-Candidacy Doctoral Dissertation. 1-12 Credit Hours.
Required of all candidates for the Ph.D. The student will enroll for credit as determined by his/her advisor, but not for less than a total of 12. Not more to than 12 hours of PHY 730 may be taken in a regular semester, nor more than six in a summer session.
Components: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.

PHY 840. Post-Candidacy Doctoral Dissertation. 1-12 Credit Hours.
Required of all candidates for the Ph.D. who have advanced to candidacy. The student will enroll for credit as determined by his/her advisor, but not for less than a total of 12. Not more than 12 hours of PHY 740 may be taken in a regular semester, nor more than six in a summer session.
Components: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.

PHY 850. Research in Residence. 1 Credit Hour.
Used to establish research in residence for the Ph.D. and D.A., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.
Components: THI.
Grading: SUS.
Typically Offered: Fall & Spring.