

# Physics (PHY)

The Department of Physics offers one major with two separate tracks based on the student's intended career path. The Industry Track is intended for students who plan to attend graduate school in a field other than physics and/or plan to seek immediate employment. The Pre-Professional Track is for students who intend to enter graduate school in preparation for a future career specifically in Physics. Either track may be augmented by the Emphasis in Computational Science (<http://catalog.wofford.edu/archive/2015-2016/courses-programs-departments/computer-science>).

Students interested in pursuing an engineering degree can do through Wofford's dual degree program offered in conjunction with Clemson University and Columbia University. Additional information is located in the Pre-Professional Programs (<http://catalog.wofford.edu/archive/2015-2016/degree-program-requirements/preprofessional-programs>) section of the Catalog.

## Chair

G. Mackay Salley

## Professors

J. Daniel LeJeune  
Daniel W. Welch  
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## • Requirements for the Major in Physics

Both the Industry and Pre-Professional track require PHY 141/142 and the auxiliary courses listed below.

### Prerequisites and Corequisites

PHY 141 & PHY 142	Physics for Science & Engineering I (with lab) and Physics for Science & Engineering II (with lab)	8
CHEM 123 & CHEM 124	General Chemistry I (with lab) and General Chemistry II (with lab)	
MATH 181	Calculus I	
MATH 182	Calculus II	
MATH 212	Vector Calculus	
MATH 240	Differential Equations	
COSC 200- level or higher; OR PHY 203	Computer Science Requirement	

## Industry Track

The Industry Track is for students who plan to attend graduate school in a field other than Physics and those who plan immediate employment in areas such as industry, government, or public schools.

### Course Requirements

PHY 206	Electronics (with lab)	4
PHY 211	Modern Physics	3
PHY 221	Mechanics	3
PHY 311	Contemporary Physics	3
PHY 331	Electricity and Magnetism	3

Select nine Physics (PHY) credit hours at the 200- level or above, excluding PHY 203 9

Total Hours 25

## Pre-Professional Track

This Pre-Professional Track is for students who plan to attend graduate school in Physics in preparation for a career in the field.

### Course Requirements

PHY 211	Modern Physics	3
PHY 221	Mechanics	3
PHY 331	Electricity and Magnetism	3
PHY 441	Theoretical Physics I	3
PHY 442	Theoretical Physics II	3

Select twelve Physics (PHY) credit hours at the 200- level or above, excluding PHY 203 12

Total Hours 27

*Physics course prerequisites require a grade of 'C' or higher in the prerequisite unless specifically noted otherwise in the course description.*

### PHY 104. Physics: Concepts & Methods (with lab). 4 Hours.

A study of topics selected to introduce students to basic concepts in physics and/or astronomy, and to the scientific method. Does not count toward a major in Physics nor toward science requirements for the B.S. degree.

### PHY 108. Astronomy. 3 Hours.

A survey course in astronomy which includes observational astronomy, the solar system, structure and evolution of stars and galaxies, and cosmology.

### PHY 121. General Physics I (with lab). 4 Hours.

A study of mechanics, heat, light, sound, electricity, magnetism, and modern physics using algebra, trigonometry, and limits.

### PHY 122. General Physics II (with lab). 4 Hours.

A continuation of PHY 121 in the study of mechanics, heat, light, sound, electricity, magnetism, and modern physics using algebra, trigonometry, and limits.

**Prerequisite:** PHY 121 with a minimum grade of D.

### PHY 141. Physics for Science & Engineering I (with lab). 4 Hours.

A calculus-based study of mechanics, heat, light, sound, electricity, magnetism, and modern physics suitable for those majoring in areas such as physics or chemistry and for those in pre-engineering.

**Prerequisite:** MATH 181 with a minimum grade of D.

### PHY 142. Physics for Science & Engineering II (with lab). 4 Hours.

A continuation of PHY 141 in a calculus-based study of mechanics, heat, light, sound, electricity, magnetism, and modern physics suitable for those majoring in areas such as physics or chemistry and for those in pre-engineering.

**Prerequisite:** PHY 141 with a minimum grade of D and MATH 182 with a minimum grade of D.

**PHY 203. Computer Organization & Interfacing (with lab). 4 Hours.**

A course situated at the point where software meets hardware. From there it reaches downward to the microcode level and upward to the system level. To meet the needs of scientists and computer scientists, the logical and physical foundations on which computer systems are built are developed with enough rigor that functioning computer systems can be successfully altered for new applications during the laboratory component of the course. The algorithm design and control programming progresses during the course from the microcode and machine language level, through hand assembly, to full assembly methods. The course concludes with an analytical comparison of competing contemporary architectures.

**PHY 206. Electronics (with lab). 4 Hours.**

An elementary course in the principles of electronic devices, circuits, and instruments. It is intended for students of science who desire some understanding of the electronic instrumentation they use.

**Prerequisite:** PHY 122 with a minimum grade of D or PHY 142 with a minimum grade of D.

**PHY 211. Modern Physics. 3 Hours.**

A study of the major developments in physics since 1895, with emphasis on special relativity, the atom, the nucleus, and 'elementary particles'.

**Prerequisite:** (PHY 122 with a minimum grade of D or PHY 142 with a minimum grade of D) and MATH 182 with a minimum grade of D.

**PHY 221. Mechanics. 3 Hours.**

Classical Newtonian analytical mechanics. Newton's laws are used together with vector analysis to analyze problems in statics and dynamics, with emphasis upon the latter. Problem-solving situations include rectilinear particle dynamics (especially oscillators), general particle dynamics, non-inertial reference frames, central forces, systems of particles, and mechanics of rigid bodies. Prerequisites: Physics 121, 122 or 141, 142 or 173; and Mathematics 182.

**Prerequisite:** (PHY 122 with a minimum grade of D or PHY 142 with a minimum grade of D) and MATH 182 with a minimum grade of D.

**PHY 231. Thermodynamics. 3 Hours.**

Development and application of basic concepts and methods useful in understanding thermal phenomena. The approach is divided into three basic branches: classical thermodynamics, kinetic theory, and statistical mechanics.

**Prerequisite:** (PHY 122 with a minimum grade of D or PHY 142 with a minimum grade of D) and MATH 212 with a minimum grade of D.

**PHY 250. Introduction to Research. 1 Hour.**

An opportunity to learn the elements of research in physics by participating in one of the department's existing research projects. A maximum of four semester hours may be earned in this way.

**Prerequisite:** PHY 211 with a minimum grade of D.

**PHY 280. Selected Topics in Physics. 1 to 4 Hours.**

An opportunity to participate in a special intermediate course offering. Students planning to take this course should consult with the instructor during the previous semester.

**Prerequisite:** PHY 211 with a minimum grade of D.

**PHY 311. Contemporary Physics. 3 Hours.**

The general physics background of the student serves as a tool for comprehending readings taken from professional physics publications on topics with significant relationship to life outside the laboratory. The course demands substantial progress in technical writing, technical speaking, and technical literature search skills as measured against normal professional requirements in the field. Prerequisite: Physics 211.

**Prerequisite:** PHY 211 with a minimum grade of D.

**PHY 321. Optics. 3 Hours.**

The presentation and demonstration of the proper use of several alternative models of the electromagnetic spectrum, including the ray model, the wave model, and the quantum model.

**Prerequisite:** PHY 122 with a minimum grade of D or PHY 142 with a minimum grade of D.

**PHY 331. Electricity and Magnetism. 3 Hours.**

The study of physics and mathematics of the classical description of the electromagnetic field. This includes the experimental and theoretical background for each of Maxwell's equations, in vacuum and in matter.

**Prerequisite:** PHY 221 with a minimum grade of D and MATH 182 with a minimum grade of D.

**PHY 341. Quantum Physics. 3 Hours.**

The mathematical structure and physical meaning of quantum mechanics, as a fundamental theory of physics, are developed at the intermediate level. Problems are drawn from areas such as the structure of nuclei, atoms, molecules, and crystals.

**Prerequisite:** PHY 211 with a minimum grade of D and MATH 212 with a minimum grade of D.

**PHY 371. Advanced Laboratory I. 1 Hour.**

A series of four semesters of experiments and projects that develop the basic experimental skills that a student majoring in physics should have. These include use of standard physics instrumentation, some familiarity with shop tools, laboratory record-keeping and report-writing, and knowledge of ways in which basic physical quantities are measured. The basics for all of these skills are developed in the first semester in the series. The others may be taken in any order.

**Prerequisite:** PHY 211 with a minimum grade of D.

**PHY 372. Advanced Laboratory II. 1 Hour.**

A series of four semesters of experiments and projects that develop the basic experimental skills that a student majoring in physics should have. These include use of standard physics instrumentation, some familiarity with shop tools, laboratory record-keeping and report-writing, and knowledge of ways in which basic physical quantities are measured. The basics for all of these skills are developed in the first semester in the series. The others may be taken in any order.

**PHY 441. Theoretical Physics I. 3 Hours.**

Designed for students planning to attend graduate school, this course should be taken in the senior year at Wofford. The material is taken from the more advanced portions of mechanics, electrodynamics, quantum physics, optics, and introductory statistical mechanics. Special attention is given to the mathematical methods used in each of these areas.

**Prerequisite:** MATH 240 with a minimum grade of D and PHY 331 with a minimum grade of D and PHY 341 with a minimum grade of D.

**PHY 442. Theoretical Physics II. 3 Hours.**

Designed for students planning to attend graduate school, this course should be taken in the senior year at Wofford. The material is taken from the more advanced portions of mechanics, electrodynamics, quantum physics, optics, and introductory statistical mechanics. Special attention is given to the mathematical methods used in each of these areas.

**Prerequisite:** MATH 240 with a minimum grade of D and PHY 331 with a minimum grade of D and PHY 341 with a minimum grade of D.

**PHY 451. Research I. 2 Hours.**

Active participation in a research project selected from one of the department's existing projects, or developed earlier in Physics 250 or in coordination with a faculty member. The student is expected to maintain a regular weekly schedule of lab and library work in connection with this project, keep a notebook in standard format, and write a detailed research report to be retained by the faculty member.

**Prerequisite:** PHY 221 with a minimum grade of D and PHY 331 with a minimum grade of D and PHY 371 with a minimum grade of D.

**PHY 452. Research II. 2 Hours.**

Active participation in a research project selected from one of the department's existing projects, or developed earlier in Physics 250 or in coordination with a faculty member. The student is expected to maintain a regular weekly schedule of lab and library work in connection with this project, keep a notebook in standard format, and write a detailed research report to be retained by the faculty member.

**Prerequisite:** PHY 221 with a minimum grade of D and PHY 331 with a minimum grade of D and PHY 371 with a minimum grade of D.

**PHY 480. Advanced Topics in Physics. 1 to 4 Hours.**

An opportunity to participate in a special advanced course offering. Students planning to take this course should consult with the instructor during the previous semester.

**Prerequisite:** PHY 221 with a minimum grade of D and PHY 331 with a minimum grade of D and PHY 341 with a minimum grade of D and PHY 371 with a minimum grade of D.