

# PHY - PHYSICS

## PHY 101 4 credit hours (lecture: 3 | lab: 3)

### Applied Physics

Course introduces physics. Content includes mechanical systems, electrical systems, thermal systems, fluid mechanics, and electromagnetic waves. Intended for students in technical programs.

**Prerequisite:** Successful completion of MAT 065 or higher, except MAT 111, or appropriate Math placement.

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$30

*Term Typically Offered: Fall | Spring | Summer*

## PHY 131 4 credit hours (lecture: 3 | lab: 2)

### College Physics I

Course introduces physics. Algebra and trigonometry are used throughout the course. Content includes kinematics, Newton's laws of motion, energy, momentum, gravity, rotational dynamics, simple harmonic motion, fluid mechanics, and heat. Intended for liberal arts, life science and health science students.

**Prerequisite:** MAT 122 or concurrent enrollment in MAT 122 or consent of instructor.

*IAI General Education: P1 900L*

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$35

*Term Typically Offered: Fall | Spring | Summer*

## PHY 132 4 credit hours (lecture: 3 | lab: 2)

### College Physics II

Course continues PHY 131. Content includes sound, mechanical waves, electrostatic forces, capacitance, electric current, voltage, resistance, magnetism, Faraday's law, electrical instruments and electrical safety; light, geometric and physical optics, and optical instruments.

**Prerequisite:** PHY 131.

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$35

*Term Typically Offered: Fall | Spring | Summer*

## PHY 140 4 credit hours (lecture: 3 | lab: 3)

### Fundamentals of Nanotechnology I

Course introduces nanoscience and nanotechnology, incorporating topics in physics, chemistry and biology at the nanoscale. These include forces, fluidics, atoms and molecules, nanoscale structures and biological function at the nanoscale. Practical nanotechnology applications of pharmaceutical biotechnology and drug delivery will be highlighted that are relevant to local industry. Hands-on laboratory activities make use of dip-pen nanolithography, atomic force microscopy, fluorescence microscopy, scanning electron microscopy and nanoparticle characterization.

**Prerequisite:** MAT 070 or placement into MAT 095, and one year of high school biology and one year of high school chemistry.

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$50

*Term Typically Offered: Fall | Spring*

## PHY 141

4 credit hours (lecture: 3 | lab: 3)

### Fundamentals of Nanotechnology II

Course continues discussion of topics covered in PHY 140 at greater depth, including nanophysics and nanobiology, such as forces, fluidics, the wave nature of light, photonics, atomic and molecular bonds, nanoscale structures, quantum mechanics and conductivity. Locally pertinent nanotechnology applications such as development and delivery of small molecules, nanoparticles and biologics for theradiagnostic uses will be examined. Hands-on laboratory activities make use of dip-pen nanolithography, atomic force microscopy, fluorescence microscopy, nanoparticle characterization, scanning electron microscopy, UV-Vis spectroscopy, nanoparticle synthesis and carbon nanotube synthesis.

**Prerequisite:** PHY 140 with minimum grade of C.

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$50

*Term Typically Offered: Fall | Spring*

## PHY 142

4 credit hours (lecture: 2 | lab: 4)

### Nanotechnology Projects

Course uses project-based learning and team-building techniques to study topics in electronics, photonics, thin films, biotechnology, and procedures for troubleshooting instrumentation. Instrumentation and techniques include, atomic force microscopy, fluorescence microscopy, nanoparticle characterization, scanning electron microscopy, energy dispersive X-ray analysis, ultraviolet-visible and Fourier-transform infrared spectroscopy, basic photonics, photolithography, profilometry, and ellipsometry.

**Prerequisite:** PHY 141 with minimum grade of C.

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$50

*Term Typically Offered: Fall | Spring*

## PHY 143

3 credit hours (lecture: 2 | lab: 10)

### Nanotechnology Internship

Course consists of direct work experience in a nanotechnology-related environment at an approved business or industrial firm applying knowledge and skills learned to daily assigned responsibilities. The student will meet with a nanotechnology instructor who will evaluate their on-the-job technical skills. Arrangements for the work experience will be worked out in conjunction with the nanotechnology coordinator. In addition, the student will discuss work-related situations with the instructor.

**Prerequisite:** PHY 141 with minimum grade of C

*Instruction Type: In-Person | Online*

*Term Typically Offered: Fall | Spring*

## PHY 221

5 credit hours (lecture: 4 | lab: 3)

### General Physics I

Course presents fundamental elements of physics with quantitative methods utilizing vectors, and differential and integral calculus. Content includes kinematics and dynamics, conservation of energy and momentum, angular momentum, elastic properties of matter, simple harmonic motion, resonance, kinetic theory of gasses, and thermodynamics. Intended for engineering and physical science students.

**Prerequisite:** MAT 250 with minimum grade of C or consent of instructor.

*IAI General Education: P2 900L*

*IAI Major: PHY 911*

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$35

*Term Typically Offered: Fall | Spring | Summer*

**PHY 222** **5 credit hours (lecture: 4 | lab: 3)**

**General Physics II**

Course continues PHY 221. Content includes quantitative methods utilizing differential and integral calculus; mechanical waves and sound, charge, electric field and potential, Gauss's Law, Ampere's Law, Faraday's Law, magnetic properties of matter, inductance, capacitance, electromagnetic radiation, geometrical optics, and physical optics.

**Prerequisite:** PHY 221 with minimum grade of C and MAT 251 or concurrent enrollment in MAT 251.

*IAI Major: PHY 912*

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$35

*Term Typically Offered: Fall | Spring*

**PHY 223** **4 credit hours (lecture: 3 | lab: 2)**

**Modern Physics**

Course continues PHY 222. Content includes special relativity, classic experiments leading to the development of quantum mechanics, wave-particle duality, wave motion and wave packets, the uncertainty principle, the Bohr model of hydrogen, Schrödinger equation, infinite and finite square wells, quantum harmonic oscillator, tunneling, angular momentum and the hydrogen atom, atomic structure, and basic nuclear physics.

**Prerequisite:** PHY 222 with a minimum grade of C.

*Instruction Type: In-Person | Online | Hybrid*

Fee: \$30

*Term Typically Offered: Spring*

**PHY 230** **4 credit hours (lecture: 3 | lab: 3)**

**Optics**

Course is designed to introduce students to the mathematics and applications of physical optics. Topics include the mathematics of waves, electromagnetic waves, photons, various ways that light interacts with matter, the principle of superposition, basic geometric optics, polarization, diffraction, interference and Fourier optics.

**Prerequisite:** PHY 222 with minimum grade of C or consent of instructor.

*Instruction Type: In-Person*

Fee: \$30

**PHY 290** **1-4 credit hours (lecture: 1-4 | lab: 1-4)**

**Topics in Physics**

Course is designed to meet the special interest needs of physics students. Topics will be offered for variable credit from one to four semester credit hours. Students may repeat PHY 290 up to three times on different topics for a maximum of nine semester credit hours. Fee Varies. Prerequisite may vary by topic.

*Instruction Type: In-Person*