PHYSICS AND PRE-ENGINEERING (PHY)

College of the Sciences and Mathematics

Courses

PHY 100. Elements of Physical Science. 3 Credits.
Typically offered in Fall & Spring.

PHY 105. Structure of the Universe. 3 Credits.
A survey of phenomena and objects in the universe from the very smallest distance scales to the grandest in the cosmos. Includes a historical consideration of the developments of modern theories of the physical world. Gen Ed Attribute: Science Distributive Requirement.
Typically offered in Fall & Spring.

Use and preparation of engineering drawings. Topics include the use of instruments, linework, geometric construction, lettering, four types of projections, dimensioning, and sections. Typically offered in Fall.

PHY 116. Engineering Graphics II. 1 Credit.
A continuation of PHY 115, to include topics such as layout, detail, and assembly drawings, developments, auxiliary drawings, various types of drafting, machine tool processes, and computer drafting. Pre / Co requisites: PHY 116 requires prerequisite of PHY 115. Typically offered in Spring.

PHY 123. Food, Fire, and Physics: The Science of Cooking. 3 Credits.
An exploration of food and cooking from a physical science perspective. Principles of soft matter physics (e.g. phase diagram, intermolecular forces, rheology, diffusion, self-assembly, polymer physics) are discussed and used to gain insight into food and cooking. Gen Ed Attribute: Science Distributive Requirement. Typically offered in Spring.

PHY 125. Theology and Science: Enemies or Partners. 3 Credits.
An inquiry into the relationship of theology to the natural sciences. Team taught by both a physicist and a philosopher, the course investigates how ideas of God have been affected by advances in physics and biology. Gen Ed Attribute: Humanities Distributive Requirement, Science Distributive Requirement. Typically offered in Spring.

PHY 130. General Physics I. 4 Credits.
LEC (3), LAB (2), DIS (1)

PHY 140. General Physics II. 4 Credits.
LEC (3), LAB (2), DIS (1)

PHY 170. Physics I. 4 Credits.
LEC (3), LAB (2), DIS (1)
An introductory laboratory-based course. Includes mechanics, kinetic theory, waves, heat, and thermodynamics. The laboratory emphasizes error analysis, the writing of technical reports, and data analysis using computers. Pre / Co requisites: PHY 170 requires a prerequisite of MAT 161. Gen Ed Attribute: Science Distributive Requirement. Typically offered in Fall & Spring.

PHY 180. Physics II. 4 Credits.
LEC (3), LAB (2), DIS (1)

PHY 240. Introduction to Modern Physics. 3 Credits.
An atomic view of electricity and radiation, atomic theory, special relativity theory, X-rays, radioactivity, nuclear fission, and introductory quantum mechanics. Pre / Co requisites: PHY 240 requires prerequisites of PHY 140 or PHY 180 and PHY 162. Typically offered in Spring & Summer.

PHY 260. Engineering Statics. 3 Credits.
Composition and resolution of forces, equivalent force systems, equilibrium of particles and rigid bodies, centroids and center of gravity, analysis of simple structures, internal forces in beams, friction, moments and products in inertia, and methods of virtual work. Pre / Co requisites: PHY 260 requires prerequisites of PHY 130 or PHY 170 and PHY 162. Typically offered in Spring.

PHY 300. Mechanics. 3 Credits.
Particle kinematics, dynamics, energy, and momentum considerations; oscillations; central force motion; accelerated reference frames; rigid body mechanics; Lagrangian mechanics. Pre / Co requisites: PHY 300 requires prerequisites of PHY 140 or PHY 190 and PHY 162. Typically offered in Fall.

PHY 310. Intermediate Physics Lab I. 3 Credits.
LEC (1), LAB (2)
A lecture and laboratory course designed to familiarize students with modern physics laboratory equipment and practices through a series of experiments. Students write three research papers and give one research talk describing the experiments and their results in a style consistent with scientific conventions. Pre / Co requisites: PHY 310 requires a prerequisite of PHY 240. Gen Ed Attribute: Writing Emphasis. Typically offered in Fall & Spring.

PHY 320. Intermediate Physics Lab II. 3 Credits.
LEC (1), LAB (2)
This course is a continuation of PHY 310, a lecture and laboratory course designed to familiarize students with modern physics laboratory equipment and practices through a series of experiments. Students write three research papers and give one research talk describing the experiments and their results in a style consistent with scientific conventions. Pre / Co requisites: PHY 320 requires a prerequisite of PHY 310. Gen Ed Attribute: Writing Emphasis. Typically offered in Fall & Spring.

PHY 330. Electronics I. 3 Credits.
Emphasis is divided between theory and experiment. The course begins with a brief review of resistive and RC voltage dividers. Electronic circuits studied include basic operational amplifiers, timers, instrumentation amplifiers, logic circuits, flip flops, counters, and timers. Pre / Co requisites: PHY 330 requires prerequisites of MAT 161 and PHY 140 or PHY 180. Typically offered in Fall.

PHY 350. Heat and Thermodynamics. 3 Credits.
Equations of state, first and second laws of thermodynamics, ideal and real gases, entropy, and statistical mechanics. Pre / Co requisites: PHY 350 requires prerequisite of PHY 240 or co-requisite of MAT 262. Typically offered in Fall.

PHY 370. Mathematical Physics. 3 Credits.
Selected topics in mathematics applied to problems in physics, ordinary differential equations, vector calculus, Fourier analysis, matrix algebra, and eigenvalue problems. Pre / Co requisites: PHY 370 requires prerequisites of MAT 261 and PHY 140 or PHY 180. Typically offered in Fall & Spring.

PHY 390. Fundamentals of Astrophysics. 3 Credits.
An advanced physics course that deals with a broad range of topics in modern astrophysics. Topics include, but are not limited to, astronomical measurements, celestial mechanics, radiative transfer theory, stellar structure, and both newtonian and relativistic cosmology. Pre / Co requisites: PHY 390 requires prerequisites of PHY 240. Typically offered in Spring.
PHY 400. Analytical Dynamics. 3 Credits.
Wave propagation, Lagrange's equations and Hamilton's principle, rigid body motion, and special relativity.
Pre / Co requisites: PHY 400 requires prerequisites of PHY 300 and MAT 343.
Typically offered in Spring.

PHY 410. Optics. 3 Credits.
Geometrical and physical optics. Reflection and refraction at surfaces, lenses, interference and diffraction, and polarization.
Pre / Co requisites: PHY 410 requires prerequisites of PHY 140 or PHY 180 and co-requisite of MAT 262.
Typically offered in Fall.

PHY 420. Quantum Mechanics I. 3 Credits.
This course is an introductory quantum mechanics course. The following fundamental topics will be covered: the Schrodinger equation, Solutions to systems with stationary states (potential step, potential well, potential barrier, and harmonic oscillator), an abstract view of quantum mechanics (Dirac notation, Operator methods), the hydrogen atom, Angular momentum, and Spin.
Pre / Co requisites: PHY 420 requires prerequisites of PHY 240 and PHY 300 and MAT 343 or PHY 370.
Typically offered in Fall.

PHY 425. Quantum Mechanics II. 3 Credits.
This course is the second-semester quantum mechanics course. The following fundamental topics will be covered: Time-independent Perturbation Theory, the Variational Principle, the WKB approximation, time-dependent Perturbation Theory, and advanced topics.
Pre / Co requisites: PHY 425 requires prerequisites of PHY 420.
Typically offered in Spring.

PHY 430. Electricity and Magnetism I. 3 Credits.
Electrostatics of point charges and extended charge distributions, fields in dielectrics, and magnetic fields due to steady currents. Ampere's Law and induced emfs. Topics in electromagnetic waves as time permits.
Pre / Co requisites: PHY 430 requires prerequisites of PHY 300 and MAT 343 or PHY 370.
Typically offered in Fall.

PHY 440. Microcomputer Electronics. 3 Credits.
Laboratory study of special circuits, integrated circuits, microcomputers, and microcomputer interface applications.
Pre / Co requisites: PHY 440 requires prerequisites of PHY 330 and MAT 343 or PHY 370.
Typically offered in Spring.

PHY 450. Advanced Physics Lab I. 1 Credit.
A course to familiarize students with contemporary laboratory equipment and methods.
Typically offered in Fall.

PHY 460. Advanced Physics Lab II. 1 Credit.
A continuation of PHY 450.
Typically offered in Spring.

PHY 470. Seminar in Physics. 1 Credit.
Oral and written reports on approved topics. Variation in topics from year to year, depending on the interest and needs of students.
Typically offered in Spring.
Repeatable for Credit.

PHY 480. Special Topics in Physics. 1-3 Credits.
Topics of special interest to be presented once or twice. Enrollment requirements to be specified by the instructor. Course may be repeated by student for credit any number of times when different topics are presented.
Typically offered in Spring.
Repeatable for Credit.

PHY 490. Introduction to Research. 1-9 Credits.
Specific problems in consultation with the faculty adviser.
Typically offered in Fall.
Repeatable for Credit.