

# PHYSICS (PHYS)

## PHYS 1500 Conceptual Physics 3 s.h.

A conceptual treatment of selected theories and laws of classical and modern physics and their application to the understanding of natural phenomena.

The evolution of these laws from hypotheses to functional relationships examined in a historical context. Not applicable to the major in Physics or to the combined major in Physics and Astronomy.

**Gen Ed:** Natural Science.

## PHYS 1500L Conceptual Physics Laboratory 1 s.h.

Experimental work designed to supplement PHYS 1500. Three hours per week.

**Prereq. or Coreq.:** PHYS 1500.

## PHYS 1501 Fundamentals of Physics 1 4 s.h.

Topics include kinematics, forces, energy, momentum, rotational kinematics, torque, angular momentum, simple harmonic motion, and mechanical waves. Not recommended for mathematics, chemistry, physics, or engineering majors.

**Prereq.:** C or better in MATH 1507 or MATH 1510 and MATH 1511, or readiness for MATH 1571 or equivalent, or at least level 40 on the Mathematics Placement Test.

**Gen Ed:** Natural Science.

## PHYS 1501L Fundamentals of Physics Laboratory 1 1 s.h.

Experimental work designed to supplement the PHYS 1501, PHYS 1502 sequence. Three hours per week.

**Prereq. or Coreq.:** PHYS 1501.

## PHYS 1501R Fundamentals of Physics 1 Recitation 1 s.h.

Discussion and problem solving based on current material in PHYS 1501. Concurrent with: PHYS 1501.

## PHYS 1502 Fundamentals of Physics 2 3 s.h.

Study of electricity, magnetism, and light. Topics include electric charge, electric forces and fields, electric potential, capacitance and resistance in direct current circuits, basic circuit analysis, magnetic forces and fields, induced emf, inductance, reflections, refraction, geometric optics as applied to lenses and mirrors, interference, and diffraction.

**Prereq.:** PHYS 1501 or equivalent.

**Gen Ed:** Natural Science.

## PHYS 1502L Fundamentals of Physics Laboratory 2 1 s.h.

Experimental work designed to supplement the PHYS 1501, PHYS 1502 sequence. Three hours per week.

**Prereq. or Coreq.:** PHYS 1502.

## PHYS 1506 Physics for Health Care 3 s.h.

The basic laws of physics applied to various biological and physiological problems. Designed for majors in the allied health fields, e.g., Respiratory care. Not applicable to the major in Physics or to the combined major in Physics and Astronomy.

## PHYS 2607 Physical Science for Middle and Secondary Education 4 s.h.

Selected topics in physical science appropriate to the middle- and secondary-level curriculum. Emphasis on diverse hands-on classroom activities, and multiple approaches to communicating basic concepts in physical science. Topics include simple machines, light and sound, batteries and bulbs, physical properties of solids, liquids and gases.

**Prereq.:** MATH 1501 or at least level 3 on the Mathematics Placement Test and admission to TELS Upper Division Status.

**Gen Ed:** Natural Science.

## PHYS 2608 Sound 3 s.h.

The physical principles accounting for the production, propagation, and perception of sound waves. The relevance of these principles to phenomena ranging from hearing to the operation of various musical instruments. Introduction to auditorium acoustics. This course is designed for Music majors. Not applicable to the Physics major or to the combined Astronomy and Physics major.

**Gen Ed:** Natural Science.

## PHYS 2610 General Physics 1 4 s.h.

A course in mechanics; the kinematics and dynamics of masses in translation and rotation; Newton's Laws; gravity; the conservation laws of energy and momentum; simple harmonic motion and introduction to wave motion and sound.

**Prereq.:** High school physics or PHYS 1501.

**Prereq. or Coreq.:** MATH 1571.

**Gen Ed:** Natural Science.

## PHYS 2610L General Physics Laboratory 1 1 s.h.

Experimental work designed to supplement the PHYS 2610, 2611 sequence. Three hours per week.

**Prereq. or Coreq.:** PHYS 2610 or PHYS 2601 for PHYS 2610L.

## PHYS 2610R General Physics 1 Recitation 1 s.h.

Discussion and problem solving based on current material in PHYS 2610.

Concurrent with: PHYS 2610.

## PHYS 2611 General Physics 2 4 s.h.

Study of electric and magnetic fields and their effects; introduction to electric circuits; light as an electromagnetic wave; introduction to geometrical and physical optics.

**Prereq.:** PHYS 2610.

**Prereq. or Coreq.:** MATH 1572.

**Gen Ed:** Natural Science.

## PHYS 2611L General Physics laboratory 2 1 s.h.

Experimental work designed to supplement the PHYS 2610, 2611 sequence. Three hours per week.

**Prereq. or Coreq.:** PHYS 2611 or PHYS 2602.

## PHYS 2617 Physical Science for Middle and High School Teachers 3 s.h.

Selected topics in physical science appropriate to the middle- and secondary-level curriculum. Emphasis on diverse hands-on classroom activities, and multiple approaches to communicating basic concepts in physical science. Topics include motion, forces, simple machines, light and sound, batteries and bulbs, physical properties of solids, liquids and gases.

**Prereq.:** At least level 35 on the Mathematics Placement Test (ALEKS 46-60) and admission to TELS Upper Division Status.

**Gen Ed:** Natural Science.

## PHYS 2617L Laboratory Physical Science for Middle School and High School Teachers 1 s.h.

Laboratory course to accompany PHYS 2617 Physical Science for Middle School and Secondary Teachers.

**Coreq.:** PHYS 2617.

**Gen Ed:** Natural Science.

## PHYS 3703 Classical Mechanics and Dynamics 4 s.h.

Kinematics and dynamics of particles and rigid bodies in inertial and non-inertial reference systems. Linear and non-linear oscillations and oscillating systems. Conditions for chaotic motion. Gravitational and central forces. Lagrangian and Hamiltonian mechanics.

**Prereq.:** PHYS 2611 or ECEN 2633 and prerequisite or concurrent with MATH 3705.

## PHYS 3704 Modern Physics 4 s.h.

Special Theory of Relativity. Quantum phenomena related to electromagnetic radiation and material particles. The Bohr model of the hydrogen atom; the Schroedinger equation; the Heisenberg Uncertainty Principle. Wave mechanics of single particles in one-dimensional potentials. Selected topics in atomic, nuclear and condensed matter physics.

**Prereq.:** PHYS 2611 or ECEN 2633 and prerequisite or concurrent with MATH 2673.

## PHYS 3704L Modern Physics Laboratory 1 s.h.

Experimental work designed to supplement PHYS 3704. Three hours per week.

**Prereq. or Coreq.:** PHYS 3704.

**PHYS 3705 Thermodynamics and Classical Statistical Dynamics 3 s.h.**

Principles and theorems of thermodynamics derived from the observable macroscopic properties related to temperature, heat, and the underlying statistical origins of thermodynamic processes. Includes the laws of thermodynamics, entropy, state functions, differential equations of state, Maxwell relations, and Maxwell-Boltzmann statistics.

**Prereq.:** PHYS 2611 or ECEN 2633 and prerequisite or concurrent with MATH 2673.

**PHYS 3705L Thermodynamics and Classical Statistical Mechanics Laboratory 1 s.h.**

Experimental work designed to supplement PHYS 3705. Three hours per week.

**Prereq. or Coreq.:** PHYS 3705.

**PHYS 3741 Electromagnetic Field Theory 1 3 s.h.**

Intermediate theory of electric and magnetic fields. Topics include electric field, scalar potential, techniques for calculating scalar potential (method of images, Laplace's and Poisson's equations, multipole expansion, Green's Function approach), dielectrics and polarization, Maxwell's equations and their application to the propagation of electromagnetic waves including reflection, refraction, transmission, and absorption; guided waves, retarded potentials, radiating systems, special relativity. Must be taken in sequence, before PHYS 3742.

**Prereq.:** MATH 3705 and either PHYS 2611 or ECEN 2633.

**PHYS 3742 Electromagnetic Field Theory 2 3 s.h.**

Intermediate theory of electric and magnetic fields. Topics include electric field, scalar potential, techniques for calculating scalar potential (method of images, Laplace's and Poisson's equations, multipole expansion, Green's Function approach), dielectrics and polarization, Maxwell's equations and their application to the propagation of electromagnetic waves including reflection, refraction, transmission, and absorption; guided waves, retarded potentials, radiating systems, special relativity.

**Prereq.:** PHYS 3741.

**PHYS 3750 Mathematical Physics 3 s.h.**

The mathematics techniques required in the study of classical, statistical, and quantum mechanics, and field theory.

**Prereq.:** MATH 3705 and either PHYS 2611 or ECEN 2633.

**PHYS 4805 Undergraduate Physics Research 3 s.h.**

Research conducted under the direction of a faculty member. The grading is Traditional/PR.

**Prereq.:** PHYS 3703 and PHYS 3704.

**Gen Ed:** Capstone.

**PHYS 5810 Quantum Mechanics and Quantum Statistical Mechanics 1 3 s.h.**

The postulates of wave mechanics, Matrix mechanics, angular momentum coupling, scattering, perturbation theory, intrinsic spin, emission and absorption of radiation. Fermi-Dirac and Bose-Einstein statistics with applications in quantum theory. Must be taken in sequence before PHYS 5811.

**Prereq.:** PHYS 3703 and PHYS 3704 and MATH 3705.

**PHYS 5811 Quantum Mechanics and Quantum Statistical Mechanics 2 3 s.h.**

The postulates of wave mechanics, Matrix mechanics, angular momentum coupling, scattering, perturbation theory, intrinsic spin, emission and absorption of radiation. Fermi-Dirac and Bose-Einstein statistics with applications in quantum theory. Must be taken in sequence.

**Prereq.:** PHYS 5810.

**PHYS 5830 Condensed Matter Physics 3 s.h.**

Selected topics in condensed matter physics: mechanical, thermal, electrical, and magnetic properties of amorphous and crystalline materials; crystal structures.

**Prereq.:** PHYS 3704.

**PHYS 5835 Spectroscopy 3 s.h.**

Treatment of atomic, molecular, and nuclear structure based on the analysis of electromagnetic and other spectra.

**Prereq.:** PHYS 3704.

**PHYS 5835L Spectroscopy Laboratory 1 s.h.**

Experimental work designed to supplement PHYS 5835. Three hours per week.

**Prereq. or Coreq.:** PHYS 5835.

**PHYS 5849 Computational Methods for problems in the Physical Sciences 3 s.h.**

PHYS 5849: Computational Methods for the Physical Sciences 3 s.h. Provides application of the techniques discussed in the class to real world situations.

Cross-Listed: Will be cross-listed with CSIS 5849 and MATH 5849 3.0 s.h.

PHYS 5849: Computational Methods for the Physical Sciences 3 s.h. **Prereq.:** MATH 3705 and PHYS 2610.

**PHYS 5850 Special Topics in Physics 2-4 s.h.**

The study of a standard topic at greater depth, of the development of a correlated background for areas of physical knowledge, or the physical and educational experimentation necessary to develop new physics courses. May be repeated twice.

**Prereq.:** Senior standing in Physics, Electrical Engineering, or Education.

**PHYS 5890 Physics and Astronomy for Educators 1-4 s.h.**

Intensive study of selected topics of current interest in Physics education. Not applicable to the major in Physics or the combined Astronomy and Physics major. May be repeated for different topics.

**Prereq.:** Admission to upper-division status in the College of Education or to the Graduate School.

**PHYS 6900 Physics Education Workshop 1-3 s.h.**

Intensive study of selected topics of current interest in physics education. May be repeated. Grading is S/U.

**PHYS 6930 Semiconductor Materials and Devices 3 s.h.**

Material properties of semiconductors, the physics and principles of operation of various semiconductor devices including Schottky diodes, PN junction diodes, photodetectors, LEDs, and bipolar junction transistors. Electrical, Optical, and Physical characterization methods used for semiconductor materials and devices.

**Prereq.:** Completion of at least one of the following courses or their equivalent: PHYS 3742, PHYS 3750, PHYS 5810, or PHYS 5830.