PHYS - PHYSICS (PHYS)

PHYS 101 Freshman Physics Orientation  
Credit 1. 1 Lecture Hour.  
Critical thinking skills and problem solving in physics: time management and teaming skills. For physics majors. Registration by non-majors requires approval of instructor.  
**Prerequisite:** PHYS 218 or registration therein; MATH 171 or registration therein; or approval of instructor.  
**PHYS 102 Freshman Physics Orientation II**  
Credit 1. 1 Lecture Hour.  
Critical thinking skills and problem solving in physics: time management and teaming skills. For physics majors. Registration by non-majors requires approval of instructor.  
**Prerequisites:** PHYS 101, PHYS 208 or registration therein; MATH 172 or registration therein; or approval of instructor.  
**PHYS 109/ASTR 109 Big Bang and Black Holes**  
Credits 3. 3 Lecture Hours.  
Designed to give an intuitive understanding of the Big Bang and Black Holes, without mathematics, and de-mystify them for the non-scientist.  
**Cross Listing:** ASTR 109/PHYS 109.  
**PHYS 119/ASTR 119 Big Bang and Black Holes: Laboratory Methods**  
Credit 1. 2 Lab Hours.  
Hands-on understanding of the concepts surrounding the Big Bang and Black Holes; emphasis on the evidence-based decision making process, methods and presentation; for non-scientists. Companion course for ASTR 109/PHYS 109/PHYS 109/ASTR 109.  
**Prerequisite:** ASTR/PHYS 109/ASTR 109 or registration therein.  
**Cross Listing:** ASTR 119/PHYS 119.  
**PHYS 123 Physics for Future Presidents**  
Credits 3. 3 Lecture Hours.  
Physics needed to be an effective policy maker or world leader but appropriate for any citizen, since all citizens need to understand the world in which they live and work; fundamental principles of physics made comprehensible and usable by those not in science- or math-related fields.  
**Prerequisite:** Basic math skills.  
**PHYS 201 College Physics**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
**PHYS 202 College Physics**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(PHYS 1302 and 1102, 1402) College Physics. Continuation of PHYS 201. Fundamentals of classical electricity and light; introduction to contemporary physics.  
**Prerequisite:** PHYS 201.  
**PHYS 205 Concepts of Physics**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
General survey physics course for K-8 preservice teachers integrating physics content and laboratory activities relevant to physics-related subject matter included in the current Texas and national standards for elementary school science; includes aspects of mechanics, waves, electricity, magnetism and modern physics.  
**Prerequisite:** Major in interdisciplinary studies or interdisciplinary technology or approval of instructor.  
**PHYS 208 Electricity and Optics**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
(PHYS 2326 and PHYS 2126, PHYS 2426) Electricity and Optics. Continuation of PHYS 218. Electricity, magnetism, and introdution to optics. Primarily for students in science and engineering.  
**Prerequisites:** PHYS 218; MATH 152 or MATH 172 or registration therein.  
**PHYS 218 Mechanics**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
**Prerequisite:** MATH 151 or MATH 171 or registration therein.  
**PHYS 221 Optics and Thermal Physics**  
Credits 3. 3 Lecture Hours.  
Wave motion and sound, geometrical and physical optics, kinetic theory of gases, laws of thermodynamics.  
**Prerequisites:** PHYS 208; MATH 152 or MATH 172; registration in MATH 221, MATH 308.  
**PHYS 222 Modern Physics for Engineers**  
Credits 3. 3 Lecture Hours.  
Atomic, quantum, relativity and solid state physics.  
**Prerequisites:** PHYS 208 or PHYS 219; MATH 308 or registration therein.  
**PHYS 225 Electronic Circuits and Applications**  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Linear circuit theory and applications of solidstate diodes, bipolar and field-effect transistors, operational amplifiers and digital systems.  
**Prerequisites:** PHYS 208; MATH 308.  
**PHYS 285 Directed Studies**  
Credits 1 to 4. 1 to 4 Other Hours.  
Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum; intended for use as lower-level credit.  
**Prerequisite:** Approval of department head.  
**PHYS 289 Special Topics in...**  
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 6 Lab Hours.  
Selected topics in an identified area of physics. May be repeated for credit.  
**Prerequisite:** Approval of instructor.  
**PHYS 291 Research**  
Credits 0 to 4. 0 to 4 Other Hours.  
Research conducted under the direction of faculty member in physics. May be repeated 2 times for credit.  
**Prerequisites:** Freshman or sophomore classification and approval of instructor.  
**PHYS 302 Advanced Mechanics I**  
Credits 3. 3 Lecture Hours.  
Classical mechanics of particles and rigid bodies, both by direct application of Newton's equations and by Lagrangian methods; applications to gravity and other central forces, coupled oscillators, non-inertial reference frames, and the statics and dynamics of fluids with and without viscosity; introduction to statics of structures.  
**Prerequisites:** MATH 221 or MATH 251 or MATH 253; MATH 308; PHYS 208, PHYS 218, PHYS 222, and PHYS 331; concurrent enrollment in PHYS 332; for students with other backgrounds, approval of instructor.
PHYS 303 Advanced Mechanics II
Credits 3. 3 Lecture Hours.
Classical mechanics of particles and rigid bodies with an emphasis on
Lagrangian and Hamiltonian methods; applications to chaos, scattering,
coupled oscillations, and continua, including sound in fluids; mechanical
implications of special relativity; introduction to drag and turbulence in
fluids; introduction to elasticity in solids; Euler buckling instability.
Prerequisites: PHYS 302 and PHYS 332.

PHYS 304 Advanced Electricity and Magnetism I
Credits 3. 3 Lecture Hours.
Electrostatics; dielectrics; electrical current and circuits; magnetic fields
and materials; induction; Maxwell’s equations.
Prerequisites: PHYS 221; PHYS 331; concurrent enrollment in PHYS 332;
junior or senior classification.

PHYS 305 Advanced Electricity and Magnetism II
Credits 3. 3 Lecture Hours.
Radiation and optics. Electromagnetic waves; radiation; reflection
and refraction; interference; diffraction; special relativity applied to
electrodynamics.
Prerequisite: PHYS 304.

PHYS 309 Modern Physics
Credits 3. 3 Lecture Hours.
Special relativity; concepts of waves and particles; introductory quantum
mechanics.
Prerequisites: PHYS 221; MATH 221; MATH 308.

PHYS 327 Experimental Physics I
Credits 2. 1 Lecture Hour. 2 Lab Hours.
Laboratory experiments in modern physics and physical optics with an
introduction to current, state-of-the-art recording techniques.
Prerequisites: PHYS 225; PHYS 309.

PHYS 328 Experimental Physics II
Credit 1. 1 Lecture Hour. 1 Lab Hour.
Laboratory experiments in modern physics and physical optics with an
introduction to current, state-of-the-art recording techniques.
Prerequisites: PHYS 225; PHYS 309, PHYS 327.

PHYS 331 Theoretical Methods for Physicists I
Credits 3. 3 Lecture Hours.
Applications involving vectors; vector and additional methods for
advanced electricity and magnetism; relationship and solutions of
classical wave equation, heat equation, and Schrodinger equation;
harmonic motion on finite or periodic lattice and in continuum; tensor and
matrix notation in classical mechanics and electricity and magnetism.
Prerequisites: MATH 221 or MATH 251 or MATH 253; MATH 308;
PHYS 208 or PHYS 219, PHYS 218, and PHYS 221; restricted to physics
majors.

PHYS 332 Theoretical Methods for Physicists II
Credits 3. 3 Lecture Hours.
Methods to solve the important equations of theoretical physics,
emphasizing the effects of boundary conditions and quantization on their
solutions and restricted to the essential physical symmetries associated
with free space, spheres, cylinders, and rectangles; if time permits,
introduction to symmetries in physics and to asymptotic methods.
Prerequisites: PHYS 222 or PHYS 309; PHYS 331; restricted to physics
majors.

PHYS 401 Computational Physics
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Introduction to computational and simulational techniques widely used in
physics applications and research, including trajectory integration, wave
motion analysis, molecular dynamics, Monte Carlo methods, statistical
mechanics of spin systems, phase transitions, quantum evolution, bound
state problems, and variational methods.
Prerequisites: PHYS 302; PHYS 309, PHYS 331; PHYS 332; knowledge
of a high level language such as FORTRAN or C (This prerequisite can
be obtained by taking CSCE 206 or the equivalent.); junior or senior
classification.

PHYS 408 Thermodynamics and Statistical Mechanics
Credits 4. 4 Lecture Hours.
Statistical method, macroscopic thermodynamics, kinetic theory, black
body radiation, Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac
statistics.
Prerequisites: PHYS 331; PHYS 412; junior or senior classification.

PHYS 412 Quantum Mechanics I
Credits 3. 3 Lecture Hours.
Postulates of wave mechanics; wave packets; harmonic oscillator;
central field problem; hydrogen atom; approximation methods.
Prerequisites: PHYS 302; PHYS 309; PHYS 332; junior or senior
classification.

PHYS 414 Quantum Mechanics II
Credits 3. 3 Lecture Hours.
Continuation of PHYS 412. Electron spin; addition of angular momenta;
atomic structure; time dependent perturbations; collision theory;
application of quantum mechanics to atomic, solid state, nuclear or high
energy physics.
Prerequisite: PHYS 412.

PHYS 416 Physics of the Solid State
Credits 3. 3 Lecture Hours.
A survey of solid state physics; an introduction to crystal structures and
the physics of electrons, lattice vibrations and photons; applications
to semiconductors; magnetism; superconductivity; physics of
nanostructures; brief introduction to selected current topics in
condensed matter physics.
Prerequisites: PHYS 304 and PHYS 412.

PHYS 420 Concepts, Connections, and Communication
Credit 1. 1 Lecture Hour.
Stars and atoms; new physics; post-Newtonian universe.
Prerequisite: Junior or senior classification.

PHYS 425 Physics Laboratory
Credits 2. 6 Lab Hours.
Experiments in nuclear, atomic, and molecular physics using modern
instrumentation and equipment of current research.
Prerequisite: PHYS 327 or equivalent.

PHYS 426 Physics Laboratory
Credits 2. 6 Lab Hours.
Experiments in solid state and nuclear physics. Modern instrumentation
and current research equipment are employed.
Prerequisite: PHYS 327 or equivalent.
PHYS 444 Art of Communication in Physics I: Communicating Science to Scientists
Credits 2. 2 Lecture Hours.
Communication in physics, communicating physics to scientists, scientific presentations; scientific writing; information retrieval; reading technical publications.
Prerequisite: Knowledge of oral and written English; junior or senior classification.

PHYS 445 Art of Communication in Physics II: Communicating Science to Non-Scientists
Credit 1. 1 Lecture Hour.
Communication in physics, communicating physics to scientists, scientific presentations; scientific writing; job and graduate school application; job interview.
Prerequisites: PHYS 444; knowledge of oral and written English; junior or senior classification.

PHYS 485 Directed Studies
Credits 1 to 12. 1 to 12 Other Hours.
Special work in laboratory or theory to meet individual requirements in cases not covered by regular curriculum.
Prerequisite: Approval of department head.

PHYS 489 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.
Selected topics in an identified field of physics. May be repeated for credit.
Prerequisite: Approval of instructor.

PHYS 491 Research
Credits 0 to 4. 0 to 4 Other Hours.
Research conducted under the direction of faculty member in physics. May be repeated for credit. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.
Prerequisites: Junior or senior classification and approval of instructor.