

## 2015-2016 Physics and Astronomy Course Descriptions

**PHY 100N How Things Work.** A non-mathematical introduction to the science of physics intended for non-science students. Topics covered will be from elementary mechanics, properties of matter, sound, heat, electricity, magnetism, light, atomic physics, nuclear physics and relativity. Emphasis will be on the development of a solid qualitative understanding of the physical world. Demonstrations and activities involving physical phenomena will accompany lectures. Six contact hours per week. 4 Semester Hours.

**PHY 101N General Physics I.** A practical and theoretical introduction to physics covering elements of classical mechanics including kinematics, forces, momentum conservation, energy conservation, work and rotational motion. Elements of vector analysis and calculus are presented. Three class hours and one three-hour laboratory session per week. Corequisite: MTH 140, MTH 141 or higher. 4 Semester Hours.

**PHY 102 General Physics II.** A practical and theoretical introduction to physics covering elements of thermodynamics, electricity and magnetism, waves, optics and quantum mechanics. Elements of vector analysis and calculus are presented. Three class hours and one three-hour laboratory session per week. Prerequisite: PHY 101 and MTH 140. 4 Semester Hours.

**PHY 120N Astronomy.** This course is designed to introduce students to the field of astronomy. Topics covered include historical astronomy, the Solar System, stars, galaxies, and cosmology. Laboratory sessions include observing constellations and astronomical objects through the observatory's telescopes. Six contact hours per week. 4 Semester Hours.

**PHY 199 Special Topics in Physics.** See All-University 199 course descriptions

**PHY 200 Planets and Moons.** This course is an introduction to the physical and geological study of the properties, origin and evolution of planets, moons, comets and asteroids. The methods used to explore our solar system and planetary systems of other stars will also be studied. Four class hours per week. Prerequisite: MTH 100 or equivalent mathematics in high school. 4 Semester Hours.

**PHY 201 Einstein's Universe – The Big Bang, Black Holes and Beyond.** A study, accessible to non-science majors, of modern scientific cosmology and other ramifications of Einstein's General Theory of Relativity. What is the nature of the universe, and what rules govern it? What is the history of the universe, and what is its future? Do black holes really exist? Could there be more than one universe? These questions, scientific theories related to them, and the observations that lead to those theories will be discussed. Four class hours per week. Prerequisite: MTH 100 or equivalent mathematics in high school. 4 Semester Hours.

**PHY 211 Modern Physics.** A study of topics in modern physics including special relativity, the quantization of matter and energy, atomic structure, the Schrodinger equation, the basic physics of atoms, spectroscopy and the periodic table. Four class hours per week. Prerequisite: PHY 102. Corequisite: MTH 142. 4 Semester Hours.

**PHY 218 Thermodynamics and Statistical Mechanics.** A study of thermodynamics, statistical mechanics and kinetic theory. Core concepts include entropy and the second law of thermodynamics, the canonical probability distribution and the partition function and the chemical potential. Additional topics may include photons and phonons, chemical and phase equilibrium, transport processes and critical phenomena. Four class hours per week. Prerequisites: PHY 102, MA 142 or permission of the instructor. 4 Semester Hours.

**PHY 220 Observational Astronomy.** An introduction to aspects of modern observational astronomy. Includes astronomical instrumentation, time, star charts and catalogs, astrometry, photometry, spectroscopy and other selected topics. Particular attention is paid to CCD imaging and data reduction. Three class hours per week plus laboratory and evening observing sessions on individually arranged schedules. Prerequisites: PHY 120 and MTH 140, or permission of the instructor. 4 Semester Hours.

**PHY 230 Electronics.** A laboratory-based course in the basic principles of practical and theoretical modern electronics. Topics include circuit analysis, semiconductor devices, operational amplifiers, digital electronics and computer interface. Two three-hour lecture/laboratory meetings per week. Prerequisite: PHY 102. 4 Semester Hours.

**PHY 233 Advanced Lab I.** A hands-on course in the basic methods of experimental physics covering topics from classical mechanics, thermodynamics and modern physics. This includes the use of computers for data acquisition and analysis and the communication of scientific results through written and oral presentations. Three laboratory hours per week. Prerequisite: PHY 102. 2 Semester Hours.

**PHY 254 Science, Sound and Music.** This course examines the science of sound, music and acoustics, exploring ideas including how sound is produced and perceived, the effect of room acoustics on sound and how musical instruments work. Four class hours per week. Prerequisites: MTH 100 or equivalent mathematics in high school. 4 Semester Hours.

**PHY 270 Seminar I.** Students review relevant topics from physics and astronomy by presenting formally to the class. 1 Sem. Hour

**PHY 299 Special Topics in Physics.** See All-University 299 course description.

**PHY 302 Analytical Mechanics.** A study of classical statics and dynamics including translational and rotational motion, work and energy, damped and undamped oscillating systems, wave propagation, Lagrange's equations, the Hamiltonian and tensors. Four class hours per week. Prerequisites: PHY 101 and MTH 142. 4 Semester Hours.

**PHY 307 Electromagnetic Theory.** Topics to be covered include electrostatics and electrostatic energy, dielectric media, electric currents, magnetic properties of matter, electromagnetic induction and Maxwell's equations. Four class hours per week. Prerequisites: PHY 102 and PHY 302. 4 Semester Hours.

**PHY 312 Atomic, Nuclear and Particle Physics.** A continued exploration of topics in modern physics including quantum statistics, nuclear physics, solid state physics and elementary particles. Four class hours per week. Prerequisite: PHY 211. 4 Semester Hours.

**PHY 322 Astrophysics.** Introduction to radiative transport theory, stellar atmospheres and interiors. Selected topics from among interstellar matter, variable stars, stellar dynamics, star clusters, galactic structure, general relativity and cosmology are treated. Four class hours per week. Prerequisites: PHY 120. MA 142 (must be taken previously or concurrently). 4 Semester Hours.

**PHY 333 Advanced Laboratory II.** A hands-on course in the basic methods of experimental physics covering topics from electrodynamics, modern physics and quantum mechanics. This includes the use of computers for data acquisition and analysis and the communication of scientific results through written and oral presentations. Three laboratory hours per-week. Prerequisite: PHY 233. 2 Semester Hours.

**PHY 362 Special Assignments in Advanced Physics or Research.** This course permits students, under the direction of a faculty member, to pursue special investigations of interest in physics or in physics-related computer areas. Schedules are arranged individually; the time commitment expected is four hours per week. Prerequisite: Consent of the instructor. May be repeated for credit. 2 Semester Hours.

**PHY 370 Seminar II.** Students review relevant topics from physics and astronomy by presenting formally to the class. Presentations are longer and more in depth in comparison to PHY 270. Prerequisites: PHY 270. 1 Semester Hour.

**PHY 399 Special Topics in Physics.** See All-University 399 course description.

**PHY 409 Quantum Mechanics.** Historical introduction, uncertainty principle, barrier penetration, Hilbert space, Schrodinger formulation, Heisenberg formulation, SU groups, operator concepts, Poisson, Lagrange, and commutator brackets, Dirac four-vectors, introduction to field quantization, and perturbation theory are among the topics presented. Four class hours per week. Prerequisites: PHY 211, PHY 302 and MTH 333. 4 Semester Hours.

**PHY 445 Methods of Mathematical Physics.** A study of the interface between mathematics and physics focusing particularly on partial differential equations. Mathematical modeling and various analytical and numerical solutions will be covered. Additional topics may include special functions, the calculus of residues and group theory. Four class hours per week. Prerequisites: PHY 302 or MTH 333. 4 Semester Hours.

**PHY 456 Research.** This course may serve as the Senior Culminating Experience if arranged in advance with the student's advisor. Class meetings and scheduling are arranged with each student individually; the time commitment expected is eight hours per week. Prerequisites: Declared and accepted major in physics and permission of the department chair. May be repeated for credit. 4 Semester Hours.

**PHY 460 Senior Thesis I.** This course involves the independent investigation of a problem in physics and/or astronomy. Emphasis is on generating appropriate research questions, reading relevant literature and designing a realistic plan of study. The course meets 1 hour a week with all enrolled to discuss thesis progress, composing resumes, taking the GRE exams, and applying for jobs and/or graduate school. When combined with PHY 461, this course is designed to fulfill the Senior Culminating Experience requirement. Prerequisites: Permission of the instructor. 2.0 Semester Hours.

**PHY 461 Senior Thesis II.** This course involves the independent investigation of a problem in physics and/or astronomy. Emphasis is on executing the plan of study formulated in PHY 460 and analyzing and presenting the results. The course meets 1 hour a week with all enrolled to discuss thesis progress and transitioning to graduate school, industry or other employment. When combined with PHY 460, this course is designed to fulfill the Senior Culminating Experience requirement. Prerequisite: PHY 460. 2.0 Semester Hours.

**PHY 494 Honors Thesis/Project.** See All-University 494 course description.

**PHY 499 Internship in Physics.** An experience-based course designed for juniors and seniors. Students are placed in appropriate laboratories or agencies where previous classroom learning may be integrated with a work experience. The exact location, program and method of evaluation are provided in a contract drawn between the student, the faculty sponsor and the host internship supervisor. Registration by arrangement with the faculty sponsor and departmental chair. Specific restrictions may apply. 1-16 Semester Hours.