

PHYSICS AND ASTRONOMY

Faculty: G. Layton, *Departmental Chair*; W. Delinger, R. Hall, H. Hooper, G. Johnson, A. Odell, K. O'Dell, E. Roth, W. Ward, R. Wildey, W. Willis.

Objectives

The Department of Physics and Astronomy offers degree programs in physics, astronomy, physical science, and teacher preparation programs in physics-chemistry, physics-mathematics, and physical science.

The programs in physics and astronomy prepare students for careers as professional scientists. The program in physical science is interdisciplinary and normally includes coursework from in physics, chemistry, and earth science. Students preparing for teaching careers in community colleges or secondary schools may choose an extended major in physics with some courses in one of the related fields of chemistry or mathematics. Those students interested in teaching science at the middle or junior high school level will find the broad major in physical science especially appropriate.

A program in physics or astronomy can be valuable preparation for a wide variety of careers. The principles of physics are basic to other fields of study, and individual courses in the department meet specific requirements for those programs. Those students majoring in one of the programs in the Department of Physics and Astronomy have opportunities to participate in student and faculty research projects and to work closely with individual professors.

Bachelor of Science

ASTRONOMY MAJOR: This program requires 40 hours in the major, including AST 180, 291, 392, PHY 161, 262, 263, 264, 372, 373, 374, 391:392, and 491:492, or 485, 11 hours of prerequisite Mathematics courses, a minor approved by the department, the University liberal studies program, and electives to complete 125 semester hours.

PHYSICAL SCIENCE MAJOR: This program requires PHY 151, 152; CHM 130, 132, 151L, 152L; AST 180; ENV 310; GLG 121; GGR 361, and additional courses in the physical sciences to total at least 34 hours, 2 hours of prerequisite Mathematics courses, a minor approved by the department, the University liberal studies program, and electives to complete 125 semester hours.

PHYSICAL SCIENCE EXTENDED MAJOR: This program, intended for middle/junior high school teaching preparation, requires a minimum of 54 semester hours in science and mathematics, including: PHY 151, 152; CHM 130, 230; BIO 184, 190; GLG 121; AST 180 or PHS 310; MAT 126, 135, 136, 270, 365; the University liberal studies program, and electives to complete 125 semester hours. Specially designed laboratories and field experience for the above courses are part of the program.

PHYSICS MAJOR: This program requires PHY 161, 262, 263, 264, 372, 373, 374, 375, 391:392, 491:492, 498; MAT 361, and additional upper level physics courses to total at least 41 hours, 14 hours of prerequisite Mathematics courses, a minor approved by the department, the University liberal studies program, and electives to complete 125 semester hours.

Bachelor of Science in Education

PHYSICAL SCIENCE MAJOR: This program requires PHY 151, 152; CHM 130, 132, 151L, 152L; AST 180; PHS 310; GLG 121; GGR 361, and additional courses in the physical sciences to total at least 34 hours, 2 hours of prerequisite Mathematics courses, a minor approved by the department, the University liberal studies program, and electives to complete 125 semester hours.

EXTENDED PHYSICS—CHEMISTRY EMPHASIS: This program requires 29 hours in Physics including: PHY 161, 262, 263, 264, 372, 373, 374, 375, 391:392; and 25 hours in Chemistry including: CHM 151, 152, 151L, 152L, 235:238, 235L, 238L, 320, 341; 14 hours of prerequisite Mathematics courses, the University liberal studies program, and electives to complete 125 semester hours.

EXTENDED PHYSICS—MATHEMATICS EMPHASIS: This program requires 29 hours in Physics including: PHY 161, 262, 263, 264, 372, 373, 374, 375, 391:392; and 25 hours in Mathematics including: MAT 136, 137, 211, 230, 238, 239, 365, 270, the University liberal studies program, and electives to complete 125 semester hours.

ENVIRONMENTAL SCIENCE EXTENDED MAJOR—ATMOSPHERIC SCIENCE EMPHASIS: This program is designed for students who wish to acquire the knowledge necessary to work on air pollution and related environmental problems.

Minor Programs

ASTRONOMY: Requirements include PHY 161, 262, 263; AST 180, 291, 392 for a total of 22 hours.

PHYSICAL SCIENCE: Requirements include PHY 151, 152; CHM 130, 132, 151L, 152L, and additional courses in the physical sciences to total at least 19 hours.

PHYSICAL SCIENCE SECONDARY EDUCATION: Requirements are the same as for the Physical Science Minor.

PHYSICS: Requirements include PHY 161, 262, 263, and additional courses in Physics to total at least 19 hours and including at least one 3 hour upper division course.

PHYSICS SECONDARY EDUCATION: Requirements are the same as for the Physics Minor.

AST: ASTRONOMY COURSES

AST 180 Introduction to Astronomy (4). Diurnal motion, motion of solar system objects on the background of stars, light rays and spectra, the planets, Kepler's laws, space travel, coordinates and time, the moon and eclipses, meteors, comets and the sun, stars, stellar distances and stellar evolution, galactic structure, galaxies, quasars and the big bang universe. 3 hrs. lecture, 1 hr. discussion.

AST 181 Introduction to Observational Astronomy (1). Laboratory to accompany AT 180. Astronomical observations and experiments. Use of telescope will be stressed. 2 hrs evening lab. *Prerequisite or Corequisite:* AST 180.

AST 291 Classical Astronomy (4). The spherical triangle, time, navigation, astronomical optics, orbital elements and the ephemeris. Historical perspectives. 3 hrs. lecture, 2 hrs. lab. *Prerequisites:* AST 180.

AST 392 Astrophysics (4). Radiation laws, photoelectric photometry, spectroscopy, radio astronomy and other recently studied spectral regions. 3 hours lecture, 2 hours lab. *Prerequisite:* PHY 263.

PHY: PHYSICS COURSES

PHY 100 Introduction to Physics (3). An introduction to physical principles, reasoning, and problem solving techniques for students needing to meet the prerequisites for General Physics or University Physics. 2 hours lecture, 1 hour lab.

PHY 141 Concepts of Physics (4). The conceptual basis of physical laws with examples of their applications in the modern world. 3 hrs. lecture, 2 hrs. lab.

PHY 151:152 General Physics (4:4). A one year algebra based introductory physics course covering mechanics, heat, sound, electricity, magnetism, optics, atomic and nuclear physics. 3 hrs. lecture, 2 hrs. lab. *Prerequisite:* High school Physics or PHY 100; *Corequisite:* MAT 111 or MAT 112.

PHY 161 University Physics I (4). First course in the three semester, calculus based, introductory physics sequence. A study of classical mechanics, fluid statics and dynamics. 3 hrs. lecture, 2 hrs. lab. *Prerequisite:* High School Physics or PHY 100. *Corequisite:* MAT 136.

PHY 262 University Physics II (3). Second course in the three semester, calculus based, introductory physics sequence. A study of thermodynamics, electricity and magnetism. 3 hrs. lecture. *Prerequisite:* PHY 161; *Corequisite:* MAT 137.

PHY 263 University Physics III (3). Final course in the three semester, calculus based, introductory physics sequence. A study of AC electricity, optics, atomic and nuclear structure. 3 hrs. lecture. *Prerequisite:* PHY 262 or PHY 152 and MAT 137.

PHY 264 Electronics for Science Students (4). Review of basic electricity including network theorems. Introduction to semiconductor electronics including bipolar and field effect devices and operational amplifiers. 3 hours lecture, 2 hours lab. *Prerequisites:* PHY 152 or PHY 262.

PHY 372 Electricity and Magnetism (4). Static and time dependent electromagnetic fields, wave Phenomena. *Prerequisites:* PHY 263, MAT 238.

PHY 373 Modern Physics (4). Special relativity, atomic and nuclear physics, quantum mechanics. *Prerequisites:* PHY 263, CHM 152, CHM 152L, MAT 238.

PHY 374 Mechanics (3). Vector calculus, Newtonian mechanics of a particle, mechanics and dynamics of systems, Lagrange equations, the Hamiltonian. 3 hours lecture. *Prerequisites:* PHY 263, MAT 238.

PHY 375 Waves (3). Fundamentals of wave generation and propagation in solids and fluids, development of the wave equation and solutions in terms of rays and normal modes. Energy dissipation and attenuation processes. Wave sources, Fourier analysis, and Fourier transforms. 3 hrs. lecture. *Prerequisite:* PHY 263. *Corequisite:* MAT 239.

PHY 391:392 Advanced Laboratory I, II (1:2). Advanced laboratory problems in physics. The student and instructor select experiments to be performed. 3 hours lab for each credit.

PHY 410:411 Statics and Dynamics of the Atmosphere (3:3). First semester, cloud formation, microphysics and precipitation, radiation processes, atmospheric electricity, optics and acoustics. Second semester, dynamics of fluids in rotating coordinates, basic conservation equations, geostrophic flow, vorticity theorems, the planetary boundary layer, atmospheric waves and numerical weather prediction. *Prerequisite:* MAT 137.

PHY 454 Thermal and Statistical Physics (3). Thermodynamics, heat transfer, kinetic theory and quantum statistics. *Prerequisites:* MAT 238, PHY 263.

PHY 455 Solid State Physics (3:3). Band theory of solids. *Prerequisite:* PHY 264, MAT 238.

PHY 456 Physical Electronics (3). Semiconductor devices, digital electronics, microprocessors. *Prerequisite:* PHY 264.

PHY 457:458 Atomic and Nuclear Physics (3:3). First semester, atomic and molecular spectra and systems. X-rays. Second semester, atomic nuclei, radioactivity, particles and nuclear models.

PHY 491:492 **Advanced Laboratories III and IV** (1:2). 3 hours lab for each credit.

Graduate Courses

- PHY 501:502 **Theoretical Physics** (3:3).
PHY 533 **Physical Optics** (3).
PHY 551:552 **Electricity and Magnetism** (3:3).
PHY 565 **Quantum Mechanics** (3:3).
PHY 610:611 **Topics in Modern Physics** (3.2).
PHY 640 **Secondary School Physics and Physical Science Curricula** (3).
PHY 671 **Techniques of Observational Astronomy** (3).
PHY 685 **Graduate Research** (1-6).
PHY 697 **Independent Study** (1-3).
PHY 698 **Graduate Seminar** (1-3).

SCI: SCIENCE COURSES

SCI 204-5 **Investigative Science for the Elementary School Teacher** (4:4). Investigation of scientific concepts and processes for elementary education. Lectures and lab are integrated.

Graduate Course

SCI 629 **Instructional and Experimental Aspects of Science for the Elementary Teacher** (3).

College of Business Administration

Joseph J. Walka, Dean

H. Ronald Pitt, Associate Dean

Wayne Fox, Assistant Dean

Philosophic Commitments and Objectives

In keeping with the traditions of Northern Arizona University and the convictions of its faculty, the objectives of the College of Business Administration reflect a dedication to the maximum intellectual growth of the individual student and a commitment to community service and to research.

Dedication to the intellectual growth of the individual student: The primary objective of the college is to provide each of its students with an academic environment that fosters the development of a broad intellectual foundation. This foundation is the basis for effective service in responsible positions in organizations which in turn enables students to assume higher professional levels of responsibility as they gain experience and demonstrate ability. The faculty members of the college believe that this objective is best accomplished by the development and maintenance of quality curricula, by effective teaching, and by conscientious advisement of students.

Commitment to community service: The college recognizes and accepts its obligation to serve the interest of the broad community through management development programs, consulting activities, publication of studies vital to the economic growth of the area and professional participation in volunteer organizations. These activities are conducted by the following College of Business units: Management Development Office, Small Business Institute, Bureau of Business and Economic Research, and The Center for American Indian Economic Development.

It is a blog and a page actually created for physics and astronomy lovers and to increase... See more of Physics & Astronomy on Facebook. Log In. or. Create New Account. See more of Physics & Astronomy on Facebook. Log In. Forgotten account? Texas A&M Physicists Receive DOE Grant for Detector Research and Development. Texas A&M Physicists Receive DOE Grant for Detector Research and Development. Joint Appointment in Physics and Astronomy Texas A&M University. View Profile. New Publication in PRL By Joe Ross' Team. Minors: Physics, Space Science and Engineering. With its world-renowned faculty and state-of-the-art facilities, the Henry A. Rowland Department of Physics and Astronomy combines the best aspects of a top research university with the more intimate learning environment typical of small liberal arts colleges. A flexible curriculum accommodates students with post-graduation aspirations as diverse as graduate study, medical or law school, teaching, or technological careers. Explore the Department. PhD Program. The Physics & Astronomy Colloquium Series presents the Physics & Astronomy Annual Awards Ceremony on Friday, April 23, at 4:10 p.m. at an Online Departmental Ceremony. Join on your computer or mobile app Click here to join the meeting Or call in (audio only) +1 614-706-6572,,117227170# United States, Columbus [â€] Astrophysics is a science that employs the methods and principles of physics in the study of astronomical objects and phenomena. Among the subjects studied are the Sun, other stars, galaxies, extrasolar planets, the interstellar medium and the cosmic microwave background. Emissions from these objects are examined across all parts of the electromagnetic spectrum, and the properties examined include luminosity, density, temperature, and chemical composition. Because astrophysics is a very broad subject...