

DEPARTMENT OF PHYSICS AND GEOSCIENCES

Contact Information

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The Department of Physics and Geosciences serves the needs of three types of students:

1. those majoring in geology or physics and those minoring in geography, geology, GIS, geophysics, or physics
2. technical or pre-professional students; and
3. students who take physics and geoscience courses out of interest or to satisfy science requirements.

The department seeks to prepare students who are majoring in geology or physics; minoring in geography, geology, Geographic Information Systems (GIS), geophysics, or physics to compete with graduates from other institutions for industrial and governmental positions, follow a career in science education, or pursue a higher level degree. It does this through fundamental courses in the respective disciplines and through specialized programs in GIS, energy, hydrogeology, groundwater modeling, certification in GIS, certification in Geophysics, and certification in nuclear power plant (NPP) operations. For students in technical areas, the department endeavors to provide the background necessary for success in their chosen profession. For non-technical majors, the department strives to enlighten students concerning some of the basic realities of our universe and to instill in them an appreciation of the methods of scientific inquiry and the impact of science on our modern world. In addition to our undergraduate degrees and minors, we also offer an interdisciplinary graduate program in Petrophysics.

Students majoring or minoring in the Department of Physics and Geosciences should plan the course work so that it will best support their career and educational goals. This should be done in consultation with their faculty adviser.

Faculty

Department Faculty

Albataineh, Hisham Assistant Professor, Department of Physics and Geosciences; B.S., Yarmouk University (Jordan); M.S., Aligrah Muslim University (India); M.S., New Mexico State University; Ph.D., New Mexico State University.

Ford, Mark T Assistant Professor, Department of Physics and Geosciences; B.A., Alfred University; M.S., Idaho State University; Ph.D., Oregon State University.

Hedquist, Brent Associate Professor, Department of Physics and Geosciences; Chair; B.S., Brigham Young University; M.A., Arizona State University; Ph.D., Arizona State University.

Hewett, Lionel Professor, Department of Physics and Geosciences; B.S., Texas A&I University; Ph.D., University of Missouri-Rolla.

McGehee, Thomas L Professor, Department of Physics and Geosciences; B.S., The University of Texas at Dallas; Ph.D., University of Texas at Dallas.

Schneider, Robert Assistant Professor, Department of Physics and Geosciences; B.S., University of Texas at El Paso; M.S., University of Texas at El Paso; D.Sc., University of Texas at El Paso.

Su, Haibin Associate Professor, Department of Physics and Geosciences; B.S., Beijing University (China); M.S., Chinese Academy of Sciences (China); Ph.D., University of Cincinnati.

Yelisetti, Subbarao Assistant Professor, Department of Physics and Geosciences; B.S., Acharya Nagarjuna University (India); M.S., University of Hyderabad (India); Ph.D., University of Victoria (Canada).

Emeritus

Norwine, James Professor Physics and Geosciences, Department of Physics and Geosciences; Regents Professor; B.S., Southeast Missouri State College; M.S., Southeast Missouri State College; Ph.D., Indiana State University.

Courses

Geography (GEOG)

GEOG 1101 Phys Geography Meteorology Lab **1 SCH (2)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes greater understanding of concepts of meteorology presented in GEOG 1301. Prerequisite: credit or registration in GEOG 1301.

Fee: \$5.00

GEOG 1102 Phys Geog Climate and Mankind **1 SCH (2)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes greater understanding of concepts of climatology and its effect on human civilization, as presented in GEOG 1302. Prerequisite or corequisite: GEOG 1302.

Fee: \$5.00

GEOG 1301 Physical Geography Meteorology **3 SCH (3)**

Earth motions and their meanings; system of location and time; composition and structure of the earth's atmosphere. Meteorology and weather prediction, including storms. Air pollution meteorology. Field trips will be arranged.

GEOG 1302 Phy Geog Climate and Mankind **3 SCH (3)**

Climatic classification, types and world regions. Climatic change, fluctuations and their effects on human ecology (e.g., droughts). Agricultural and urban climatology. Microclimates. The distribution of soils and natural vegetation as related to climate. Field trips will be arranged.

GEOG 1303 World Geography **3 SCH (3)**

Major geographic regions of the world. Landscapes and peoples of continents; major culture realms and nations, resources, land-use and industries. Contrasts between developed and emerging nations.

GEOG 2472 Intro to Geographic Info Sys **4 SCH (3-3)**

Principles and experience of Geographic Information Systems. Acquisition, management, processing, and interpretation of geographic data. Spatial data structure and the display, manipulation, and analysis of geographic data. Field trip required. Field trip fee required. Prerequisite: 3 hours of natural science or permission of instructor. Field Trip Fee required.

Fee: \$40.00

GEOG 3302 Intro to Broadcast Meteorology **3 SCH (3)**

Principles and practice of broadcast meteorology, a joint effort of the Department of Physics and Geosciences and Department of Communication and Theatre Arts. Introduction to television weather broadcasting with emphasis on creating accurate forecasts and on the techniques of communicating weather information to the public. Prerequisites: GEOG 1301 with GEOG 1302 recommended.

GEOG 3305 Environmental Geography **3 SCH (3)**

The nature, geographic distribution, use and misuse of global resources with emphasis on those of North America. Ecosystems, air, water, soil, mineral and energy resources will be considered. Prerequisites: 3 semester credit hours of Geography or a science course (see General Education Requirements natural sciences component).

GEOG 3310 World in Chg Crucial Topics **3 SCH (3)**

Intensive study of the geography of selected world "crisis" regions. Examples include the Middle East, Sub-Saharan Africa and the former U.S.S.R. and Eastern Europe. May be repeated for credit as the topic changes. Prerequisite: 6 semester hours of geography or 12 semester hours of social sciences.

GEOG 3331 United States and Canada **3 SCH (3)**

The regional aspects of landforms, climate, resources and peoples of United States and Canada. Prerequisite: 6 hours of geography or 12 hours of social science.

GEOG 3421 Geomorphology **4 SCH (3-3)**

Description, classification and quantitative analysis of landforms and surface processes in relation to human development. Regional physiography of the United States and topographic map interpretation. May be used as geology credit. Field trip required. Field trip fee required. Prerequisite: GEOL 1302/GEOL 1102 or GEOL 1303/GEOL 1103, MATH 1316. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOG 3450 Field Mapping Cartography **4 SCH (3-3)**

The principles and practice of plane surveying and the global positioning system (GPS) and their interface with geographic information systems (GIS). Basic principles of cartography and use of cartographic tools and software. Management of cartographic data and GPS data. Local field trips required. Field trip fee required. Prerequisite: MATH 1316 or MATH 1324. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOG 3460 GIS in Nat Res and Envir Mgmt **4 SCH (3-3)**

GIS and other geospatial technologies (including GPS and remote sensing) as applied to natural resources and environmental management.

Technologies and techniques used to acquire geographic information, spatial data and location analysis, and applications of geospatial technology within the natural and environmental sciences. Case studies, labs, and field exercises. Prerequisite: GEOG 2472 (preferred), or six hours of physical or life science, or permission of instructor.

GEOG 3470 Quant. Methods in Geography **4 SCH (3-3)**

Quantitative methods commonly used to describe, characterize, model, and analyze geo-spatial data. Geographic data description and summary, use of inferential statistics as exploratory and descriptive tools, different spatial statistics to explore geographic patterns, geographical correlation analysis, and geo-spatial regression analysis. Prerequisite: junior standing.

GEOG 4305 Geographic Research Methods **3 SCH (3)**

Review of scientific techniques used in geographic research, independent review of literature, and a research problem yielding a formal report on the research. Prerequisites: senior standing and 12 hours of Geography and Geology.

GEOG 4420 Spec Topics in Geoscience **1-4 SCH (1-4)**

Concepts, developments or discoveries in geography. May be repeated for a maximum of six semester hours credit. Prerequisite: 12 semester hours of geography and/or geology.

GEOG 4429 Advanced GIS **4 SCH (3-3)**

Advanced techniques and applications of Geographic Information Systems. GIS data structure and conversions, advanced spatial analysis, data visualization, hydrological modeling. Basic and intermediate GIS programming for customizing and manipulating GIS applications. May be used as a geology credit. Prerequisite: GEOG 2472 or permission of instructor.

GEOG 4435 Remote Sensing **4 SCH (3-3)**

The technology and interpretation of aerial photography and satellite imagery, including multi-spectral, thermal and radar images. Digital image processing using a raster geographic information system. Applications of remote sensing and guided projects in areas of student interest. May be used as a geology credit. Prerequisite: MATH 1314 and 6 hours of science, engineering or agriculture.

Fee: \$5.00

GEOG 4436 Advanced Remote Sensing **4 SCH (3-3)**

Advanced topics in remote sensing. Recently emerged remote sensing systems, including high-resolution multi-spectral imaging systems, thermal remote sensing and airborne LiDAR remote sensing systems. Cutting-edge remote sensing data processing and analysis techniques. May be used as Geology credit. Prerequisite: GEOG 4435 or equivalent.

GEOG 4441 GIS for Business **4 SCH (3-3)**

GIS and spatial analysis applied to organizations. Geographic information, locational decision-making, spatial data, investment in and value of GIS, ethical aspects, and GIS strategies. Case studies and lab practice with spatial data. Prerequisite: GEOG 2472.

Geology (GEOL)

GEOL 1101 Earth Science I Laboratory **1 SCH (2)**

A laboratory experience that focuses on laboratory techniques, data collection, and analysis. Reinforces and promotes greater understanding of concepts presented in GEOL 1301. Prerequisite: credit or registration in GEOL 1301.

Fee: \$5.00

GEOL 1102 Intro Ocean Astron & Atmos Lab **1 SCH (2)**

A laboratory experience that focuses on laboratory techniques, data collection, and analysis. Reinforces and promotes greater understanding of concepts of the oceans, the hydrosphere and atmosphere, and astronomy as presented in GEOL 1302. Prerequisite: credit of registration in GEOL 1302.

Fee: \$5.00

GEOL 1103 Physical Geology Laboratory **1 SCH (2)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes greater understanding of earth materials and the physical processes at work on and in the earth. Prerequisite or corequisite: GEOL 1303.

Fee: \$5.00

GEOL 1104 Historical Geology Lab **1 SCH (2)**

A laboratory experience that focuses on laboratory techniques, data collection and analysis. The experience reinforces and promotes greater understanding of the events and processes that have shaped the earth and influenced the development of life through time. Prerequisite or corequisite: GEOL 1304.

Fee: \$5.00

GEOL 1131 Intro to Forensic Geology Lab **1 SCH (0-2)**

Analyses of soil, sand, minerals, gemstones, rocks, glass, and metal using analytical equipment. Hands-on experience identifying rocks and minerals. Field use of GPS units and mapmaking to solve forensic problems. Prerequisite: Credit for or registration in GEOL 1331.

GEOL 1301 Earth Science I **3 SCH (3)**

Study of the earth and the concepts and physical properties responsible for its problems including volcanoes, earthquakes, floods and droughts. Includes the study of plate tectonics, physical geology and geomorphology. Field trips may be arranged. Designed for students not majoring in science or engineering.

GEOL 1302 Intro Ocean, Astron & Atmos **3 SCH (3)**

Survey of earth's dynamic systems: the oceans, the hydrosphere and the atmosphere. Survey of astronomy emphasizing earth's place in the universe. Field trips may be arranged. Designed for students not majoring in science or engineering. Open to geosciences majors.

GEOL 1303 Physical Geology 3 SCH (3)

General composition and form of the earth's surface and the volcanic, erosional, depositional and deformational processes which operate on it. The properties of the interior of the earth inferred from earthquakes and other external evidence. Occasional field trips may be arranged.

GEOL 1304 Historical Geology 3 SCH (3)

The important change through which the earth has passed since its origin as a planet; especially, the history of the orderly evolution of life and physical features evidenced in the rocks of the earth. Field trip and field trip fee required. Prerequisite: GEOL 1303. Field Trip Fee will be required. Fee: \$20.00

GEOL 1331 Intro Forensic Geology 3 SCH (3)

Principles and methods of forensic geosciences. Analyses of soil, sand, minerals, gemstones, rocks, glass, and metal. Application of forensic science to solve crimes. Introduces GPS and forensic interpretation of maps.

GEOL 2376 Nature of Earth and Universe 3 SCH (3-2)

Survey of the basic concepts of geosciences. This course begins with an introduction to astronomy and the Earth's position in our solar system. The course includes the interrelationships between the solid portion, hydrosphere, atmosphere and biosphere of the Earth. Prerequisite: BIOL 2375, CHEM 1376.

GEOL 3107 Field Geology Laboratory 1 SCH (0-3)

Methods of collection of geological field data and its presentation; proper use of geological field and lab equipment and instruments; interpretation of various types of map systems. Overnight camping field trip required, and local mini-field trip reports. Prerequisite: Credit or registration in GEOL 3307, or permission of instructor. Field trip fee required. Fee: \$40.00

GEOL 3170 Intro to Geophysics Laboratory 1 SCH (0-3)

Structure of the earth, plate tectonics, and sea-floor spreading. Principles of seismology, gravity, heat flow, geomagnetism, and rock magnetism. Prerequisite: registration or credit in GEOL 3370.

GEOL 3305 Environmental Geology 3 SCH (3)

The relationship between humans and their geologic environment. Reviews and builds on principles of physical geology to understand the geology of the present, as distinct from that of the distant past. Relevant examples from South Texas environmental geologic research are included. Prerequisite: GEOL 1303 or permission of instructor.

GEOL 3307 Field Geology 3 SCH (3)

Geologic mapping on topographic maps and aerial photographs. Interpretation of field relationships. Basic topographic surveying methods and measurements using the Global Positioning System (GPS). Prerequisite: GEOL 1304/GEOL 1104. Concurrent enrollment in GEOL 3107 recommended.

GEOL 3370 Introduction to Geophysics 3 SCH (3)

Application of classical physics to the study of the Earth and the solution of problems in Earth sciences. Geomagnetism, the Earth's gravitational field, seismic analysis, sequence stratigraphy, well log interpretation, and applications to petroleum exploration. Prerequisites: GEOL 1303/1103, PHYS 2325/2125, PHYS 2326.

GEOL 3409 Mineralogy 4 SCH (3-3)

Morphological crystallography and symmetry concepts. Methods of identification of minerals by their physical and chemical properties. Origin of economic minerals and ore deposits. Geological significance of common rock-forming minerals. One weekend field trip required. Prerequisites: GEOL 1303/GEOL 1103 and 3 hours of chemistry. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOL 3411 Petrology 4 SCH (3-3)

Classification and origin of igneous, sedimentary and metamorphic rocks. Laboratory emphasis on identification and interpretation of hand specimens. One weekend field trip required. Field trip fee required. Prerequisite: GEOL 3409. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOL 3431 Stratigraphy and Sedimentology 4 SCH (3-3)

Study of the composition, environment, sequence and correlation of stratified rocks. Prerequisites: GEOL 1303/GEOL 1103 and GEOL 1304/GEOL 1104. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOL 3445 Oceanography 4 SCH (3-3)

Methods and principles of oceanography. The physical and chemical properties of the seas, life in the sea and a comprehensive treatment of marine geology. Saturday field trips will be arranged. Prerequisites: GEOG 1301/GEOL 1101 or GEOL 1303/GEOL 1103 or GEOL 1301/GEOL 1101. May be used for geography credit.

Fee: \$5.00

GEOL 3446 Comp Methods in Geosciences 4 SCH (3-3)

Time series analysis, autocorrelation, cross-correlation, Fourier transform, Z transform, filtering, deconvolution, wave equation migration, forward and inverse problems, finite difference methods, and tomography. Prerequisites: GEOL 3307/3170; MATH 3320.

GEOL 3481 Structural Geology 4 SCH (3-3)

The inherent and imposed structures in rocks and their modes of formation. Mechanical principles of rock deformation, petrofabrics, regional structural interpretation, theories of mountain building and geotectonics. Prerequisites: GEOL 1303/GEOL 1103 and GEOL 1304/GEOL 1104. Field Trip Fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOL 4107 Applied Geology Lab 1 SCH (3)

Laboratory course to accompany GEOL 4307. Field and laboratory applications of geological concepts in solving geological engineering problems. Study of engineering principles and properties of earth materials. Exploration of engineering design and methods of site investigations. Prerequisite: registration or credit in GEOL 4307.

Fee: \$20.00

GEOL 4175 Seismology Laboratory 1 SCH (0-3)

Interpretation of the spatial component of three-dimensional seismic data. Identification of faults and horizons within real-world volumes. Data loading, preparation, and examination, along with correlation of interpretation to geologic well control. Emphasis on the application of seismic interpretation to hydrocarbon exploration. Prerequisite: registration or credit in GEOL 4375.

GEOL 4213 Industry Geotech Training (WI) 2 SCH (8)

Industrial geologic field methods and techniques. Becoming familiar with local geologic employment situations through intern-type experiences. Typically scheduled in Winter Intersession with daily daylong activities; special travel charges may apply. Prerequisites: GEOL 3431 and approval of instructor; GEOL 3407, GEOL 3411, and GEOL 3481 recommended. Activity fee.

GEOL 4307 Applied Geology 3 SCH (3)

Applications of geological concepts in solving geological engineering problems. Study of engineering principles and properties of earth materials. Exploration of engineering design and methods of site investigations. Prerequisites: GEOL 1303, MATH 1316, CHEM 1311/CHEM 1111.

GEOL 4311 Field Course I (WI) 3 SCH (12)

Geologic field methods and techniques. Includes the use and maintenance of field equipment; measurement, description, and interpretation of stratigraphic sections; identification and interpretation of field relationships of sedimentary rocks; preparation of geological field reports. Typically scheduled in Spring Intersession with daylong activities daily; special travel charges may apply. Prerequisites: GEOL 3431 and approval of instructor; GEOL 3407, GEOL 3411, and GEOL 3481 recommended.

Fee: \$723.00

GEOL 4312 Field Course II (WI) 3 SCH (12)

Geologic field methods and techniques. Includes the use and maintenance of field equipment; identification and interpretation of field relationships of igneous and metamorphic rocks; preparation of geological field reports. Typically scheduled in Summer Intersession with daylong activities daily; special travel charges may apply. Prerequisites: GEOL 3431 and approval of instructor; GEOL 3407, GEOL 3411, and GEOL 3481 recommended.

Fee: \$480.00

GEOL 4325 Aqueous Geochemistry 3 SCH (3-1)

Introduces the processes controlling the chemical composition of surface and groundwater. Prerequisites: GEOL 1303/GEOL 1103, CHEM 1111, CHEM 1112, CHEM 1311 and CHEM 1312.

Fee: \$5.00

GEOL 4375 Seismology 3 SCH (3)

Basics of seismology, starting with wave propagation, seismic reflection and refraction. The physics of determining the seismic velocity and anisotropy structure of the Earth. Earthquake generation, post-seismic deformation and creep events, and their relation to faulting and plate tectonics. Prerequisites: GEOL 1303/1103, PHYS 2325/2125, PHYS 2326, GEOL 3370.

GEOL 4395 Special Problems 1-3 SCH (1-3)

Supervised individual research of a geological problem that meets the needs and interest of the student. May be repeated for a maximum of 3 semester hours credit. Prerequisite: 18 semester hours of geology prior to registration.

GEOL 4405 Senior Research Project 4 SCH (3-3)

Collaborative research project involving the student and a geology faculty member, focused on a topic that requires mastery of geologic knowledge appropriate to the student's plans for a professional career or advanced study in the field. Prerequisite: senior standing in geology. Activity fee, \$10.

Fee: \$10.00

GEOL 4420 Spec Topics in Geoscience 4 SCH (3-3)

One or more important concepts, developments or discoveries in geology. May be repeated once for credit. Prerequisite: 12 semester hours of geography and/or geology. Field Trip and field trip fee will be required.

Fee: \$5.00

Fee: \$40.00

GEOL 4425 Hydrogeology 4 SCH (3-3)

Principles of fluid, mass and energy transport in geologic formations are emphasized to handle human affair problems such as water supply, contamination and energy resources. Prerequisite: GEOL 1303/GEOL 1103 and GEOL 1304/GEOL 1104.

GEOL 4441 Non-Seismic Geophys. Explor. **4 SCH (3-3)**

Overview of gravity, magnetism, and other geophysical properties applied to exploration. Focus in on acquiring, processing, and interpreting non-seismic geophysical data and on integration of raw data with other geophysical and geologic data. Prerequisites: GEOL 3370/GEOL 3170; GEOL 3446.

GEOL 4615 Geology Field Camp (WI) **6 SCH (1-15)**

Geologic field methods and techniques. Includes the use and maintenance of field equipment; measurement, description and interpretation of stratigraphic sections; identification and interpretation of field relationships of various rocks; preparation of geological field reports. Typically scheduled in summer with daily day-long activities; special travel charges may apply. Prerequisites: GEOL 3431 and approval of instructor; GEOL 3307/GEOL 3107; GEOL 3411 and GEOL 3481 recommended. Activity fee of \$80.00.

Fee: \$80.00

Physics (PHYS)

PHYS 0325 University Physics I **0 SCH (0)****PHYS 1101** Coll Physics I Laboratory **1 SCH (4)**

A laboratory course to accompany PHYS 1301. Prerequisite: credit or registration in PHYS 1301.

Fee: \$5.00

PHYS 1102 College Physics II Lab **1 SCH (4)**

A laboratory course to accompany PHYS 1302. Prerequisite: credit or registration in PHYS 1302.

Fee: \$5.00

PHYS 1103 Stars and Galaxies Laboratory **1 SCH (3)**

A laboratory course to accompany PHYS 1303. Prerequisite: credit or registration in PHYS 1303.

Fee: \$5.00

PHYS 1104 Solar System Laboratory **1 SCH (3)**

A laboratory course to accompany PHYS 1304. Prerequisite: credit or registration in PHYS 1304.

Fee: \$5.00

PHYS 1301 College Physics I **3 SCH (3)**

A trigonometry-based introduction to physics. Topics include kinematics, vector analysis, force dynamics, equilibrium, work, energy, momentum, collisions, fluid dynamics, and thermal physics. Prior knowledge of physics (one year of high school physics; otherwise PHYS 1373 is recommended) is assumed. Prerequisites: MATH 1314 and MATH 1316. Concurrent enrollment in PHYS 1101 is recommended.

PHYS 1302 College Physics II **3 SCH (3)**

A continuation of PHYS 1301. Topics include periodic motion, sound, electric force, electric current, resistance, electric circuits, magnetism, electromagnetic induction, AC circuits, light and optics. Prerequisite: PHYS 1301 and PHYS 1101. Concurrent enrollment in PHYS 1102 is recommended.

PHYS 1303 Stars and Galaxies **3 SCH (3)**

A survey of stellar astronomy and cosmology. Topics include the behavior of light; the sun as a star; positions, motions and brightness of the stars; stellar evolution; the Milky Way and other galaxies; and cosmology. Concurrent enrollment in PHYS 1103 is recommended.

PHYS 1304 Solar System **3 SCH (3)**

A survey of the astronomy of our solar system. Topics include the history of astronomy, naked-eye phenomena, telescopes, gravity and orbits and the nature and history of the Earth, moon, planets, asteroids and comets. Concurrent enrollment in PHYS 1104 is recommended.

PHYS 1373 Preparatory Physics **3 SCH (3)**

Topics needed to succeed in College Physics or University Physics. Problem solving using basic techniques of algebra and trigonometry. Topics include vector mechanics, linear and two-dimensional kinematics, and Newtonian dynamics.

PHYS 1375 Physics **3 SCH (3-2)**

A survey of the most basic concepts of physics. Topics include scientific measurements, motion, momentum, energy, gravitation, matter, heat, electricity, magnetism, sound, light, atomic structure and nuclear energy. Prerequisite: MATH 1314.

Fee: \$5.00

PHYS 1471 Acoustical Foundations of Music **4 SCH (3-2)**

A general introduction and survey of the physical and acoustical foundations of music. Topics include the fundamental physics relevant to music, the reception of musical sound, intervals, scales, tuning, temperament, auditorium and room acoustics and the production of sounds by musical instruments including electronic.

Fee: \$5.00

PHYS 2125 University Physics I Lab **1 SCH (4)**

A laboratory course to accompany PHYS 2325. Prerequisite: credit or registration in PHYS 2325.

Fee: \$5.00

PHYS 2126 University Physics II Lab **1 SCH (4)**

A laboratory course to accompany PHYS 2326. Prerequisite: credit or registration in PHYS 2326.

Fee: \$5.00

PHYS 2174 Physics Forensics Lab **1 SCH (0-4)**

Physics laboratory in mechanics, including ballistics and other topics relating to forensics. Falling objects, momentum, thermodynamics as relating to burning materials, and electric phenomena such as bomb detonators. Prerequisites: PHYS 1375 or permission of instructor. For minors in Forensic Sciences, credit or registration in CRIJ 3250 required.

PHYS 2325 University Physics I **3 SCH (3)**

A calculus-based introduction to physics. Topics include kinematics, vector analysis, force dynamics, equilibrium, work, energy, momentum, collisions, fluid dynamics, and thermal physics. Prior knowledge of physics (one year of high school physics; otherwise PHYS 1373 is recommended) is assumed. Prerequisite: credit or registration in MATH 2413 or equivalent. Concurrent enrollment in PHYS 2125 is recommended.

PHYS 2326 University Physics II **3 SCH (3)**

A continuation of PHYS 2325. Topics include periodic motion, sound, electric force, electric current, resistance, electric circuits, magnetism, electromagnetic induction, light, optics and modern physics. Prerequisite: PHYS 2325 and PHYS 2125 or PHYS 1302 and PHYS 1102; credit or registration in MATH 2414 or equivalent or MATH 3415. Concurrent enrollment in PHYS 2126 is recommended.

PHYS 3310 Advanced Physics Laboratory **3 SCH (1-4)**

A laboratory course focusing on advanced techniques and experiments drawn from the full range of physics classes. The student will understand the role of experimental design, advanced data analysis and reduction and the use of computers while investigating physical phenomena. Prerequisite: credit or registration in PHYS 3343.

PHYS 3313 Mechanics I **3 SCH (0-3)**

A mathematical treatment of the fundamentals of classical mechanics. Topics include particle dynamics in one, two and three dimensions; conservation laws; dynamics of a system of particles; motion of rigid bodies; central force problems; accelerating coordinate systems; gravitation; Lagrange's equations and Hamilton's equations. Prerequisites: PHYS 2326/PHYS 2126; credit or registration in either MATH 3320 or MATH 3415.

PHYS 3323 Electromagnetic Field Theory **3 SCH (3)**

Electrostatics; Laplace's Equation; the theory of dielectrics; magnetostatics; electromagnetic induction; magnetic fields of currents; Maxwell's equations. Prerequisites: PHYS 2326/PHYS 2126; credit or registration in MATH 3320 or MATH 3415 or equivalent.

PHYS 3333 Thermodynamics **3 SCH (0-3-3)**

Equations of state, ideal gases, first and second laws of thermodynamics, entropy and statistical methods. Prerequisites: PHYS 2326 and 2126; credit or registration in MATH 3415 or equivalent.

PHYS 3343 Modern Physics I **3 SCH (3)**

An introduction to special relativity and elementary quantum mechanics. Topics include space-time, relativistic energy and momentum, the uncertainty principle, Schrodinger's equation, observables and operators, bound states, potential barriers and the hydrogen atom. Prerequisites: PHYS 2326 and 2126; credit or registration in either MATH 3320 or MATH 3415 or equivalent.

PHYS 4160 Nuclear Physics Laboratory **1 SCH (4)**

Laboratory study of natural and artificial radioactivity, and particle physics. Particle physics detectors, such as Geiger-Muller, sodium-iodide, plastic scintillation and solid state detectors. Detector resolution, radioactive half-life, muon lifetime, energy of particles and gamma rays and coincidence measurements. Prerequisite: credit or registration in PHYS 4360.

PHYS 4191 Physics Research Project **1 SCH (1)**

Literature survey and preparation for, and initiation of, a research project agreed to between the student and a faculty advisor, to be completed and reported on in the Research Seminar course. Prerequisite: PHYS 3343.

PHYS 4192 Physics Research Seminar **1 SCH (1)**

An experimental or theoretical project, begun in the Research Project course, will be concluded by the student and the results reported in a seminar. Students who have not yet taken the ETC major field test in physics are required to do so while enrolled in Seminar. Prerequisite: PHYS 4191.

PHYS 4303 Math Methods for Physicists **3 SCH (3)**

Mathematical techniques from the following areas: infinite series, integral transforming, applications of complex variables; vectors, matrices and tensors, special functions, partial differential equations, Greens' functions, perturbation theory, integral equations, calculus of variations and groups and group representations. Prerequisite: credit or registration in MATH 3320.

PHYS 4323 Optics **3 SCH (3)**

A mathematical treatment of the modern theory of optics. Topics include Huygen's principle as applied to geometric optics, interference, diffraction, polarization, crystal optics, electromagnetic theory of light, the interaction of light with matter and quantum optics. Prerequisites: PHYS 3323; MATH 3415 or MATH 3320.

PHYS 4343 Modern Physics II **3 SCH (3)**

A continuation of Modern Physics I. Topics include atomic, molecular, nuclear, statistical, solid state, laser and elementary particle physics. Prerequisites: PHYS 3343; MATH 3315 or MATH 3320.

PHYS 4353 Quantum Physics **3 SCH (3)**

The Schrodinger equation; one dimensional systems; the Heisenberg uncertainty principle; magnetic moments and angular momentum; two and three dimensional systems; approximation methods; scattering theory. Prerequisites: PHYS 3343; credit or registration in either MATH 3320 or MATH 3415 or equivalent.

PHYS 4360 Nuclear Physics 3 SCH (3)

A study of nuclear phenomena and properties including mass, stability, magnetic moment, radioactive decay processes and nuclear reactions. The application of nuclear principles to other fields such as astronomy, engineering, manufacturing and medicine. Prerequisites: PHYS 3343; credit or registration in both PHYS 4353 and either MATH 3320 or MATH 3415.

PHYS 4370 Geophysics 3 SCH (3)

Fundamentals of the mechanics of geophysics. Study of the instruments and methods used in geophysical exploration. Prerequisite: 6 semester hours of advanced physics and/or engineering.

PHYS 4383 Computational Physics 3 SCH (3)

An introduction to the methods and algorithms used in solving physical problems with computers, and computer-related limitations on such solutions. Prerequisites: knowledge of the C programming language; credit or registration in MATH 3415 or 3320.

PHYS 4390 Sel Topics in Modern Physics 3 SCH (0-3)

A detailed study of one or more important physical discoveries, developments and/or theories. Course may be repeated for credit. Prerequisite: senior standing.

Degree Requirements

Majors

- Geology, B.S. (<https://catalog.tamuk.edu/undergraduate/arts-sciences/physics-geosciences/geology-bs>)
- Geology, B.S. (Concentration in Geosciences) (<https://catalog.tamuk.edu/undergraduate/arts-sciences/physics-geosciences/geology-bs-concentration-geosciences>)
- Geology, B.S. - Geophysics Minor in Mathematics (<https://catalog.tamuk.edu/undergraduate/arts-sciences/physics-geosciences/geology-bs-geophysics-minor-mathematics>)
- Physics, B.S. (<https://catalog.tamuk.edu/undergraduate/arts-sciences/physics-geosciences/physics-bs>)

Minor

- Geographic Information Systems, Minor (<https://catalog.tamuk.edu/undergraduate/arts-sciences/minors/geographic-information-systems-minor>)
- Geophysics, Minor (<https://catalog.tamuk.edu/undergraduate/arts-sciences/minors/geophysics-minor>)
- Physics, Minor (<https://catalog.tamuk.edu/undergraduate/arts-sciences/minors/physics-minor>)

Certificates

- Geophysics, Certificate (<https://catalog.tamuk.edu/undergraduate/arts-sciences/physics-geosciences/geophysics-certificate>)