

Physical Sciences

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Physical Sciences Program Description

The Dixie State University Physical Sciences department offers a variety of courses in Chemistry, Engineering, Environmental Science, Geology, Geography, and Physics that allow students to better understand and appreciate the natural world and our place in it. Many of these courses fulfill the General Education Physical Science requirement for all students. Coursework and academic degrees offered in the Physical Sciences also fulfill prerequisites and requirements for students planning to pursue careers in natural sciences, chemistry, physics, engineering, environmental sciences, earth sciences, and medical and health sciences.

Degrees & Minors

- Bachelor of Science in Chemistry (catalog.dixie.edu/programs/physicalsciences/bachelor_of_science_in_chemistry)
- Bachelor of Science in Physical Science Composite Teaching, Secondary Education Licensure (catalog.dixie.edu/programs/physicalsciences/bachelor_of_science_in_physical_science_composite_teaching__secondary_education_licensure)
- Bachelor of Arts / Science in Integrated Studies - Chemistry Emphasis (catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor_of_sciencebachelor_of_arts_in_integrated_studies__chemistry_emphasis)
- Bachelor of Arts / Science in Integrated Studies - Earth Science Emphasis (catalog.dixie.edu/programs/interdisciplinaryartsandsciences/bachelor_of_sciencebachelor_of_arts_in_integrated_studies__earth_science_emphasis)
- Associate of Science in Pre-Engineering (APE) (catalog.dixie.edu/programs/physicalsciences/associate_of_preengineering)
- Minor in Chemistry (catalog.dixie.edu/programs/physicalsciences/minor_in_chemistry)
- Minor in Chemistry Education (catalog.dixie.edu/programs/physicalsciences/minor_in_chemistry_education)

The chemistry Program Learning Outcomes are:

- 1) Will be able to demonstrate knowledge of the skills required to make informed personal and social decisions about the issues that we will face locally as well as globally.
- 2) Will be able to demonstrate knowledge of basic fundamental laws, concepts, and theories in the physical sciences and be able to apply them to everyday life.
- 3) Will understand the process of science — how scientific knowledge is generated and validated — so that they can make independent, empirical inquiries about the natural world.
- 4) Will be able to demonstrate knowledge of the process of science by being able to interpret data in the form of tables, graphs, and charts and then communicate those findings in oral and or written form.

Physical Science Career Information

Chemistry

Career Opportunities

There are a number of directions a bachelor's degree in chemistry can go. Primarily, it's a launch pad for a graduate degree in chemistry; which could lead to careers in chemical engineering, healthcare, pharmaceuticals, or in the public sector. With just an undergraduate degree, however, chemistry majors can hope for careers in research or as chemical technicians.

Job Outlook*

Employment for chemists is expected to grow by 3% from 2014 to 2024, slower than the average for all occupations. Employment for chemical technicians will grow slightly slower in the same decade, increasing by 2%. The development of cheaper energy is expected to boost the chemical manufacturing activity in the United States, and generate a higher demand for chemical technicians.

Salary Range*

The median annual wage for chemists in 2015 was \$71,260. The lowest 10 percent earned less than \$41,110, and the highest 10 percent earned more than \$125,740. For chemical technicians, the median annual wage was \$44,660. The lowest 10 percent earned less than \$27,260, and the highest 10 percent earned more than \$75,230.

Secondary Education

Job Outlook*

Employment of middle school and high school teachers is expected to grow 6% from 2014 to 2024, about as fast as average for all occupations.

Salary Range*

In 2015, the median annual wage for middle school teachers was \$55,860. The lowest 10 percent earned less than \$37,350, with the highest 10 percent earning more than \$87,060. For high school teachers, the median annual wage was \$57,200. The lowest 10 percent earned less than \$37,800, and the highest earned more than \$91,190.

* Derived from the Occupational Outlook Handbook

Chemistry Courses

CHEM 1001. FYE: Chemistry. 1 Hour.

Strongly recommended for entering freshmen and transfer students with 0-24 credits interested in the BS degree in chemistry. Designed to help students adapt to college life and become integrated into DSU. Students will refine academic skills, learn about college resources and procedures, and explore different fields of study, degree options, and career opportunities. Multiple listed with all other sections of FYE (all 1001 courses and ENGR 1000). Students may only take one FYE course for credit. FA.

CHEM 1010. Intro to Chemistry. 3 Hours.

Fulfills General Education Physical Science requirement for students majoring in Business, Communication, Fine Arts, Humanities, and other non-Science disciplines. Emphasizes basic chemical concepts within daily life. CHEM 1015 lab course recommended but not required. FA, SP, SU.

CHEM 1015. Intro to Chemistry Lab. 1 Hour.

Lab portion of CHEM 1010. Lab fee required. Corequisite: CHEM 1010. FA, SP.

CHEM 1110. Elem General/Organic Chemistry. 4 Hours.

Fulfills General Education Physical Science requirement for students majoring in Health Sciences, Family & Consumer Science, Natural Resources, or Agriculture. Not appropriate for students majoring in Life Sciences, Physical Sciences, pre-Medical, pre-Dental or other pre-professional program. First semester in a 2-course sequence covering fundamental laws and reactions of general inorganic and organic chemistry, including the basic organic functional groups. Successful completion satisfies prerequisite for CHEM 1120. Prerequisite: MATH 1000 or MATH 1010 or Math Placement score 23 or higher. Corequisite: CHEM 1115. FA, SP, SU.

CHEM 1115. Elem General/Organic Chemistry Lab. 1 Hour.

Lab portion of CHEM 1110. Successful completion satisfies pre-requisite for CHEM 1125. Lab fee required. Corequisite: CHEM 1110. FA, SP, SU.

CHEM 1120. Elem Organic / Bio Chemistry. 4 Hours.

Continuation of CHEM 1110. Second semester in a 2-course sequence covering fundamental laws of carbohydrates, lipids, proteins, biochemical energy, enzymes, and molecular biology, as well as the organic functional groups related to these biochemicals. Successful completion prepares students for further study in Chemistry and Life Sciences. Prerequisite: CHEM 1110. Corequisite: CHEM 1125. SP.

CHEM 1125. Elem Organic/Bio Chemistry Lab. 1 Hour.

Lab portion of CHEM 1120. Lab fee required. Prerequisite: CHEM 1115. Corequisite: CHEM 1120. SP.

CHEM 1200. Preparation for Gen Chemistry. 3 Hours.

For students with little or no background in Chemistry and is designed to prepare students for General Chemistry. Covers basic topics through lecture and online problems. Prerequisite: MATH 1050 (can be concurrently enrolled).

CHEM 1210. Principles of Chemistry I. 4 Hours.

Fulfills General Education Physical Science requirement for students majoring in Life or Physical Sciences, Engineering, and pre-professional programs (pre-medical, pre-dental, etc.). Provides theoretical and practical framework for further study in the sciences; emphasizes measurement, stoichiometry, the nature of the atom, chemical periodicity, the states of matter, thermodynamics and bonding. Successful completion satisfies pre-requisite for CHEM 1220. Completion of a prior Chemistry course is strongly recommended before enrolling in this course. Prerequisite: MATH 1050 (Grade C or higher), or equivalent placement score taken within 2 years prior to enrollment in this course. Corequisite: CHEM 1215. FA, SP.

CHEM 1215. Principles of Chemistry I Lab. 1 Hour.

Lab portion of CHEM 1210. Successful completion satisfies pre-requisite for CHEM 1225. Lab fee required. Corequisite: CHEM 1210. FA, SP.

CHEM 1220. Principles of Chemistry II. 4 Hours.

Continuation of CHEM 1210. Emphasizes kinetics, equilibrium, descriptive chemistry, nuclear chemistry, and special topics. Successful completion prepares students for and satisfies prerequisite for CHEM 2310 and further study in life and physical sciences. Prerequisite: CHEM 1210 (Grade C- or higher). Corequisite: CHEM 1225. FA, SP.

CHEM 1225. Principles of Chemistry II Lab. 1 Hour.

Lab portion of CHEM 1220. Successful completion satisfies prerequisite for CHEM 2315. Lab fee required. Prerequisite: CHEM 1215. Corequisite: CHEM 1220. FA, SP.

CHEM 2310. Organic Chemistry I. 4 Hours.

For Chemistry, Biology, pre-Medical, pre-Dental, pre-Optometry, pre-Pharmacy majors, pre-Chiropractic, pre-Medical Technician, and pre-Veterinary majors. Introduction to functional groups and related reactions, including an introduction to spectroscopy. Successful completion satisfies prerequisite for CHEM 2320. Prerequisite: CHEM 1220 (Grade C- or higher). Corequisite: CHEM 2315. FA, SP.

CHEM 2315. Organic Chemistry I Lab. 1 Hour.

Lab portion of CHEM 2310. Lab fee required. Prerequisite: CHEM 1225 (Grade C- or higher). Corequisite: CHEM 2310. FA, SP.

CHEM 2320. Organic Chemistry II. 4 Hours.

A continuation of CHEM 2310. Further study of functional groups and related reactions, including organic reactions necessary for synthesis of larger molecules. Successful completion prepares students for further study in biochemistry and physical chemistry. Prerequisite: CHEM 2310 (Grade C- or higher). Corequisite: CHEM 2325. FA, SP.

CHEM 2325. Organic Chemistry II Lab. 1 Hour.

Lab portion of CHEM 2320. Lab fee required. Prerequisite: CHEM 2315 (Grade C- or higher). Corequisite: CHEM 2320. FA, SP.

CHEM 2700R. Field Methods in Chemistry Research. 1 Hour.

A preparatory course for undergraduate participation in field research projects in chemistry. Repeatable for a maximum of 3 credits. Prerequisite: CHEM 1215 (Grade B- or higher). Course fee required.

CHEM 2990. Seminar in Chemistry. 0.5-3 Hours.

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable-credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit hour offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other non-traditional instruction methods. Note that this course is an elective and does not fulfill general education or program requirements. Prerequisite: Instructor permission.

CHEM 3000. Quantitative Chemical Analysis. 4 Hours.

This course is focusing on understanding the principles of analytical chemistry and the application of these principles in various scientific disciplines. This course is addressing aspects of modern chemical analysis with emphasis on chemical equilibrium. Volumetric, gravimetric, and instrumental methods are described. Course will cover basic statistics, chemical equilibrium, gravimetric analysis, volumetric analysis, acid-base chemistry, complexation, spectrophotometry, and separations. Prerequisite: CHEM 1220 (Grade C or higher). FA (even).

CHEM 3060. Physical Chemistry I. 4 Hours.

A problem-oriented course in atomic and molecular structure, states of matter, and chemical kinetics. Introduction to efficient retrieval of information from the physical chemical literature and thinking critically about the material. Students will understand the difference between classical and quantum mechanics, understanding the time, length, and energy scales on which chemical processes occur, and connect common approximation methods to standard chemical frameworks. Prerequisites: CHEM 1220 and PHYS 2210 (Grade C or higher). FA (odd).

CHEM 3065. Physical Chemistry I Lab. 1 Hour.

A problem-oriented course in atomic and molecular structure, states of matter, and chemical kinetics. Introduction to efficient retrieval of information from the physical chemical literature and thinking critically about the material. Students will understand the difference between classical and quantum mechanics, understanding the time, length, and energy scales on which chemical processes occur, and connect common approximation methods to standard chemical frameworks. Lab fee required. Prerequisites: CHEM 2320 and CHEM 2325 (both Grade C or higher), and PHYS 2210 and PHYS 2215 (both Grade C or higher). Corequisite: CHEM 3060. FA (odd).

CHEM 3070. Physical Chemistry II. 4 Hours.

Introduction to microscopic and bulk thermodynamics, partition functions, theory of electrolytes and electrochemistry, and chemical kinetics. Prerequisites: CHEM 3060 (Grade C or higher) and MATH 2210 (Grade C or higher). SP (even).

CHEM 3075. Physical Chemistry II Lab. 1 Hour.

A problem-oriented course in atomic and molecular structure, states of matter, and chemical kinetics. Introduction to efficient retrieval of information from the physical chemical literature and thinking critically about the material. Students will understand the kinetics and thermochemistry. They will gain understanding in statistical distributions, mechanistic pathways, and energy scales on which chemical processes occur, and connect common approximation methods to standard chemical frameworks. Prerequisite: CHEM 1220 and CHEM 2320 and PHYS 2210 (all Grade C or higher). Corequisite: CHEM 3070. SP (even).

CHEM 3100. Inorganic Chemistry. 4 Hours.

Covers current theory and concepts in inorganic chemistry with an emphasis on general trends and periodic properties of the elements and their compounds. Topics include bonding and structure, acid-base theories, redox properties, molecular symmetry, coordination compounds, and crystal-field theory. Students will expand their knowledge of the role of metals in nature and use gained knowledge and critical thinking skills for problem solving. Prerequisites: CHEM 2320 and CHEM 2325. FA.

CHEM 3300. Instrumental Analysis. 4 Hours.

Focuses on understanding the theory and practice of modern analytical instrumentation. Course emphasis will be placed on chromatography, optical spectroscopy, mass spectrometry, microscopy as well as sample preparation techniques, statistical data treatment, and quality assurance of data. Course fee required. Prerequisite: CHEM 3000 (Grade C or higher). SP (odd).

CHEM 3510. Biochemistry I. 3 Hours.

Covers cellular metabolism of biologically-important molecules (carbohydrate, lipids, proteins, and nucleic acids) as well as regulation of these metabolic processes. Principles will be taught using structure/function relationships. Prerequisites: BIOL 1610 AND BIOL 1615; AND CHEM 2320 AND CHEM 2325 (all Grade C- or higher). Corequisite: CHEM 3515. FA.

CHEM 3515. Biochemistry I Lab. 1 Hour.

Introduction to current biochemical techniques including spectrophotometry, chromatography, and electrophoresis. Includes analysis and manipulation of nucleic acids. Lab fee required. Prerequisite: CHEM 2325 (Grade C or higher). Corequisite: CHEM 3510. FA.

CHEM 3520. Biochemistry II. 3 Hours.

Continuation of Biochemistry I. Introduction into catabolic and anabolic processes of animal and plant metabolism. Includes protein and nucleic acid biosynthesis and signal transduction. Discussion of current biochemical methods. Prerequisite: CHEM 3510 (Grade C or higher). SP.

CHEM 3525. Biochemistry II Lab. 1 Hour.

A laboratory course to be taken concurrently with CHEM 3520. Lab fee required. Prerequisite: CHEM 3515 (Grade C or higher). Corequisite: CHEM 3520. SP.

CHEM 4100. Advanced Inorganic Chemistry. 3 Hours.

A continuation of CHEM 3100. Topics may include more in-depth emphasis on molecular symmetry, group theory, organometallic reactions, bonding and structure, acid-base theories, redox properties, coordination compounds, and crystal-field theory. Students will expand their knowledge of the role of metals in nature and use gained knowledge and critical thinking skills for problem solving. Prerequisite: CHEM 3100 (Grade C or higher). SP (odd).

CHEM 4200. Environmental Chemistry. 3 Hours.

This course will focus on the fundamental principles of chemistry necessary for understanding of the source, fate, and reactivity of compounds in natural and polluted environments. Emphasis will be placed on the environmental implications of energy utilization and on the chemistry of the atmosphere, hydrosphere, and lithosphere. Environmental issues that will be discussed include air pollution, stratospheric ozone depletion, pollution and treatment of water sources, and the utilization of insecticides and herbicides. Prerequisite: CHEM 2320 (Grade C or higher). FA (odd).

CHEM 4310. Adv Organic Chemistry I. 3 Hours.

A problem-oriented course inorganic structure, stereochemistry, and thermodynamics and kinetics in organic reaction mechanisms. Introduction to efficient retrieval of information from the organic chemical literature, and to thinking critically about the material. Introduction to molecular orbital theory and aromaticity and resulting spectroscopic properties. Prerequisite: CHEM 2310 (Grade C or higher); AND CHEM 2320 (Grade C or higher); AND CHEM 2325 (Grade C or higher). Offered based upon sufficient student need.

CHEM 4510. Chemistry of Materials. 3 Hours.

Provides the molecular understanding of materials structure and properties, including solid-state chemistry, chemical bonding in bulk materials, and properties of materials as function of local and extended structures. Topics include inorganic solids, organic and coordination polymers, organic conductors, hybrid materials, optical and magnetic materials, and biomaterials. Prerequisites: CHEM 2310, CHEM 2320, CHEM 2325; and either CHEM 3100 or CHEM 4310, or instructor permission. FA, SP.

CHEM 4800R. Independent Research. 1-3 Hours.

An independent research course that allows the students to explore science through the scientific method, and allows close interaction between the student and faculty member to address scientific problems through experiment design and execution. Projects are at the discretion of the faculty member, in line with the student's interests in the various scientific areas. Repeatable up to 6 credits subject to graduation and program restrictions. Prerequisites: CHEM 2310 AND CHEM 2320 AND CHEM 2325; AND ENGL 2010 or ENGL 2010; AND instructor permission. Variable credit: 1-3. Offer based upon sufficient student need.

CHEM 4910. Chemistry Senior Seminar. 1 Hour.

A seminar course where students will share their research results or literature searches with fellow students and faculty in written and oral formats. Prerequisites: CHEM 2320 and CHEM 2325 (Grade C or higher); and ENGL 2010(Grade C or higher); Advanced Standing; and Instructor Permission. FA, SP.

Engineering Courses

ENGR 1000. Intro to Engineering. 2 Hours.

For students considering an Engineering career. Introduces the functions and career paths for various branches of Engineering and the nature and challenges of the Engineering profession, including educational requirements of various fields, as well as history, ethics, and the engineering method. Also serves as a First Year Experience (FYE) seminar, introducing students to skills and resources designed to make them more successful university students. FA.

ENGR 1050. Intro to Engineering Design. 3 Hours.

For pre-engineering students. Covers basic principles behind the engineering design process, including all be introduced to solid modeling software, gathering design information, development of design alternatives, working in teams to support the entire design process, evaluating design alternatives, and communicating design outcomes. Ethics of design will be presented, and students will develop three simple projects, two of which will be in teams. Prerequisite: MATH 1060 or MATH 1080. SP.

ENGR 2010. Statics. 3 Hours.

For pre-Engineering students. Covers the equilibrium of bodies, that is, those that are either at rest or move with a constant velocity. Covers properties of vectors as they apply to force systems, including trusses, frames, and machines. Applications of friction and forces in beams. Prerequisites: MATH 1220 (can be concurrently enrolled), FA.

ENGR 2030. Dynamics. 3 Hours.

For pre-Engineering students. Covers the kinematics of a particle in both rectilinear and curvilinear motion, as well as application of Newton's laws of motion to the kinetics of particles in detail for several types of motion. Force and acceleration, and energy and momentum are used as methods for solving dynamic problems. Planar kinematics and kinetics of rigid bodies are covered. Prerequisite: ENGR 2010. Offered upon sufficient student need.

ENGR 2140. Strength of Materials. 3 Hours.

For pre-Engineering students. Introduces the internal effects (stress, strain, elastic and inelastic behavior, shear and bending movement) of loads (axial, torsion, and bending) on engineering systems. Prerequisite: ENGR 2010. Offered upon sufficient student need.

ENGR 2250. Electrical Circuits. 3 Hours.

For pre-Engineering students. Presents basic concepts of electric circuit theory, including voltage, current, power, resistance, capacitance, and inductance. Covers circuit analysis techniques, including Kirchoff's Laws, node voltages, and mesh currents for direct and alternating current. Circuits discussed include first and second order inductive and capacitive circuits (RC, RL, RLC). Operational amplifiers are introduced into circuit analysis. Phasers are used in conjunction with AC circuits. Prerequisites: MATH 2280 (can be concurrently enrolled), and MATH 1220. Offered upon sufficient student need.

ENGR 2255. Electrical Circuits Lab. 1 Hour.

Introductory lab course for pre-Engineering students. Discusses electrical circuit measurements and analysis methods. Through several laboratories students are introduced to instrumentation important to the understanding of electrical circuit analysis and the safety required with the use of instrumentation. Several different circuits will be analyzed including LC and RC circuits, resistive networks, operational amplifiers, and AC circuits. Includes basic circuit design and analysis techniques using circuit analysis software. Prerequisites: MATH 1220, and MATH 2270. Corequisite: ENGR 2250. Offered upon sufficient student need.

ENGR 2300. Engineering Thermodynamics. 3 Hours.

For pre-Engineering students. Covers fundamentals of thermal energy and work, thermodynamic properties of fluids and equations of state, open and closed systems, first and second laws of thermodynamics, and applications to thermal and mechanical processes. Prerequisites: MATH 2210 (can be concurrently enrolled) and MATH 1220. Offered upon sufficient student need.

ENGR 2990. Seminar in Engineering. 0.5-3 Hours.

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit hour offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other non-traditional instruction methods. Note that this course is an elective and does not fulfill general education or program requirements. Prerequisite: Instructor Permission.

Environmental Science Courses

ENVS 1010. Intro to Environmental Science. 3 Hours.

Fulfills General Education Physical Science requirement and is an approved Global & Cultural Perspectives course. Introduction to the field of environmental science, focusing on how an understanding of the natural world around us and the application of scientific method can help us address problems facing our planet. Subject areas include environmental policy, natural resources, energy, and human impact to the environment. FA, SP, SU.

ENVS 2000R. Field Exp: Environmental Sci. 1 Hour.

Fulfills General Education Laboratory Sciences requirement. Provides an opportunity for students to meet each other in a field-research setting and discuss a major environmental issue. The class will be held over a 3-4 day weekend (overnight stays required). Each semester the class will focus on a particular issue related to the environment that is of interest to the region where the class is being held. Repeatable up to 2 credits. Offered on sufficient student need. Prerequisite: ENVS 1010 (can be concurrently enrolled), or Instructor permission.

ENVS 2700R. Field Methods in Environmental Science. 1 Hour.

A preparatory course for undergraduate participation in collaborative research projects in environmental science. Repeatable for a maximum of 3 credits. Course fee required. Prerequisite: ENVS 1010 (Grade B- or higher).

ENVS 3910. Costa Rica Natural History. 3 Hours.

An interdisciplinary course that introduces students to the geography, cultural history, literature, ecology and biodiversity of Costa Rica. The course will meet for an hour a week during the semester, then the participants will travel to Costa Rica for a 2-week study abroad experience. The students will live and study at field research stations in Costa Rica. Pre-trip preparation will include selected literary and scientific readings to prepare students to understand their experiences in Costa Rica. Lectures and laboratory/field experiences will focus on incorporating these readings into observations and experiences while in Costa Rica. The fee covers most costs while in Costa Rica, airfare is not included. Offered upon sufficient student need. Course fee required.

ENVS 3920. Peruvian Amazon Natural History. 3 Hours.

An interdisciplinary course that introduces students to the geography, cultural history, literature and biodiversity of the Amazon region of Peru. The course will meet for an hour a week during the semester, then the participants will travel to Peru for a 10 day study abroad experience. Participants live and study at field research stations in Peru. Pre-trip preparation will include selected literary and scientific readings to prepare students to understand their experiences in Peru. Lectures and laboratory/field experiences will focus on incorporating these readings into observations and experiences while in Peru. Offered upon sufficient student need. Fee covers program costs while in Peru, it does not cover international flights round-trip to Iquitos, Peru (\$800-\$1200). Offered upon sufficient student need.

Geography Courses**GEOG 1000. Physical Geography. 3 Hours.**

Fulfills Physical Science General Education Requirement and is an approved Global and Cultural Perspectives course. Focuses on the physical dynamics of the natural environment, including atmosphere, lithosphere, biosphere, hydrosphere and their integrated patterns of global distribution. Successful completion enables students to be familiar with climates, landforms, soils, water, plants, animals and how they all interact to make up the surface of the earth, provide resources for society, and create natural hazards. One field trip required. GEOG 1005 OR GEO 2000R lab course recommended. Course fee required. FA, SP, SU.

GEOG 1005. Physical Geography Lab. 1 Hour.

Lab portion of GEOG 1000. One field trip required. Lab fee required. Corequisite: GEOG 1000. FA, SP, SU.

GEOG 1020. Introduction to Weather. 3 Hours.

Fulfills General Education Physical Science requirement. Survey of the atmosphere and related phenomenon, including the impact of weather on human activities as well as understanding of basic weather principles. GEOG 1025 lab course recommended but not required. Offered upon sufficient student need.

GEOG 1025. Introduction to Weather Lab. 1 Hour.

A laboratory course to be taken concurrently with GEOG 1020. Lab fee required. Corequisite: GEOG 1020. Offered upon sufficient student need.

GEOG 1300. World Regional Geography. 3 Hours.

The study of different places, countries, and regions of the world. Addresses topics relating to natural environment, ethnic diversity, and regional differences in subjects related to culture, gender, age, class, social structure, spatial organization, and economic activities. Current social conditions within the world's major culture realms are analyzed and compared. SP.

GEOG 2000R. Natural History of Zion National Park. 1 Hour.

Fulfills General Education Laboratory Sciences requirement. Provides an opportunity for students to study in a field-research setting and learn about the natural history of Zion National Park. Topics will include plants, animals, geology, environmental issues and human history. The class will be held over a 4-5 day period (overnight stays required). Repeatable up to 2 credits. Offered on sufficient student need. Course fee required. FA, SP, SU.

GEOG 2990. Seminar in Geography. 0.5-3 Hours.

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit hour offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other non-traditional instruction methods. Note that this course is an elective and does not fulfill general education or program requirements. Prerequisite: Instructor permission.

GEOG 3600. Introduction to Geographic Information Systems. 3 Hours.

Introduces the history, theory, and operation of Geographic Information Systems (GIS). Includes an introduction to GIS data sources, database design, data input, spatial analysis, and map production. Offers valuable preparation for careers in geology, geography, geographic information systems, geomatics, planning, surveying, marketing, environmental science, biology, engineering, and other related fields. Corequisite: GEOG 3605. FA.

GEOG 3605. Introduction to Geographic Information Systems Laboratory. 1 Hour.

A laboratory component of GEOG 3600 to have experience working with GIS software, data sources, database design, data input, spatial analysis, and map production. Lab fee required. Corequisite: GEOG 3600. FA.

GEOG 4200. Geography of Utah. 3 Hours.

Explores human and physical phenomena that make Utah distinctive. Lectures examine webs of relationships among Utah's people, places, and environments. Students examine Utah's contrasting physical and social environments and explore what is meant by a sense of place. Offered upon sufficient student need.

Geology Courses**GEO 1010. Introduction to Geology. 3 Hours.**

Fulfills Physical Science General Education requirement and is an approved Global and Cultural Perspectives course. Focuses on the physical dynamics of the natural environment, delineating its geosphere, hydrosphere, atmosphere, and biosphere components, and their global patterns of interaction. Highlights the processes of science that underpin this systemic view of the world. Emphasizes issues of resource availability, along with their political and social ramifications. Particular emphasis is placed on the challenges natural hazards present to civilization, worldwide. The extraordinary geology of the region surrounding DSU is featured in many textbook and lecture examples. One field trip required. GEO 1015 OR GEO 2000R lab course recommended. Course fee required. FA, SP, SU.

GEO 1015. Introduction to Geology Lab. 1 Hour.

A laboratory course to be taken concurrently with Geology 1010. Lab fee required. Corequisite: GEO 1010. FA, SP.

GEO 1020. Life of the Past. 3 Hours.

Fulfills General Education Physical Science requirement for non-Science majors. General survey of historical Geology focusing on the relationship between the tectonic history of the Earth, the evolution of life through time, and the histories of the Earth and life and the complex interactions between them. GEO 1025 lab course recommended but not required. One field trip required. Course fee required. Offered upon sufficient student need.

GEO 1025. Life of the Past Laboratory. 1 Hour.

A laboratory course to be taken concurrently with GEO 1020. Lab fee required. 2 lab hours per week. Offered upon sufficient student need. Corequisite: GEO 1020.

GEO 1040. Introduction to Dinosaurs. 3 Hours.

Fulfills General Education Physical Science requirement. Utilizes the popular subject matter of dinosaurs to teach basic principles of geology, biology, physics, chemistry, and astronomy, with some basic math (algebra). Successful completion of this interdisciplinary course contributes to an understanding of science and scientific concepts as well as their applications in a multitude of disciplines. GEO 1045 lab course recommended but not required. One field trip required. Course fee required. Offered upon sufficient student need.

GEO 1045. Intro to Dinosaurs Laboratory. 1 Hour.

A laboratory course to be taken concurrently with GEO 1040. Lab fee required. Offered upon sufficient student need. Corequisite: GEO 1040. FA (odd).

GEO 1050. Geology of the National Parks. 3 Hours.

Fulfills General Education Physical Science requirement. General survey of Physical Geology emphasizing the geology of Utah's scenic national parks and monuments, as well as state parks, to investigate the geologic history of and processes shaping the region, inherent geologic hazards, and natural resource use and availability. Corequisite: GEO 1055. Offered upon sufficient student need.

GEO 1055. Geology National Parks Lab. 1 Hour.

Field trip portion of GEO 1050. An eight-day/seven-night field trip featuring national parks and monuments, usually over Spring Break, to experience geologic processes shaping the landscape, interpret past environments/climates that created the resources utilized by society, and observe first-hand how our Earth has changed through geologic time and, in fact, is ever-changing. Requires hiking on park trails over uneven surfaces for average of three miles a day. Elevations up to 8300 feet. Lab fee required. Offered upon sufficient student need. Corequisite: GEO 1050.

GEO 1060. Intro to Environmental Geology. 3 Hours.

Fulfills General Education Physical Science requirement for non-Science majors. Emphasizes relationship between human beings and the geologic environment, including geologic hazards, mineral and energy resources, and environmental issues, including causes and impacts of environmental threats. Offered upon sufficient student need.

GEO 1080. Introduction to Oceanography. 3 Hours.

Fulfills General Education Physical Science requirement. Conveys the essential principles of ocean science, including an understanding of the earth's oceans focusing on sea floor topography and composition, plate tectonics, seawater dynamics and chemistry, atmospheric and ocean currents, waves, coastal land forms, and marine life as well as recognition of the close linkage of weather, climate, and humans to the oceans. GEO 1085 lab course recommended but not required. Offered upon sufficient student need.

GEO 1085. Intro to Oceanography Lab. 1 Hour.

A laboratory course in oceanography. Lab fee required for travel to marine laboratories and coastal regions in California. Offered upon sufficient student need.

GEO 1110. Physical Geology. 3 Hours.

Fulfills a General Education Physical Science requirement for students majoring in the Sciences or Engineering, including Civil Engineering, Geology, Range Management, Forestry, etc. Covers the study of the physical features of the earth and the processes that shape those features. Successful completion gives students the background necessary for further study in the sciences. Corequisite: GEO 1115. FA.

GEO 1115. Physical Geology Lab. 1 Hour.

Lab portion of GEO 1110. Three Saturday field trips required. Lab fee required. Corequisite: GEO 1110. FA.

GEO 1220. Historical Geology. 3 Hours.

Conceptual examinations of how the atmosphere, biosphere, hydrosphere, and lithospheres interact to create major structural and stratigraphic features (emphasizing North America) and how life has evolved through deep time. Prerequisite: GEO 1110. Corequisite: GEO 1225. SP.

GEO 1225. Historical Geology Lab. 1 Hour.

Lab accompanying GEO 1220. Local field trip required. Lab fee required. Prerequisite: GEO 1115. Corequisite: GEO 1220. SP.

GEO 2000R. Applied Geologic Investigation of Grand Canyon, Zion, and Bryce National Parks. 1 Hour.

Fulfills General Education Laboratory Sciences requirement. Provides an opportunity for students to study topics such as depositional environments, plate tectonics, gradation, rock dating, geologic time, Earth history, and environmental issues in a field research setting through travel to Grand Canyon, Zion, and Bryce Canyon National Parks. The class will be held over a 4-5 day period. Overnight stays at the Tanner Field Station required. Repeatable up to 2 credits. FA, SU.

GEO 2700R. Field Methods in Geoscience Research. 1 Hour.

A preparatory course for undergraduate participation in collaborative research projects in the geosciences. Repeatable for a max of 3 credits. Corequisite: GEO 1115. Course fee required.

GEO 2990. Seminar in Geology. 0.5-3 Hours.

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit hour offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other non-traditional instruction methods. Note that this course is an elective and does not fulfill general education or program requirements.

GEO 3060. Environmental Geology. 3 Hours.

Geological attributes of environmental settings with emphasis on the analysis of geologic conditions pertinent to resource availability, urban planning, recognition and assessment of geologic hazards, and environmental issues through geochemical investigation of Earth's atmosphere, hydrosphere and lithosphere. Prerequisites: GEO 1110 (Grade C or higher) AND GEO 1115 (Grade C or higher). Offered upon sufficient student need.

GEO 3180. Paleontology. 4 Hours.

Reviews theories, principles, and applications of paleontology, as well as the characteristics of important groups of fossil organisms and their geologic distributions and paleoecologies. Course includes lab. Course fee required. Prerequisites: GEO 1220 and GEO 1225, or instructor permission. FA (even).

GEO 3400. Water Resources. 3 Hours.

A detailed examination of the water cycle, including: precipitation, surface water, ground water, glaciers, water conservation, water management, and water pollution with special emphasis on the water resources of Utah and neighboring areas. Prerequisites: GEO 1110/1115 AND CHEM 1210/1215. Offered upon sufficient student need.

GEO 3550. Sedimentology & Stratigraphy. 4 Hours.

Explores the origins, classification, and occurrences of sedimentary rocks and their distributions in space and time. Course emphasizes the description and interpretation of sedimentary rocks and the philosophy and application of stratigraphic principles. Offered upon sufficient student need. Course fee required. Prerequisites: GEO 1220 AND GEO 1225.

GEO 3910. Applied Geologic Investigation of Iceland. 3 Hours.

Iceland, the land of fire and ice, offers students an experiential learning opportunity to study nearly every basic topic in Geology. Both tectonic processes powered by Earth's internal energy such as plate boundaries, volcanoes, earthquakes, and geysers, and gradation processes powered by the sun such as glaciers, rivers, shorelines, weathering and erosion are observed first hand. Environmental issues like resource use and its relationship to climate change and utilizing geothermal as a green energy resource to generate electricity are also examined. Course participants will meet for an hour a week during the semester then travel to Iceland for a six day travel abroad experience. Pre-trip classes include the above topics to prepare students to understand their experiences in Iceland. The fee covers airfare, lodging, transportation, activities, trip insurance and most meals. SP.

Physics Courses

PHYS 1010. Elementary Physics. 3 Hours.

Fulfills General Education Physical Science requirement for students not majoring in Physics, other Sciences, or Engineering. Covers the basic concepts of physics in an historical perspective, providing many practical examples that demonstrate the role of physics in their everyday life. PHYS 1015 lab course recommended but not required. Prerequisite: ACT Math Placement score 23 or higher; OR MATH 1010 or MATH 1000 (Grade C or higher in either class). FA, SP, SU.

PHYS 1015. Elementary Physics Lab. 1 Hour.

Lab portion of PHYS 1010. Lab fee required. Offered upon sufficient student need. Corequisite: PHYS 1010.

PHYS 1040. Elementary Astronomy. 3 Hours.

Fulfills General Education Physical Science requirement intended for students not majoring in Physics, other Sciences, or Engineering. Covers a general study of the solar system, including the formation of the solar systems and a brief description of its parts. Also covers a brief history of astronomy and a general study of the known universe. Course fee required. Corequisite: PHYS 1045. FA, SP.

PHYS 1045. Elementary Astronomy Lab. 1 Hour.

Lab portion of PHYS 1040. Lab fee required. Corequisite: PHYS 1040. FA, SP.

PHYS 2010. College Physics I. 4 Hours.

Fulfills General Education Physical Science requirement for students majoring in some Science programs, and pre-Medical, pre-Dental, and other pre-professional programs. Covers the basics of mechanics, heat, and sound. First course in a two-semester sequence required for further study in science fields. Prerequisite: MATH 1060 or MATH 1080 (Grade C or higher), or equivalent placement score taken within 2 years prior to enrollment in this course. Corequisite: PHYS 2015. FA.

PHYS 2015. College Physics I Lab. 1 Hour.

Lab portion of PHYS 2010. Lab fee required. Corequisite: PHYS 2010. FA.

PHYS 2020. College Physics II. 4 Hours.

Second course in a two-semester sequence required for further study in science fields for students majoring in some Science programs, and pre-Medical, pre-Dental, and other pre-professional programs. Covers the basics of electricity, magnetism, light, and modern physics. Uses lecturers, videos, and demonstrations. Prerequisite: PHYS 2010. Corequisite: PHYS 2025. SP.

PHYS 2025. College Physics II Lab. 1 Hour.

Lab portion of PHYS 2020. Lab fee required. Prerequisite: PHYS 2015 (Grade C or higher). Corequisite: PHYS 2020. SP.

PHYS 2210. Physics/Scientists Engineers I. 4 Hours.

Fulfills General Education Physical Science requirement for students majoring in physical science, engineering, and some biological/plant sciences. First course in an intensive two-semester sequence. Covers basic principles of physics, emphasizing mechanics with the objective of developing students' capacities to analyze problems in physics and to express solutions in mathematical form utilizing mathematics up to and including calculus. Successful completion satisfies prerequisite for ENGR 2000. Prerequisite: MATH 1210 (Grade C or higher) or MATH 1220 (can be concurrently enrolled). Corequisite: PHYS 2215. FA.

PHYS 2215. Physics/Scientists Engineers Lab. 1 Hour.

Lab portion of PHYS 2210. Lab fee required. Corequisite: PHYS 2210. FA.

PHYS 2220. Physics/Scientists EngineersII. 4 Hours.

Second course in a two-semester sequence required for students majoring in physical science, engineering, and some biological/plant sciences. Covers basic principles of physics, emphasizing electricity and magnetism; optics, and relativity with the objective of developing students' capacities to analyze problems in physics and to express solutions in mathematical form utilizing mathematics up to and including calculus. Successful completion of this series satisfies Physics requirements for Physical Science and Engineering. Prerequisite: MATH 1220; and PHYS 2210. Corequisite: PHYS 2225. SP.

PHYS 2225. Physics/Scientists Engineers II Lab. 1 Hour.

Lab portion of PHYS 2220. Lab fee required. Prerequisite: PHYS 2215. Corequisite: PHYS 2220. SP.

PHYS 2710. Introductory Modern Physics. 3 Hours.

For students majoring in Physics and some Engineering fields, also recommended for Chemistry and other Science majors. Includes relativity; wave-particle duality; and an introduction to quantum physics, atomic physics, and nuclear physics. Prerequisites: MATH 2280; and PHYS 2220/2225. Offered upon sufficient student need.

PHYS 2990. Seminar in Physics. 0.5-3 Hours.

For students wishing instruction that is not available through other regularly scheduled courses in this discipline. Occasionally, either students request some type of non-traditional instruction, or an unanticipated opportunity for instruction presents itself. This seminar course provides a variable credit context for these purposes. As requirements, this seminar course must first be pre-approved by the department chair; second, it must provide at least nine contact hours of lab or lecture for each credit hour offered; and third, it must include some academic project or paper (i.e., credit is not given for attendance alone). This course may include standard lectures, travel and field trips, guest speakers, laboratory exercises, or other non-traditional instruction methods. Note that this course is an elective and does not fulfill general education or program requirements. Prerequisite: Instructor permission.

PHYS 3400. Classical Mechanics. 3 Hours.

Study of Newtonian Mechanics, work and energy, systems of particles, Lagrange's and Hamilton's equations, harmonic oscillators, accelerated reference frames, and rigid body rotations. Offered upon sufficient student need. Prerequisite: PHYS 2220 (Grade C or higher).

PHYS 3710. Intermediate Modern Physics. 3 Hours.

For students majoring in Physics and Physical Science education. Includes a basic study of relativity and wave-particle duality, as well as an introduction to quantum physics, atomic physics, and nuclear physics. Prerequisite: MATH 1220 (Grade C or higher) AND PHYS 2220 (Grade C or higher). Offered upon sufficient student need.

PHYS 3720. Modern Physics II. 3 Hours.

Second course in a two-semester sequence for students majoring in Physics and Physical Science education. Continuation of Physics 3710 with an emphasis on applications of quantum mechanics and relativity. Prerequisite: PHYS 3710 (Grade C or higher). SP (odd).

Science Courses

SCI 1001. FYE: Science/Pre-Professional. 1 Hour.

A First Year Experience course strongly recommended for all entering freshmen and transfer student with 0-24 credits. Designed to help students succeed in science and other courses, adapt to university life, and become integrated into Dixie State University. Students will refine academic skills, create and foster social networks, learn about university resources, and explore different fields of study, degree options, and career opportunities as well as learning what science is and some of the career paths one can take in science. Multiple listed with all other sections of First Year Experience (all 1001 courses, ENGR 1000). Students may only take one FYE course for credit. FA, SP.

SCI 2600. Lab Safety for Teachers. 1 Hour.

Scientific school laboratory safety certification course required for secondary education majors to receive teaching endorsements in the sciences. Course will include the necessary knowledge required for pre-service teachers to safely teach lab science, including identifying the most common safety issues and providing affordable solutions. Offered upon sufficient student need.A.

SCI 3570. Foundation of Science Education. 3 Hours.

For students with a major or minor in secondary science education. Thorough investigation of research in science learning and state and national curricular standards. Philosophy of science, history of science, nature of scientific inquiry, and current research in science education are included as applicable to secondary science teaching. Serves as a foundation to pre-service science teachers' professional coursework.

SCI 4130. Science Teaching Methods. 3 Hours.

Required of students pursuing a Biology Secondary Education degree. Designed to assist pre-service teachers plan, teach, and evaluate activities for biology classes. Students will examine objectives, instructional methods, and curriculum for biology in secondary schools. Students will gain experience in developing, adapting, evaluating and using strategies and materials for teaching biology. Special characteristics of the science discipline will be considered. Students will be exposed to a diversity of laboratory and outdoor environmental materials and methods. This course does not fulfill a Biology elective for the Bachelor of Science in Biology degree. Offered based upon sufficient student need. Prerequisite: Admission to the Dixie State University Secondary Education Licensure program.

SCI 4700. Secondary Science Teaching Methods. 3 Hours.

Acquaintance and practice with various teaching and assessment methods in science. Development of science curricula emphasizing the integrated linkages between subjects. Development of science lesson and unit plans. It is recommended that students complete this course immediately prior to student teaching. FA.

SCI 4800R. Independent Research. 1-3 Hours.

Students will devise and perform original, preferably unique research projects in their respective Physical Science fields. The culmination of this project will be a publication-quality paper on their research that uses primary scientific literature pertinent to the student's field and individual projects. Repeatable for a maximum of 6 credits subject to graduation restrictions. Prerequisite: Instructor permission and Senior standing. Offered upon sufficient student need.