

SCIENTIFIC INQUIRY: NATURAL AND PHYSICAL WORLD COURSES

Science and technology play increasing roles in the most profound challenges and the greatest opportunities that we face as global societies. Gaining knowledge of the practice and promise of science is an essential responsibility of each educated citizen. While science provides the most thoroughly tested tools for developing accurate knowledge of nature, developing technologies shape our daily living and provide opportunities to ask questions that were not imaginable by previous generations. Courses provide students with a three-quarter experience that builds knowledge and application of scientific approaches in one core area. The three-quarter format with accompanying laboratories allows in-depth explorations that have significant social implications and that encourage development of reasoning skills and reflective judgment. By working between classroom and laboratory to understand the nature of science in the natural and physical world, students will apply scientific methods, analyze and interpret data, and justify conclusions where evidence is conflicting. Students will also explore the strengths and weaknesses of scientific knowledge and reflect on the connections between the natural sciences, developing technologies and other ways of knowing and constructing human experiences. Students in the BM degree program may choose between eight credits in the Language requirement or eight credits in the Scientific Inquiry: The Natural and Physical World requirement. Students in the BFA meet this requirement through eight credits taken in two sequential courses.

BIOL 1010 Physiological Systems (4 Credits)

The second required course in the introductory biology sequence required for students majoring in Biology or another science. Emphasis on physiology and development of plants and animals. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1020 lab section.

BIOL 1011 Evolution, Heredity and Biodiversity (4 Credits)

The first required courses in the introductory biology sequence required for students majoring in Biology or another science. Emphasis on evolution, basic genetics and inheritance, and biodiversity. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1021 lab section.

BIOL 1020 Physiological Systems Lab (1 Credit)

Exercises and experimentation to complement lecture material. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1010 lecture section.

BIOL 1021 Evolution, Heredity and Biodiversity Lab (1 Credit)

Exercises and experimentation to complement lecture material. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: BIOL 1011 lecture section.

BIOL 1220 Molecules to Humankind I (4 Credits)

First class in a three-quarter sequence for non-majors that examines the mechanisms that sustain life. Emphasis is placed on understanding the human body at the molecular, cellular and physiological levels. In the fall quarter our discussions start with the atom and basic chemistry. We next consider the properties of complex molecules, including DNA, proteins, carbohydrates and lipids, in order to see how such molecules are used and organized by living organisms. Our discussions of large and complex molecules lead naturally to the basic unit of life, the cell. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1221 Molecules to Humankind II (4 Credits)

Second class in a three-quarter sequence for non-majors begins with an introduction to the general vertebrate body plan; we emphasize the human body plan but also compare it with other vertebrates. Discussions progress through the major organ and physiological systems of the body, including circulatory, respiratory, excretory, endocrine, nervous, skin, immune, reproductive, gastrointestinal, and skeletal and muscle systems. Discussions concentrate on the organization and function of these systems. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1222 Molecules to Humankind III (4 Credits)

Third class in a three-quarter sequence focuses for non-majors on cell biology, genetics, and human reproduction and development. After a review of cell structure and function, focusing on how cells are capable of replication with modification, the mechanisms by which information is passed on from one cell to another and from one generation to the next are considered. The second half of the quarter concerns sexual reproduction and early development. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1260 Sustaining Life I (4 Credits)

A three-quarter sequence for non-majors examining some important biological mechanisms that sustain life -- and "life" in general! Emphasis is placed on the understanding the critical connections between the student's health and the health of the surrounding world. The first quarter begins with a discussion of the defining characteristics of "life" and the basic mechanisms required to sustain it. The course continues with an overview of biological diversity and ends with a focus on the many important connections between food, human health, and environmental health. The second quarter begins by building a basic understanding of how ecosystems function -- including the interactions among living organisms (including humans) and between these living organisms and their environment. The course continues with focused discussions of issues related to the impact of biological diversity on infectious disease and medicine. The third quarter begins with a focus on the importance of biodiversity to biomedical research, especially related to model systems. It then reviews some of the current threats to biodiversity and concludes by exploring some possible solutions that can give hope for sustaining "life" in the future. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1261 Sustaining Life II (4 Credits)

A three-quarter sequence for non-majors examining some important biological mechanisms that sustain life -- and "life" in general! Emphasis is placed on the understanding the critical connections between the student's health and the health of the surrounding world. The first quarter begins with a discussion of the defining characteristics of "life" and the basic mechanisms required to sustain it. The course continues with an overview of biological diversity and ends with a focus on the many important connections between food, human health, and environmental health. The second quarter begins by building a basic understanding of how ecosystems function -- including the interactions among living organisms (including humans) and between these living organisms and their environment. The course continues with focused discussions of issues related to the impact of biological diversity on infectious disease and medicine. The third quarter begins with a focus on the importance of biodiversity to biomedical research, especially related to model systems. It then reviews some of the current threats to biodiversity and concludes by exploring some possible solutions that can give hope for sustaining "life" in the future. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1260.

BIOL 1262 Sustaining Life III (4 Credits)

A three-quarter sequence for non-majors examining some important biological mechanisms that sustain life -- and "life" in general! Emphasis is placed on the understanding the critical connections between the student's health and the health of the surrounding world. The first quarter begins with a discussion of the defining characteristics of "life" and the basic mechanisms required to sustain it. The course continues with an overview of biological diversity and ends with a focus on the many important connections between food, human health, and environmental health. The second quarter begins by building a basic understanding of how ecosystems function -- including the interactions among living organisms (including humans) and between these living organisms and their environment. The course continues with focused discussions of issues related to the impact of biological diversity on infectious disease and medicine. The third quarter begins with a focus on the importance of biodiversity to biomedical research, especially related to model systems. It then reviews some of the current threats to biodiversity and concludes by exploring some possible solutions that can give hope for sustaining "life" in the future. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1261.

BIOL 1270 Living in the Microbial World I (4 Credits)

Students receive an introduction to the world of microbiology, the good, the bad and the ugly. With the help of the press and movie industry, most "human hosts" believe that microorganisms are to be feared, sterilized and/or destroyed. While this is true for a very small number of microbes, the majority is composed of essential and beneficial microorganisms that help the existence of all life on Earth. This first course in the sequence for non-majors is dedicated to raising the awareness of students to the value and need of our unseen partners. Laboratory included. Lab fee associated with this course. Honors only. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

BIOL 1271 Living in the Microbial World II (4 Credits)

For such a small size, microorganisms can have a large impact on our human world. This second course in the sequence for non-majors brings a new perspective to students on the role microorganisms, and their associated diseases, have played in turning the tide of war victories, immigration of a country, world politics and more. We tend to believe that humans alone can control their world but sometimes the mightiest of all are our unseen partners. Laboratory included. Lab fee associated with this course. Honors only. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1270.

BIOL 1272 Living in the Microbial World III (4 Credits)

In this last course in the sequence for non-majors, students are given an opportunity to challenge their beliefs and understandings of how life came to exist on Earth and the perspective of how humans are the most evolutionarily advanced. Students are guided through time on Earth and examine the development of life and the constant contribution of their unseen partners. Laboratory included. Lab fee associated with this course. Honors only. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: BIOL 1271.

CHEM 1001 Science of Contemporary Issues I (4 Credits)

CHEM 1001 is the first class in a three-quarter sequence focused on real-world applications of chemistry. The first quarter focuses on sustainability, pollution, and climate change. To understand these topics, we will explore the behavior of gases, properties of solutions, chemical reactions in the atmosphere, and acid-base chemistry. This course cannot be taken for credit for a chemistry major or minor. A lab fee is associated with this course. The course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

CHEM 1002 Science of Contemporary Issues II (4 Credits)

CHEM 1002 is the second class in a three-quarter sequence focused on real-world applications of chemistry. This course focuses on fossil fuels, renewable resources, nuclear energy, batteries, and fuel cells. To understand these topics, we will examine combustion reactions, radioactive elements, nuclear waste, and electrochemistry. This course cannot be taken for credit for a chemistry major or minor. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: CHEM 1001.

CHEM 1003 Science of Contemporary Issues III (4 Credits)

CHEM 1003 is the final class in a three-quarter sequence focused on real-world applications of chemistry. This course focuses on plastics, nutrition, drugs, and genetic engineering. To understand these topics, we will learn about polymerization, macromolecules, and the chemistry behind foods such as fats, proteins, and carbohydrates. This course cannot be taken for credit for a chemistry major or minor. A lab fee is associated with this course. The course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: CHEM 1002.

CHEM 1010 General Chemistry I (3 Credits)

The first course in the introductory chemistry sequence for natural science and engineering majors. Topics covered include atomic and molecular structure, reactions in solution, and thermochemistry. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: CHEM 1240.

CHEM 1020 General Chemistry II (3 Credits)

The second course in the introductory chemistry sequence for science and engineering majors. Topics covered include thermodynamics, equilibria including acids and bases, and kinetics. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Pre-requisites: CHEM 1010 and CHEM 1240; Co-requisite: CHEM 1250.

CHEM 1240 General Chemistry I Laboratory (1 Credit)

Laboratory to accompany CHEM 1010. Experiments illustrate aspects of atomic structure, chemical bonding and thermochemistry. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Co-requisite: CHEM 1010.

CHEM 1250 General Chemistry II Laboratory (1 Credit)

Laboratory to accompany CHEM 1020. Experiments illustrate chemical principles applied to equilibrium of acids/bases, kinetics, and thermodynamics. Lab fee associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Pre-requisites: CHEM 1010 and CHEM 1240; Co-requisite: CHEM 1020.

CHEM 2131 Chemistry of the Elements (3 Credits)

Descriptive chemistry of main group and transition elements including redox and coordination chemistry. Prerequisites: CHEM 1020 and CHEM 1250. Corequisite: CHEM 2141.

CHEM 2141 Chemistry of the Elements Lab (1 Credit)

Laboratory to accompany CHEM 2131. Study of reactions of main group and transition elements including redox and coordination chemistry. Lab fee associated with this course.

CHEM 2240 Introduction to Environmental Chemistry (4 Credits)

An introduction to the chemistry of the environment. Topics cover the chemistry of air, water, and soil with a special focus on the influence that humankind has on the natural environment. Course provides tools to understand environmental science from a chemical perspective. The course is a combined lecture and laboratory. Primarily for environmental science majors. Lab fee associated with this course. Prerequisites: CHEM 1010, CHEM 1020, CHEM 1040, and CHEM 1250.

CHEM 2451 Organic Chemistry I (3 Credits)

Structure and reactions of covalent compounds of carbon. Satisfies organic chemistry requirement in chemistry, biology and related fields. Prerequisites: CHEM 2131 and CHEM 2141.

CHEM 2452 Organic Chemistry II (3 Credits)

Structure and reactions of covalent compounds of carbon. Satisfies organic chemistry requirement in chemistry, biology and related fields. Prerequisite: CHEM 2451 and CHEM 2461.

CHEM 2461 Organic Chemistry Lab I (1 Credit)

Laboratory course in theory and practice of preparative and analytical organic chemistry, including introduction to IR and NMR spectroscopy. Lab fee associated with this course. Co-requisite: CHEM 2451.

CHEM 2462 Organic Chemistry Lab II (1 Credit)

Laboratory course in theory and practice of preparative and analytical organic chemistry, including introduction to IR and NMR spectroscopy. Lab fee associated with this course. Co-requisite: CHEM 2452.

GEOG 1201 Environmental Systems: Weather (4 Credits)

First class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; introduction to the fundamentals of the environmental system and the various processes that control weather and climate. The student will have a fundamental understanding of the basic components of the environmental system, familiarity with the role of energy in the atmosphere and its control over cycles of air temperature, a sound foundation in the mechanisms governing cloud formation and precipitation, a basic understanding of the atmospheric circulation and the storm systems which develop within it, and an introduction to the regional variation of climate. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

GEOG 1202 Environmental Systems: Hydrology (4 Credits)

Second class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; the role of water in the environment. This course focuses on the matter and energy flows through the hydrologic cycles, together with the resulting spatial distribution and work of water. Various environmental issues concerning water including drought, water pollution, and human impacts on water supplies are included. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1201.

GEOG 1203 Environmental Systems: Landforms (4 Credits)

Third class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; geological phenomena in various places in the world. Topics include maps and air photos; rocks and minerals; plate tectonics and volcanoes; landforms produced by wind, water, earth forces and ice; and biogeography. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1201 and GEOG 1203.

GEOG 1216 Our Dynamic Earth I (4 Credits)

This is the first quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. Natural processes become hazards when they have the potential to have an adverse effect on humans and their property, or the natural environment. This first quarter of the sequence introduces students to the physical processes associated with atmospheric natural hazards (tornados, hurricanes, severe storms) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

GEOG 1217 Our Dynamic Earth II (4 Credits)

This is the second quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. In this course, students investigate the physical processes that result in geologic natural hazards (earthquakes, landslides, volcanoes) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1216.

GEOG 1218 Our Dynamic Earth III (4 Credits)

This is the third quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. In this course, students investigate the physical processes that result in hydrologic natural hazards (floods, drought, tsunamis) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1217.

GEOG 1264 Global Environmental Change I (4 Credits)

First class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

GEOG 1265 Global Environmental Change II (4 Credits)

Second class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1264.

GEOG 1266 Global Environmental Change III (4 Credits)

Third class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1265.

PHYS 1011 21st-Century Physics and Astronomy I (4 Credits)

First class in a three-quarter sequence that explores the meaning of discoveries in our physical world in terms of astronomy and astrophysics, and how they shape modern research into our knowledge of the nature of the universe. In this course sequence, students (1) survey the fundamentals of the cutting-edge astronomy and astrophysics and (2) learn how physics works in explaining varieties of observed astronomical phenomena that encompass the origin and evolution of the universe and its contents—from galaxies to stars and planets. In this way students become familiar with the essential concepts of modern physics in terms of astronomy and astrophysics. Lab fee associated with these courses. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

PHYS 1012 21st-Century Physics and Astronomy II (4 Credits)

Second class in a three-quarter sequence that explores the meaning of discoveries in our physical world in terms of astronomy and astrophysics, and how they shape modern research into our knowledge of the nature of the universe. In this course sequence, students (1) survey the fundamentals of the cutting-edge astronomy and astrophysics and (2) learn how physics works in explaining varieties of observed astronomical phenomena that encompass the origin and evolution of the universe and its contents—from galaxies to stars and planets. In this way students become familiar with the essential concepts of modern physics in terms of astronomy and astrophysics. Lab fee associated with these courses. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

PHYS 1013 21st-Century Physics and Astronomy III (4 Credits)

Third class in a three-quarter sequence that explores the meaning of discoveries in our physical world in terms of astronomy and astrophysics, and how they shape modern research into our knowledge of the nature of the universe. In this course sequence, students (1) survey the fundamentals of the cutting-edge astronomy and astrophysics and (2) learn how physics works in explaining varieties of observed astronomical phenomena that encompass the origin and evolution of the universe and its contents—from galaxies to stars and planets. In this way students become familiar with the essential concepts of modern physics in terms of astronomy and astrophysics. Lab fee associated with these courses. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

PHYS 1111 General Physics I (5 Credits)

This is the first of a three-quarter sequence for students in any Natural Science and Mathematics field of study. The course stresses physics concepts rather than equation derivation as in the calculus-based course (PHYS 1211/PHYS 1212/PHYS 1213 or PHYS 1214). Algebra and trigonometry are used regularly to solve problems and make predictions. Includes topics in mechanics (kinematics, dynamics) including forces, one and two dimensional motion, work, energy and momentum. The course includes a rigorous algebra-based laboratory that exposes students to a broad range of the real physical phenomena investigated using equipment as well as computerized instrumentation and data acquisition techniques. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisites: high school algebra, trigonometry. Students majoring in physics or engineering are required to take PHYS 1211/PHYS 1212/PHYS 1213 or PHYS 1214. Lab fee associated with this course.

PHYS 1112 General Physics II (5 Credits)

This is the second of a three-quarter sequence for students in any Natural Science and Mathematics field of study. The course stresses physics concepts rather than equation derivation as in the calculus-based course (PHYS 1211/PHYS 1212/PHYS 1213 or PHYS 1214). Algebra and trigonometry are used regularly to solve problems and make predictions. Includes topics in rotational motion, torque, vibrations, fluids, heat and thermodynamics, kinetic theory, and particles and matter waves. The course includes a rigorous algebra-based laboratory that exposes students to a broad range of the real physical phenomena investigated using equipment as well as computerized instrumentation and data acquisition techniques. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisites: high school algebra, trigonometry, PHYS 1111. Students majoring in physics or engineering are required to take PHYS 1211/PHYS 1212/PHYS 1213 or PHYS 1214. Lab fee associated with this course.

PHYS 1113 General Physics III (5 Credits)

This is the third of a three-quarter sequence for students in any Natural Science and Mathematics field of study. The course stresses physics concepts rather than equation derivation as in the calculus-based course (PHYS 1211/PHYS 1212/PHYS 1213 or PHYS 1214). Algebra and trigonometry are used regularly to solve problems and make predictions. Includes topics in rotational motion, torque, vibrations, fluids, heat and thermodynamics, kinetic theory, and particles and matter waves. The course includes a rigorous algebra-based laboratory that exposes students to a broad range of the real physical phenomena investigated using equipment as well as computerized instrumentation and data acquisition techniques. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisites: high school algebra, trigonometry, PHYS 1112. Students majoring in physics or engineering are required to take PHYS 1211/PHYS 1212/PHYS 1213 or PHYS 1214. Lab fee associated with this course.

PHYS 1211 University Physics I (5 Credits)

First of a three-quarter sequence. Kinematics, vectors, force, energy and work, linear momentum, rotation of rigid bodies. Required for all physics and engineering majors and recommended for all science majors who are also required to take calculus. The course includes a rigorous calculus-based laboratory that exposes students to a broad range of the real physical phenomena studied in the lecture course. Through the use of experimental apparatus, computerized instrumentation and data acquisition, data analysis and graphical representation, students use the observed phenomena to exemplify the laws of physics. Physics theory and other relevant background information are explored individually by students in weekly prelab exercises. Students learn to write introductory-level laboratory reports and become familiar with good laboratory technique. Emphasis for this lab is on mechanics. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Corequisite: MATH 1951.

PHYS 1212 University Physics II (5 Credits)

Second of a three-quarter sequence. Gravitation, fluids; oscillatory motion; waves; thermal physics. Required for all physics and engineering majors and recommended for all science majors who are also required to take calculus. The lab portion of this course is a continuation of the PHYS 1211 lab portion and builds on laboratory skills and knowledge from that course. Emphasis for this lab is on waves, oscillations, sound, fluids and thermodynamics. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: PHYS 1211. Corequisite: MATH 1952.

PHYS 1213 University Physics III (5 Credits)

Third of a three-quarter sequence. Electrostatics, electric circuits, magnetism and electromagnetism; electromagnetic waves. Required for all physics and engineering majors and recommended for all science majors who are also required to take calculus. The lab portion of this course is a continuation of the PHYS 1221 and 1222 lab portions and builds on the students' laboratory skills and knowledge from those labs. Emphasis for this lab is on electricity, magnetism and circuits. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Cross listed with PHYS 1214. Prerequisite: PHYS 1212. Corequisite: MATH 1953.

PHYS 1214 University Physics III for Engineers (4 Credits)

This is the third course of a three-quarter sequence and is for engineers only; this is equivalent to PHYS 1213, but does not include lab component. Electrostatics, electric circuits, magnetism and electromagnetism; electromagnetic waves. Required for all engineering majors. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Cross listed with PHYS 1213. Prerequisite: PHYS 1212. Corequisite: MATH 1953.