Science and Mathematics Program

Science and Mathematics Program Classes

ASTR 120: Earth's Cosmic Context

This course will explore how astronomers have been able to discover Earth's place in the universe, and the structure of the local galaxy and universe. Within this exploration, astronomers have also discovered thousands of other planets, and have begun to map the deepest extents of time and space. From the discovery of distant galaxies and signatures of the origins of the universe, we also have begun to unravel the mysteries of the Big Bang, the formation of the first stars and galaxies, and how the earth arose from billions of years of cosmic evolution. The course will explore the search for exoplanets and the early universe with a mix of in-class exercises, analysis of space-based datasets and observations with telescopes and instruments.

Units: 3
Program: Physical Science

BIO 110: Nature and Humanity

This course is an introduction to environmental issues – the interactions of humanity and industrial civilization with the natural environment of Earth. The course draws on scientific, technological, and social perspectives to examine current and future environmental challenges, including the impacts of human actions on natural ecosystems, natural resources, pollution, and climate change.

Units: 3
Program: Biology

BIO 115: Cancer Biology

Everyone knows someone who has been impacted by cancer. By merely surviving, our bodies are primed with the capacity to develop this disease. This course will explore the 'war on cancer' in the context of human history, cell biology, and dramatic storytelling. Laboratory exercises will explore the biological basis of this disease. Not open to students who are enrolled in or who have taken and passed IBC 200 with at least a grade of C- or P.

Units: 3
Program: Biology

BIO 120: Human Body in a Modern World

The human body is an amazing product of 3.5 billions of years of evolution. From our cells to our organ systems, our bodies are beautifully designed to thrive on planet Earth. In this course, we will explore the structure and function of various human organ systems including the circulatory system, respiratory system, digestive system, reproductive system, and portions of the endocrine system (kidneys and adrenal glands). Along the way, we will discuss challenges faced by each of these organ systems in this modern age that can result in disease such as air pollution, endocrine disrupting chemicals, overuse of antibiotics, chronic stress, and a highly-processed industrial diet.

Students will perform various hands-on laboratory activities that will reinforce how their bodies function and how they can live a healthy life. Not open to students who are enrolled in or who have taken and passed BIO 303 with at least a grade of C- or P.

Units: 3
Program: Biology

BIO 130: Genetics and Evolution

Have you ever wondered about DNA and how slight alterations to the genetic code have produced the amazing variety of life forms that inhabit our planet? This class will explore exciting topics in both genetics and evolutionary biology, some of which include: the genetics of cancer, reproduction and inheritance, epigenetics, GMOs, DNA forensics, antibiotic resistance, evolution of the “fat gene,” and how to build evolutionary trees. Students will explore these topics through lectures, case study work, and hands-on laboratory exercises. Not open to students who are enrolled in or who have taken and passed IBC 200 with at least a grade of C- or P.

Units: 3
Program: Biology

BIO 135: Animal Diversity

This course explores the anatomical form and function of representatives from major animal phyla. Students will first learn about evolutionary processes that have generated the tremendous variety of form and function present in the animal kingdom. They will then learn about different lines of evidence that support the theory of common descent and examine how major lineages within the animal kingdom were created from key morphological innovations. Students will then take a tour of the major animal phyla. Students will explore these topics through lectures and hands-on laboratory activities that include live animal observations, dissections, field trips, and case studies. Not open to students who are enrolled in or who have taken and passed BIO 306 with at least a grade of C- or P.

Units: 3
Program: Biology

BIO 222: Marine Biology

This course focuses on the physical, chemical and biological characteristics of marine habitats and the organisms occupying those habitats, and provides a survey of the patterns of distribution, diversity, and abundance of species in marine communities, with an emphasis on the dynamic interactions which shape these patterns. The course also includes analysis of human impacts on marine ecosystems.

Units: 3
Program: Biology

CHEM 112: Chemistry for Life

Chemistry asks what is matter made of and how does it interact? A basic understanding of chemistry is a prerequisite for good citizenship in our changing and technological society. This course introduces modern chemical concepts and processes in the context of their impact on health, the environment, and technology. Through inquiry-based learning, you will develop critical thinking skills and data-driven decision making toward the understanding of

matter. This course has a moderate laboratory component and is appropriate for students not intending to continue in fields requiring foundational chemistry knowledge. Not open to students who are enrolled in or who have taken and passed CHEM 150 with at least a grade of C- or P.

Units: 3
Program: ChemistryPhysical Science

CHEM 115: Elements of Nutrition

Just twenty chemical elements are essential for human nutrition. This course will explore the atomic composition and structure of these elements; examine how some of these elements combine to make larger macronutrients; and consider the role that micro- and macro-nutrients play in producing energy, assisting development, and preventing and fighting disease in the human body. Team-based learning exercises and a moderate laboratory component will emphasize critical thinking and real-world applications of chemistry to physiology, health, wellness, and nutrition. This course is appropriate for students not intending to continue in fields requiring foundational chemistry. Not open to students who are enrolled in or who have taken and passed CHEM 150 with at least a grade of C- or P.

Units: 3
Program: ChemistryPhysical Science

CHEM 150: Foundations of Chemistry

This course is an introduction to general chemistry with an emphasis on developing problem solving skills for students planning a professional career in science, engineering, and medical fields. We will explore basic concepts of chemistry along with the mathematics required for quantitative problem solving. The topics include elements and compounds, chemical calculations, atomic structure, bonding, stoichiometry, chemical equations, reactions in aqueous solutions, oxidation-reduction, energy and chemical changes, quantum mechanical atom, chemical equilibrium, and acids & bases & buffers. To improve student learning outcome the laboratory section of this course will follow a research project -based learning strategy. Each project will include identifying a problem, literature search to locate an appropriate synthesis method, design experimental procedure, synthesis and characterization, analysis and reporting data. Prevents co- or later enrollment in CHEM 112 and CHEM 115. Intended for Life Sciences concentrators and those planning to pursue post-graduate science or health programs.

Units: 4
Prerequisites:
Instructor consent.
Program: Chemistry

IBC 200: Integrated Biology and Chemistry with Lab

This interdisciplinary course will focus on the molecular biology of cancer and the underlying chemistry of cell biology. Students will learn how proteins are encoded and the impact of genomic instability on protein structure and function; alterations of normal metabolism in cancer cells; and basic pathways of cell division and death. Complementary chemistry topics include chemical structure and bonding, biological polymerization, thermodynamics, enzyme kinetics, and redox reactions. Laboratory research will use model systems to understand cancer biology. Intended for Life Sciences concentrators and those planning to pursue post-graduate science or health programs.

Units: 4

Prerequisites:
CHEM 150 or instructor consent.
Program: ChemistryBiologyPhysical Science

MATH 101: Statistics

This course, which requires no specific mathematical background, is an introduction to statistical methods. Students will learn widely-used concepts, terminology, and methods of descriptive and inferential statistics. Methods of statistical inference include hypothesis testing and confidence intervals for means, proportions, and regression parameters, as well as chi-square and ANOVA methods.
Units: 3
Program: Mathematics

MATH 111: Symbolic Logic

This course, which requires no specific mathematical background, introduces valid deductive reasoning in a precise mathematical context. Students will learn formal languages encompassing elementary propositional and predicate logic, and techniques for assessing the validity of arguments expressible in those languages. Logic is foundational to mathematics, philosophy, and computer science, and indispensable in any reasonable debate.
Units: 3
Program: Mathematics

MATH 121: Introduction to Computer Science

This course is an introduction to the basic principles and great ideas of computer science. Computer science essentially deals with a particular class of problem-solving strategies called algorithms and the relative speed in which different algorithms reach similar solutions. Students will learn some of the essential topics of contemporary computer science through a mathematical perspective, and will use the Python programming language to implement their own algorithmic solutions to various problems. This course has no prerequisites.
Units: 3
Program: Mathematics

MATH 131: Network Science

This course is an introduction to the field of network science with an emphasis on the mathematical aspects and properties of networks. A network is an accessible yet powerful structure used to represent and study relationships. In practice, networks model different phenomena arising in fields such as biology, economics, sociology, computer science, and physics. In this class, we'll look rigorously at the mathematical structure of networks (this field is often referred to as graph theory), while also considering real world models, such as spread of disease, web link analysis, and financial networks. This course has no prerequisites.
Units: 3
Program: Mathematics

MATH 160: Liberal Arts Mathematics

This course helps develop quantitative, statistical, and financial literacy, indispensable for an educated, socially engaged person in today's society. Quantitative literacy involves developing confidence and competence with

numbers and measures, and requires understanding of the number system, a repertoire of mathematical techniques, and an inclination and ability to solve quantitative or spatial problems in a range of contexts. Statistical literacy requires understanding of the ways in which data are gathered and represented. Financial literacy requires, besides an understanding of basic personal finance tools like savings and loans, some knowledge of today's financial and economic realities and a willingness to consider their possible impact on personal finances.
Units: 3
Program: Mathematics

MATH 170: Calculus I

This course, suitable for students with a strong pre-calculus level background, focuses on Differential Calculus. Students will review properties of functions, learn the concept of mathematical limit, and study the properties and interpretations of the derivative, using some of the more common applications. Time permitting, students will be introduced to integrals and the Fundamental Theorem of Calculus. Calculus is widely used in the sciences, economics, and statistics for modeling and computations.
Units: 4
Prerequisites:
Strong pre-calculus background, including trigonometry, exponentials, and logarithms.
Program: Mathematics

MATH 171: Calculus II

This course, suitable for students with a good background in Differential Calculus, focuses on Integral Calculus and Infinite Series. Students will review limits and derivatives, and study the properties and interpretations of the integral, using some of the more common applications. Students will also be introduced to infinite series, and their connection to Differential Calculus. Calculus is widely used in the sciences, economics, and statistics for modeling and computations.
Units: 4
Prerequisites:
A semester of university-level Calculus, or a year of high-school-level Calculus.
Program: Mathematics

MATH 290: Topics in Mathematics

This course provides students opportunities to explore topics in mathematics, such as vector calculus, number theory, symbolic logic, differential equations, and linear algebra.
Units: 4
Prerequisites:
Instructor consent required.
Program: Mathematics

MATH 390: Advanced Topics in Mathematics

This course provides students opportunities to explore advanced topics in mathematics, such as advanced calculus, complex analysis, abstract algebra, non-Euclidean geometry, and topology.
Units: 4
Prerequisites:
Instructor consent required.
Program: Mathematics

PHYS 150: Heaven and Earth: A First Synthesis

The physics of motion on earth and in the heavens is traced from ancient Greek times through the Dark and Middle Ages, to the Renaissance and Galileo, and to Newton and the Enlightenment. Humanistic, cultural, and historical perspectives are emphasized as is the scientific method/process. Science is shown to be inextricably linked to other human endeavors such as religion, art, politics, music, literature, philosophy, and commerce. High school knowledge of algebra, geometry, trigonometry, and scientific notation would be helpful. Concurrently, we will explore physics after Newton and up to the contemporary frontier of string/brane theory, covering topics such as relativity and quantum mechanics and utilizing modern physics labs.

Units: 3
Program: Physical Science

PHYS 370: Space, Time, & the Texture of Reality

This heavily mathematical course with no lab requirement examines the changing conceptions of space and time from classical to modern to contemporary physics. Moving from Newtonian reality to Einstein's relativity to quantum mechanics to current unification theories, we will explore mathematics as a tool to transcend our faulty perceptions and to reveal new phenomenal, though perhaps not narrative, truth.

Units: 3
Prerequisites:
Previous and solid experience in physics and calculus plus instructor consent.
Program: Physical Science