

# NATURAL SCIENCES COURSES

## **ASTR-101 Introduction to Planetary Astronomy (4 Credits)**

Quantitative and descriptive view of the origins, structure, contents, and evolution of our solar system. Class includes both lecture and hands on lab exercises and the basics of night sky observing. Topics include formation of the solar system, planets and other bodies, current research missions, exploration and potential colonization. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **ASTR-102 Intro to Stellar & Galactic Astronomy (4 Credits)**

Quantitative and descriptive view of the origins, structure, contents, and evolution of our universe. Class includes both lecture and hands on lab exercises and the basics of night sky observing. Topics include light and telescopes, the origin, structure, and evolution of stars and the universe, and galactic classification and evolution. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **ASTR-315 Visions of the Universe (4 Credits)**

An in-depth study of the solar system, stellar evolution, exoplanets, binary and variable stars, black holes, the effects of dark matter and dark energy on the evolution of the universe. Emphasis will be given to historical and cultural influences leading to present day understanding. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **BIO-110 Molecules and Cells (4 Credits)**

Introduction to the life processes from the molecular to the physiological level using an integrated lecture and lab experience. Topics include the chemistry of macromolecules, cell structure and function, cellular respiration, photosynthesis, and gene expression. Use of experimental inquiry to integrate course content into a physiological context. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **BIO-111 Evolution & Ecology (4 Credits)**

An integrated lecture-lab experience that introduces the basic principles of evolution and ecology. Students investigate the causes and consequences of organismal diversity, both within and among species. Lab and field projects teach the scientific method. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **BIO-190 Topics in Biology (4 Credits)**

An exploration of biological issues and methods for nonmajors. Applying basic principles to modern problems, the course may focus on a theme such as evolution and conservation of biodiversity, plants and society, or ecology and environmental issues. Can be repeated for elective credit but not ISP credit as topics change. Course Type(s):GEE Natural Sciences.

## **BIO-301 Stem Cells and Regeneration (4 Credits)**

Advances in biomedical research have raised the prospect of using stem cells to regenerate lost or damaged body parts. This course explores the biology of this field and associated ethical and political issues. A laboratory project introduces the scientific method and the amazing regenerative ability of planarian flatworms. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **BIO-303 Barely Tolerating Yourself (4 Credits)**

Protecting oneself against a constant threat of pathogens depends on the body's ability to determine friend from foe. This course will explore fundamental biological concepts in the context of the vertebrate immune system. Topics covered include innate and adaptive immunity, vaccinations, allergies, organ transplants, pregnancy, antibiotic resistance, and cancer. Course Type(s):GEE Natural Sciences.

**Offered:** Occasionally, Every Year

## **BIO-304 Forensic Biology (4 Credits)**

This integrated lecture-lab experience introduces the basic principles of forensics science with special emphasis on biological and molecular techniques used in modern day forensics investigations. Specifically, we focus on the theory and principles of biology that applies to blood typing, fingerprinting, DNA and molecular profiling, chromatography and microbiome analyses. Course Type(s):GEE Natural Sciences.

**Offered:** Occasionally, Every Year

## **BIO-305 Marine Ecology and Conservation (4 Credits)**

This course explores the ecology of coastal and marine systems, the major threats they face, and current approaches to marine conservation. It will introduce students to current conservation issues in here New England and around the world, emphasizing scientific literacy, interpretation of quantitative data, and critical thinking. Course Type(s):GEE Natural Sciences.

**Offered:** Spring, Even Years

## **BIO-390 Advanced Topics in Biology (4 Credits)**

Topics in the biological sciences such as genetics, health, ecology, and others will be explored at an in-depth level. Socially relevant and ethical issues such as AIDS, genetic engineering, embryo research, environmental crises and other issues will be emphasized. Repeatable as topics change. Course Type(s):GEE Natural Sciences.

## **CHEM-100 Introduction to Chemistry (4 Credits)**

An introductory course providing a survey of general chemical principles and their application to current environmental and social issues. Topics include atomic and molecular structure, chemical bonding, energy, reaction chemistry, solutions and nuclear power. (Not open toward a major program in Biology, Chemistry, Geology, or Chemistry/Physics.) Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

## **CHEM-111 General Chemistry (4 Credits)**

Lecture-lab course that introduces fundamental chemical principles and concepts, including atomic structure, periodicity, molecular structure, bonding, stoichiometry, types of chemical reactions, and thermochemistry. Knowledge of algebra, exponentials and logarithms is expected. Math assessment exam required. Includes two-hour laboratory. Course Type(s):GEE Natural Sciences.

**Offered:** Fall, Every Year

## **CS-160 Microcomputer Systems (4 Credits)**

Introductory course in microcomputer systems includes discussion of the underlying physics of the computer system, hardware/software installation, configuration, troubleshooting problems, networking essentials, and other related topics. Prepares students to develop an understanding of the internal workings of a microcomputer system. Not open to students who have completed CS-160. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

**ENST-201 Earth Cycles & Systems (4 Credits)**

An overview of earth's physical systems and their interactions. Includes a survey of earth materials, the rock cycle, plate tectonics (earthquakes and volcanoes), landscape development (glaciers and rivers), the water cycle, weather, climate, and map interpretation. Three-hour lecture, two-hour lab, required field trips. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** All, Every Year

**ENST-300 Geoscience Issues and Society (4 Credits)**

A course focusing on the cause and effect of geologic processes that impact society. Content may vary, but includes earthquakes, tsunamis, floods, volcanic activity, resource issues, and the geologic record of climate change. Students are expected to closely monitor popular media to document current geologic events and their effects. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** Fall, Even Years

**ENST-303 Life Sustainability in Earth's History (4 Credits)**

This course investigates modern environmental issues in the context of Earth's history. Sustainability of life on Earth has always been linked with planetary cycles and major events, many of which are occurring today. Topics include climate change, natural hazards, natural resource limitations, pollution, evolution, and mass extinction. Required field trips. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** Fall, Every Year

**ENST-320 Earth's Climate: Past & Future (4 Credits)**

The tools of climatic science are used to investigate the evidence and mechanisms for earth's climatic change throughout geologic time. Includes climate classification and reasons for climate, climate forcing mechanisms, anthropogenic forcing, the global-warming crisis, and potential remedies. Combined lecture/lab. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** Spring, Even Years

**ENST-381 Farming With Nature in Mind (4 Credits)**

Through the lens of agroecology, we consider ecological and social conditions that influence the healthy functioning of food production systems and the effect of varying farming methods on the environment. Students will investigate models from the U.S. and around the world and have opportunities for hands-on experimentation in agroecological methods. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** Fall, Every Year

**ENST-383 Rethinking Energy (4 Credits)**

As fossil fuel energy sources have high environmental impact, we need to understand ways that cleaner, renewable alternatives can be more broadly available. This course develops a basic understanding of the physical laws of energy and explores the connections between energy sources, needs, politics, policies, environmental impact, and sustainability. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**HLSC-175 Essentials of Nutrition Science (4 Credits)**

An introduction to basic science concepts including nutrition guidelines, micro and macronutrients, anatomy and physiology of digestion and absorption of nutrients, energy balance, and health and wellness. The course will integrate course content, technology and quantitative reasoning using hands-on investigative activities to interpret and evaluate nutritional needs. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** All, Every Year

**HLSC-310 Food Science (4 Credits)**

This course introduces the principles of food selection, sensory criteria, physical and chemical changes to ingredients and nutrients during food preparation and storage, basic nutrition content related to food, government regulations related to different types of food items, food technology, food preparation methods and allows students to develop professional skills. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** Fall, Every Year

**HNRS-250 Honors Natural Science (4 Credits)**

Honors courses in the Natural Sciences will present content-specific titles and descriptions when they are approved by the Honors Program. They will meet Integrative Studies Program Outcomes and Honors Program outcomes appropriate to the course. Topics vary. Repeatable once. Course Type(s):GEE Natural Sciences.

**Offered:** Occasionally, Every Year

**HP-160 Cardiorespiratory Fitness (2 Credits)**

Students acquire knowledge and skills for heart rate-based training, and practice multiple methods of improving cardiorespiratory fitness. Students learn to monitor exercise intensity and adapt exercise to different interests and abilities. This course is useful for improving personal fitness and for developing skills for exercise programming. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**HP-162 Muscular Relaxation Training (2 Credits)**

Students will acquire knowledge and mental skills for reducing the effects of stress and anxiety on the muscles in the body. Students will be guided through mind to body and body to mind relaxation training techniques for ideal activation levels. This course is useful for improving personal health. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**HP-164 Flexibility & Mobility (2 Credits)**

Students acquire knowledge and skills for improving joint range of motion and flexibility. Evidence-based methods of improving musculoskeletal mobility are presented. Students practice techniques for stretching, self-massage, myofascial release, and postural alignment. This course is useful for improving personal fitness and for developing skills for exercise programming. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**HP-220 Physical Activity and Disease (4 Credits)**

Introduction to human physiology and research regarding physical activity's relationship to Cardiovascular Disease, Type II Diabetes, Obesity, Hyperlipidemia, Hypertension, Cancer and Mental Health. The course will integrate content, epidemiological research, and critical thinking to interpret physiological information concerning the human body adaptations due to physical activity on health. Course Type(s):GEE Natural Sciences, GEE Sustainability and Well-Being.

**Offered:** Summer, Every Year

**MET-225 Meteorology (4 Credits)**

A survey of the atmosphere followed by discussion of solar influence, temperature, humidity, pressure, wind and forces. Weather patterns, severe weather and hurricanes are emphasized. World climates and classifications are treated, ending with past and future climates. Exercises such as map reading, etc., are conducted throughout the course. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

**OPTC-101 Introduction to Optics (4 Credits)**

An introduction to optics in our world and investigating everyday optical phenomena through exploratory learning. Using hands on activities in the classroom and real world industry problems, students will learn the fundamentals of optical systems including lenses, mirrors, ray optics, spectroscopy, color theory, diffraction, interferometry, IR Imaging, polarization and more! Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

**OPTC-110 Laser Optics (2 Credits)**

Applications and use of lasers in the fields of optics. Topics include properties of light, optical handling and positioning, light sources and laser safety, geometric and physical objects, principles and applications of lasers. Basic knowledge of algebra, trigonometry, exponentials and logarithms expected. Partially satisfies IN requirement. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

**OPTC-120 Thin Film in Optics (2 Credits)**

A two-credit course exploring light and interference found in nature and applications in current technology. Students will study the wave properties of light and interference in thin films, thin film deposition techniques, vacuum systems, interference filters, spectroscopic analysis and applications. Partially satisfies IN requirement. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

**PHYS-131 Engineering Fundamentals (4 Credits)**

Introduces students to a variety of engineering disciplines and covers aspects of engineering including the design process, data presentations, systems of units and conversions, Newton's laws of motion, thermodynamics, statics, strength of materials, electricity, and case studies based on contemporary engineering problems. Course Type(s):GEE Natural Sciences.

**Offered:** Fall, Every Year

**PHYS-141 College Physics I (4 Credits)**

Algebra based introduction to Newtonian mechanics. Emphasis on conceptual understanding and problem solving: motion, forces, Newton's laws applied to both linear and rotational situations, momentum, energy and conservation laws. Knowledge of algebra and trigonometry expected. Math competency assessment administered. Includes 2-hour laboratory. Course Type(s):GEE Natural Sciences.

**Offered:** All, Every Year

**PHYS-201 Phenomenal Science (4 Credits)**

A hands-on, minds-on inquiry based exploration of the basic physical principles that underlie our observations and experiences in the everyday world. Topics include motion, forces, energy, fluids, sound, heat, light, electricity, magnetism and the atom. Ideal for preservice teachers. Course Type(s):GEE Natural Sciences.

**Prerequisite(s):** QL-101 or equivalent

**Offered:** All, Every Year

**PHYS-241 University Physics I (4 Credits)**

The first semester of a three semester calculus based sequence for science and technology majors. Emphasized are kinematics, forces, both static and dynamic, energy and momentum, gravitation thermal physics and thermodynamics. Includes a 2-hour laboratory. Course Type(s):GEE Natural Sciences.

**Offered:** Spring, Every Year

**PHYS-305 The Physics of Music (4 Credits)**

An interdisciplinary exploration of how analyses of the physics of sound aid our understanding of music. Students will learn how sound is created, sustained, amplified; how limits in human physiology shape approaches to music; how physical properties of instruments relate to tone quality and give insight into different genres. Course Type(s):GEE Natural Sciences.

**Offered:** Fall, Every Year

**PHYS-342 Data Analysis for Scientists (4 Credits)**

This course is an introduction to data analysis across the Sciences and Social Sciences emphasized through problems in current research conducted at Keene State College. Data visualization and communication is a primary focus. Topics include: basic programming techniques, data cleaning and merging, data mining, visualization, times series and image analysis. Course Type(s):GEE Natural Sciences.

**Offered:** Fall, Every Year

**SPDI-183 Ultra-Precision Manufacturing (4 Credits)**

Explore the fascinating world of Ultra-Precision Manufacturing used to make optical systems and extremely-precise components for Advanced Research, Medical, Automotive, Communication and Aerospace applications. Learn this technology's evolution and role in our economy. Gain hands-on experience in modern diamond-turning, creating and measuring with ultra-precision while obtaining in-demand skills and knowledge. Course Type(s):GEE Natural Sciences.

**Offered:** Spring, Every Year

**SPDI-385 Bio-Fabrication (4 Credits)**

Bio-printing uses 3D-printing to reproduce a 3D functional living tissue scaffold through the deposition of biomaterials along with high precision positioning of cells. Students learn about 3D bio-printing principles, biomaterials, and complex geometric modeling of body parts. Discover current challenges, possible solutions and potentials of bio-fabrication. Previous CAD experience helpful. Course Type(s):GEE Natural Sciences.

**Offered:** Spring, Every Year