

Grade 11 Science Electives

440AP BIOLOGY 2 AP® **Term: FY** **Grade: 11-12** **1 Credit Science**

Recommended Prerequisite: Successful completion of Biology 1 and Chemistry

This course will provide an advanced background in biochemistry, organic chemistry, cytology, and genetics with related laboratory work. This course is intended for those students who plan to pursue careers in biology at an advanced level or a medical field. Completion of a interdisciplinary research project and outside reading is required for this course. All students must take the AP® exam.

440H BIOLOGY 2 H **Term: FY** **Grade: 11-12** **1 Credit Science**

Recommended Prerequisite: Successful completion of Biology 1 and Chemistry

This course will provide an advanced background in biochemistry, organic chemistry, cytology, and genetics with related laboratory work. It is intended for those students who wish to study biology at a more advanced level and is the third course in the Biomedical Sciences Pathway

442 ANATOMY, PHYSIOLOGY AND KINESIOLOGY **Term: FY** **Grade: 11-12** **1 Credit Science**

Recommended Prerequisite: Biology and Chemistry and Sports Medicine 1 & 2

This lab-oriented course is the study of the human body as a machine for the performance of work in foundations in three major areas of study—namely, mechanics, anatomy, and physiology; more specifically, biomechanics, musculoskeletal anatomy, and neuromuscular physiology. intended to provide an in-depth study of the anatomy and physiology of living organisms. Course content will include the major systems and physiology of animals and the human organism. Laboratory investigations will be an integral component of this course. This course is the third sequence in the Sports Medicine and Physical Fitness Training program of study. Students can take this course as a complementary course who are in the Health Career programs or students pursuing a career in the medical field or a science or physical education major. Preference will be given to students in the Sports Medicine program of study.

443S BIOMEDICAL SCIENCE 1: **Term: S** **Grade 9-12** **1 Credit Science**

Principles of Biomedical Science (Project Lead the Way)

This is the first course in the Biomedical Science pathway sequence of courses. This course introduces students to concepts in human physiology, basic biology, medicine, and research processes and allows them to design experiments to solve problems thus creating a relevant foundation for scientific concepts. Students can take this course as an exploration into Biomedical Sciences or as a complementary course for Health Career and Sports Medicine programs or even students pursuing Criminal Justice and/or Forensic Science. This is a foundational course that will enhance, connect and allow students to apply these concepts in a relevant hands on experience. Students will apply critical thinking, problem solving, research and communication skills. Preference will be given to students enrolled in the Biomedical Sciences program of study. ***Requires a CTE application***

479S BIOMEDICAL SCIENCE 2: **Term: S** **Grade: 10-12** **.5 Credit Science**
BIOTECHNOLOGY 1

Recommended Prerequisite: Biology

This course provides students with the foundations needed to learn Biotechnology and its importance in our lives. The students begin by learning about the history of Biotechnology, dating back to the ancient Egyptians, to its many roles and uses in present-day agriculture, genetics and medicine. History of HIV/AIDS infection and its role in the development and creation of Universal Precautions and Aseptic Technique in the real-world and industrial Bio-Tech lab environment is stressed, as well as the practices and procedures involved in each. Basic clinical lab tests include simulations of HIV testing, blood typing, epidemiological outbreak, antigen/antibody reaction and blood cholesterol testing; the roles of the FDA and CDC in the development of therapies, drugs and vaccinations for use will be explored as well. The students will learn how to manipulate and calibrate the basic materials used in Bio-Tech lab settings; lab work also includes mastery of micropipette skills and DNA electrophoresis. Students will also begin learning about the many career and post-secondary opportunities within the ever-growing

Biotechnology field. Preference will be given to students enrolled in the Biomedical Science program of study.

Requires a CTE application

**480S BIOMEDICAL SCIENCE 2: Term: S Grade: 10-12 .5 Credit Science
BIOTECHNOLOGY 2H**

Prerequisite: Minimum grade of a C in Biotechnology I

This course utilizes the foundational concepts learned in Biotechnology I to deepen the students' understanding of Biotechnology at the molecular level. The process of protein translation and gene expression leads to the students' understanding of the uses of genes, cells and bacteria in the Bio-Tech lab and their roles in bringing a Bio-Tech product to market. Students will explore the Nobel Prize-winning discovery and use of recombinant DNA in Biotechnology, and its effects in our own lives, and will successfully introduce a recombinant bacterial plasmid into a benign strain of *ecoli* to create a penicillin-resistant strain in the lab. The expression and purification of protein products in the Bio-Tech lab to create pharmaceuticals for human use is conveyed as well. Ethical issues involved in the study and practice of Biotechnology will be presented and discussed in a scientific manner. The students will learn about the current job outlook and the myriad of professions available with their knowledge of Biotechnology; they will enjoy meeting professors in the field and professionals from the workplace to learn about the many opportunities available with an education in Biotechnological Sciences. Preference will be given to students enrolled in the Biomedical Science program of study.

**444S BIOMEDICAL SCIENCE 3: Term: S Grade:10-12 .5 Credit Science
DIAGNOSTIC MEDICINE 1 HUMAN BODY SYSTEMS (Project Lead the Way)**

As part of the Biomedical Science pathway, students will step inside the human body and explore the systems that help us move, protect us from disease or injury, and facilitate communication within the body and with the outside world. Students will also solve a medical mystery as they analyze a medical case file and diagnose disease. Additionally, they will design their own experiments to explore structure and function of the human body. In this course, students examine the interactions of body systems as they explore identity, communication, power, movement, protection, and homeostasis. Students design experiments, investigate the structures and functions of the human body, and use data acquisition software to monitor body functions such as muscle movement, reflex, and voluntary action, and respiration. Exploring science in action, students build organs and tissues on a skeletal manikin, work through interesting real world cases, and often play the role of biomedical professionals to solve medical mysteries. Students can take this course as a complementary course to the Health Career and Sports Medicine programs or students pursuing a science major. Preference will be given to students enrolled in the Biomedical Sciences program of study.

**445S BIOMEDICAL SCIENCES 3: Term: S Grade: 10-12 5 Credit Science
DIAGNOSTIC MEDICINE 2: MEDICAL INTERVENTIONS**

Prerequisite: Biomedical Science 1 & 2 and recommended completion of Biology CP with a B average or better

This course will allow students to investigate the variety of interventions involved in the prevention, diagnosis and treatment of disease as they follow the lives of a fictitious family. A "How-To" Manual for maintaining overall health and homeostasis in the body, the course will explore how to prevent and fight infection, how to screen and evaluate the code in our DNA, and how to prevent, diagnose and treat cancer. Additionally, students will learn what happens when the organs of the body begin to fail. Through these scenarios students will be exposed to the a wide range of interventions related to immunology, surgery, genetics, pharmacology, medical devices, and diagnostics. Each family case scenario will introduce multiple types of interventions, reinforce concepts learned in the previous two courses and present new content. Interventions may range from simple diagnostic tests to treatment of complex diseases and disorders. These interventions will be showcased across the generations of the family and will provide a look at the past, present, and future of biomedical science. Lifestyle choices and preventive measures are emphasized throughout the course as well as the important role that scientific thinking an engineering design play in the development of interventions of the future. Students can take this course as a complementary course to the Health Career and Sports Medicine programs or students pursuing a science major. Preference will be given to students enrolled in the Biomedical Sciences program of study.

450AP CHEMISTRY 2 AP®**Term: FY****Grade: 11-12****1 Credit Science****OR 1 Credit Math Related***Recommended Prerequisite: B grade in Chemistry and/or recommendation of the science department**Math Requirements: Minimum – Pre Calculus*

This mathematical and laboratory-oriented course deals with selected topics in advanced chemistry including electrochemistry, organic chemistry, equilibrium, rates of reaction, chemical kinetics, gas laws, and the chemical analysis of water. The course is designed to prepare students for the AP® exam in chemistry. Eight (8) college credits for Rhode Island College are available for this course through the EEP Early Enrollment Program. All students must take the AP® exam.

450H CHEMISTRY 2H**Term: FY****Grade: 11-12****1 Credit Science****EEP: CHEM 103: GENERAL CHEMISTRY 1****or 1 Credit Math Related***Recommended Prerequisite: Completion of Chemistry I and previous completion**or current enrollment in Physics. Math Requirements: Minimum concurrent enrollment in Precalculus*

This course is intended for those students who may wish to pursue a career in any of the allied science or health fields. The course will consist of a basic overview of topics previously studied in Chemistry 1 proceeding to topics including electrochemistry, equilibrium, rates of reaction, chemical kinetics, gas laws, and the chemical analysis of water, which are generally included in a first year college chemistry program. Laboratory investigations and problem-solving techniques will be employed to enhance student understanding of the course material. Four (4) college credits from Rhode Island College are available for this course through the EEP Early Enrollment Program.

465AP ENVIRONMENTAL SCIENCES AP®**Term: FY****Grade: 11-12****1 Credit Science***Recommended Prerequisite: Biology and Chemistry*

This course is a laboratory and field-based course designed to provide students with the content and skills needed to understand the various interrelationships in the natural world, to identify and analyze environmental problems and to propose and examine solutions to these problems. This course encompasses human population dynamics, interrelationships in nature, energy flow, resource management, environmental quality, human impact on environmental systems, and environmental law. All students must take the AP® exam.

472S EARTH SCIENCES**Term: S****Grade: 10-12****.5 Credit Science**

This semester course will cover topics in the structure of the Earth, movement of the earth's surface, continental drift, weather and climate. Students will conduct various labs to gain a better understanding of the Earth's processes. Online technology will be incorporated to enhance understanding.

473S INTRODUCTION TO MICROBIOLOGY**Term: S****Grade: 11-12****.5 Credit Science***Recommended Prerequisite: Chemistry or concurrent.*

This semester, lab-based course will serve as an introduction to microbiology for students who wish to explore this important area of science. This course will include the study of microbes, disease, bacteria, viruses, and related pathogens. This course will provide students the opportunity to conduct hands-on investigations using the microscope to view and identify microbes in our environment.

474S FORENSICS 1**Term: S****Grade: 11-12****.5 Credit Science***Recommended Prerequisite: Chemistry (may be concurrent). Preference will be given to seniors for this course.*

This course is designed for students who have a general interest in the sciences and their application to criminal investigations. Topics to be explored will include the history of forensic science, crime scene protocols, evidence collection and analysis, and classification of fingerprints.

475S FORENSICS 2**Term: S****Grade: 11-12****.5 Credit Science***Prerequisite: Chemistry and successful completion of Forensics 1*

This course is a continuation of Forensics 1. Comprehensive lab investigations will include DNA analysis, arson and explosives, firearms, tool marks and analysis of other impressions, documents and voice recognition, and the physics of accident reconstruction.

477S OCEANOGRAPHY **Term: S** **Grade: 11-12** **.5 Credit Science**

Recommended Prerequisite: Biology and Chemistry (taken or concurrent)

This course focuses on a general survey of major disciplines including geological, physical, chemical, and biological oceanography integrated into a study of the earth's ocean system. Topics covered are not limited to: (Geology) The origin & evolution of the ocean basin, including plate tectonics, volcanism, and sedimentation; (Chemistry) Composition & properties of seawater, the interaction of marine chemistry with the ocean floor, atmosphere, and marine organisms, (Physical) heat budget, water masses and circulation, waves, and tides; (Biological) Dynamics of marine ecosystems, patterns of production & distribution of plankton, benthos & nekton in relationship to their environment.

478S AQUATIC ECOLOGY **Term: S** **Grade: 11-12** **.5 Credit Science**

Recommended Prerequisite: Chemistry

This semester course will provide students with an introduction to the ecology of freshwater systems with emphasis on chemical analysis macro-invertebrate sampling, and watershed dynamics. Students will examine the physical, chemical and biological properties of area ponds and rivers using a variety of tools. Activities will include fieldwork, use of computer-based data collection, and classroom-based laboratory exercised. Other topics will include the impact of human disturbances on productivity and aquatic food webs and methods used for management and restoration of freshwater systems.

481S ASTRONOMY **Term: S** **Grade: 10-12** **.5 Credit Science**

This course is a scientific exploration of the human place in the universe. Students will study the origin and history of the Universe and the formation of the Earth and the solar system; specifically seasons, moon phases, and solar phenomena. Students will compare Earth's properties with those of the other planets, the properties of light and matter, and the tools astronomers use to measure radiation. This course also covers exciting contemporary topics such as black holes, the expansion of the universe and the search for extraterrestrial life.

483S APPLIED ENVIRONMENTAL SCIENCES F **Term: S** **Grade: 11-12** **.5 Credit Science**

Prerequisite: Chemistry or concurrent.

The focus of this fall semester course is on Forestry and Wildlife. The forestry unit will cover tree identification measurement and various management techniques. The wildlife unit will focus on native Rhode Island species, their conservation and management. Students will be involved in a variety of indoor and outdoor projects. The use of an outdoor classroom and various geospatial technologies will enhance learning.

484S APPLIED ENVIRONMENTAL SCIENCES A **Term: S** **Grade: 11-12** **.5 Credit Science**

Prerequisite: Chemistry or concurrent.

The focus of this spring semester course will be on Aquaculture, Hydroponics and basic Botany. The aquaculture unit will incorporate the raising of Trout in the school's aquaculture farm. The hydroponics unit will utilize a variety of hydroponic units to grow vegetables. In the botany section students will grow a variety of plants from cuttings and seed utilizing the greenhouse. Both vegetable and flower plants will be grown and planted in the school's community garden.

486 ENGINEERING DESIGN 1 : **Term: S** **Grade: 9 -12** **1 Credit Math or Science**
INTRODUCTION TO ENGINEERING DESIGN (Project Lead the Way)

Students dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects. They work both individually and in teams to design solutions to a variety of problems using 3-D modeling software, and use an engineering notebook to document their work. ***Requires a CTE application***

487 ENGINEERING DESIGN 2: Term: FY Grade: 10-12 1 Credit Math or Science
PRINCIPLES OF ENGINEERING (Project Lead the Way)

This course exposes students to some of the major concepts that they will encounter in a postsecondary engineering course of study. Through problems that engage and challenge, students explore a broad range of engineering topics including mechanisms, the strength of materials and structures, automation, and kinematics. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology. Students learn the computational and analytical skills necessary to be successful in the engineering field. Students deepen their understanding of the design process by working with a team, analyze and improve processes, and modify and justify systems and designs. Topics preparing students for their future include energy and power, materials and structures, control systems, and statistics and kinematics. This course is intended to enhance students' ingenuity, intellectual talents, and practical skills in devising solutions to engineering design problems in a project-based learning environment. This course follows the model of a math and science teacher to enhance and expand STEM skills.

**488H ENGINEERING DESIGN 3: Term FY Grades 11-12 1 Credit Math or Science
ENGINEERING DESIGN AND DEVELOPMENT H (Project Lead the Way)**

This is a capstone course, open-ended research course in which teams of students design and develop an original solution to a well-defined and justified open-ended problem by applying an engineering design process. Students perform research to select, define and justify a problem, then select an approach, create and test their solution prototype, present and defend their solution. Students will present their designs to a panel of engineers. Outside experts in the field will be utilized as a resource and internship opportunities may become available. This is an honors level course and there is an extensive amount of work outside of the classroom required. This is the third sequence in the Engineering Design program of study.