

## Science

The Science program at Springfield High School is designed to allow the student the option of becoming involved in specific aspects of the Sciences that parallel her/his specific interest. From Biology to Advanced Placement (AP) Environmental Science, the Science curriculum is flexible enough to account for individual needs. The program is designed to consider the development of the intellectual capabilities of each student which will in turn, lead the student to become an articulate and rational thinker. Coupled with this, is an emphasis on the application of higher order thinking processes including the skills connected with decision making, problem solving, and critical and creative thinking. The students will gain the necessary knowledge, intellectual and social awareness, and communicative skills to function and succeed in the 21st century.

### **Grade 9**

#### **Biology – Honors Hn 305**

Honors Biology is a rigorous and challenging course designed to explore the characteristics of the life. Course content includes the scientific method (summer work required), characteristics of living things, cell structure, function and transport, cellular reproduction, biochemistry, photosynthesis, cellular respiration, genetics, DNA, ecology and evolution. Students will be introduced to some of the techniques, equipment, and information used by biologists. In addition to in class lecture and lab activities, independent supplemental reading and enrichment activities will be assigned and completed outside of the classroom. Students will sit for their Keystone Biology Exam during this course. This course will have a summer assignment.

#### **Biology – Honors College Preparatory CP 311**

Biology is a course designed to explore the characteristics of the life. Course content includes the scientific method, characteristics of living things, cell structure and function, cellular reproduction, biochemistry, photosynthesis, cellular respiration, genetics, DNA, ecology and evolution. Students will be introduced to some of the techniques, equipment, and information used by biologists. Students will complete several labs and inquiry-based activities to reinforce the concepts and develop their technical writing skills. Current biological issues will also be explored. *Students will be take the Keystone Biology Exam in this course.*

### **Grade 10**

#### **Chemistry – Honors Hn 320**

Honors Chemistry is recommended for math and science students as evidenced by the prerequisites above. The major areas of study are atomic structure and mole concept, chemical bonding, kinetic molecular theory, solutions, chemical reactions, reaction rates, acid/base chemistry, oxidation/reduction chemistry, and dynamic equilibrium. Students will develop skills in making observations, analyzing data, drawing conclusions, and problem solving. This course is recommended for students planning professional careers in science and medicine. This course will have a summer assignment.

#### **Chemistry – College Preparatory CP 321**

Chemistry is a laboratory course which emphasizes five major areas of study: atomic structure and mole concept, chemical bonding and chemical formulas, principles of chemical reactions, kinetic molecular theory, solutions and acid/base. Students will develop skills in making observations, analyzing data, drawing conclusions, and problem solving. The course involves use of calculators, simulations on the computer, and using the computer to produce lab reports.

## **Grade 11**

### **Physics – Honors Hn 330**

Honors Physics focuses on understanding the basics laws of mechanics: motion, forces, momentum, energy, torque, rotation, and electricity. Skills of algebra, geometry, and trigonometry will be integrated freely and extensively in the course, both in the formulation of physical laws and in the solutions of problems. Students are expected to manipulate algebraic expressions involving multiple variables and should understand basic trigonometric functions. The student will be required to conduct experiments and compile data into lab reports. In addition, students in the honors physics course will be expected to:

Compile 12-15 formal lab reports throughout the course,  
Conduct independent and group research

This course is ideal for students who have a career interest in the sciences, math, or engineering.

### **Physics – College Preparatory CP 331**

College Preparatory Physics will focus on the laws of mechanics including motion, forces, momentum and energy. Wave behavior (sound and light) and electricity will also be addressed. Students taking the course will improve their problem-solving skills. Throughout the course, students will use lab equipment and computer-interface software to collect data and are expected to use mathematics to quantitatively discuss the concepts of physics, as well as be able to solve problems.

### **Physics – Advanced Placement Physics 1 AP 355**

Students who have already completed Honors Physics 330 are not eligible for 354. This course is ideal for students who have a career interest in the sciences, math, or engineering. No prior physics education is required; however, this is a rigorous AP course for students who intend to pursue further honors and AP science electives. This course focuses on understanding the basics laws of mechanics and electricity: motion, forces, momentum, energy, torque, rotation. Skills of algebra, geometry, and trigonometry will be integrated freely and extensively in the course, both in the formulation of physical laws and in the solutions of problems. Students are expected to manipulate algebraic expressions involving multiple variables and should understand basic trigonometric functions. The student will be required to conduct experiments and compile data into lab reports. This course follows the AP curriculum and will prepare students for the AP Physics 1 exam.

## **Science – Additional Course Offerings**

### **Planet Earth – 361**

Planet Earth is an introductory survey course broken into four units: Lithosphere, Hydrosphere, Atmosphere and Biosphere. It is designed to cover the following topics about our planet: the atmosphere, the oceans, its ecosystems, human population dynamics, its agriculture, water resources, biodiversity decline, energy challenges, atmospheric pollution, and climate change.

### **Human Anatomy and Physiology – 366A**

This course is a study of both human anatomy and physiology with an integral laboratory component. This course is designed to prepare students who are considering entering the medical, nursing, or allied health fields and as such is of a rigorous content level. The course will offer a survey of important anatomical terms as well as an overview of the body's major organ systems. Students will have the opportunity to gain insight into various career options and the studies required for them

#### Genetics – 368

This course provides a study of genetics, most specifically human genetics. This course will specifically cover the biochemistry of DNA and chromosomes, human genetics, genetic diseases and disorders and genetic technologies. The course will include laboratory exercises, statistical analysis, and long-term projects.

#### Zoology – 369

This course provides an introductory study of all members of the animal kingdom. This course is designed to cover evolution as it applies to the animal kingdom and the taxonomy of the animal kingdom. The course will survey the animal kingdom from the simple invertebrates through mammals. The course will include lab work and cooperative projects.

#### Introduction to Astronomy – 370

This college-level course is designed to introduce students to the science of astronomy, its history, and its importance as an influence on our view of humankind. Students will conduct astronomical observations using software, telescopes, and star charts to study objects in the night sky. Practical observational activities are designed to foster a conceptual understanding of how objects from great distances are studied from the earth. This is a rigorous textbook driven course intended for non-science majors to satisfy one of their college science credit requirements. This is a College Academic Learning Goal (CALG) designated course for Scientific Inquiry through DCCC.

This course is designed to introduce students to the science of astronomy, its history, and its importance as an influence on our view of humankind. The course is intended for non-science majors. Upon successful completion of this course, students should be able to: describe the night sky, trace the history of astronomy, describe the important properties of stars, describe the general characteristics of the solar system, discuss the discovery and nature of the Milky Way Galaxy and different types of galaxies, and discuss the possibility of life existing elsewhere in the universe.

#### Meteorology - 373A

This course is a study of the earth's atmosphere and weather-related phenomena. Major principles of meteorology will be addressed by long-term study of real time data sources from the Internet. The students will study the structure of the atmosphere, basic meteorological principles, weather maps and severe weather systems. Students will be expected to deliver "on-air" weather forecasts for the high school daily announcements. This is a highly challenging, science course on par with introductory Meteorology courses taught at the college level. The curriculum presupposes students understand the gas laws, fundamental physics principles and excellent math skills.

#### Exploring the Cosmos – 374

This course introduces the field of astronomy designed to provide an overview of the subject, including basic physical concepts involving planets, stars, galaxies, and cosmological distances. The course is designed to emphasize conceptual understanding and an appreciation for the discovery process. Besides project-based classroom work, students will complete an observational experience as well as a current event presentation to the class.

#### Forensic Science – 379

This course will cover updated techniques, practices and procedures used in forensic science. Students will participate in forensic analysis and the proper procedures for collection and preservation of evidence at crime scenes. Students will investigate new technologies used by forensic scientists. Discussions of probabilities role in

interpreting the significance of scientifically evaluated evidence will be incorporated in this course. Students will study actual cases to see the role of forensic science in criminal investigations.

The Great Diseases – 380

Humans and the Environment – 390

This course provides an introduction to the study of the design of the natural world and interactions between humans and their environment. It includes an investigation of the impact of human activities on biodiversity, natural resources, availability of energy, and contamination of the environment. The scientific, economic, and social issues that contribute to environmental problems are also examined. Sustainability principles, policies, and programs are explored on the local, national and global level. This course is designed for non-science majors.

### **Science - Advanced Placement Course Offerings**

Biology - Advanced Placement AP 350BI

This course is designed to be the equivalent of a first-year college course in Biology and has been developed according to the new guidelines of the College Board. In-depth topics of study include molecular genetics and evolution, cell structure and energy transformation, population ecology, plants, and animals. The required lab component of the course includes investigations and technologies in areas such as recombinant DNA technology, aquatic productivity, botany and biochemistry, and comparative vertebrate dissections, will help students improve written and oral communication skills. This course follows the AP curriculum. This course will have a summer assignment.

Chemistry – Advanced Placement AP 351CH

This course is designed to be the equivalent of a first-year college course. In AP Chemistry students will master fundamental principles of chemistry and develop competence in problem solving. The areas of study include a highly rigorous treatment of the structure of matter, the status of matter, chemical reactions, and descriptive chemistry. There is also a strong laboratory component for the course. This course will have a summer assignment.

Physics C: Mechanics – Advanced Placement AP 352

An advanced mechanics course offered to students who already completed a semester of physics (honors preferred). Taking AP Calculus concurrently, or in the past is also recommended. The course will take a calculus-based approach to exploring the topics covered in introductory physics including kinematics, dynamics, work & energy, momentum, rotation, gravitation, and oscillations.

Physics 2 – Advanced Placement AP 325

This is an AP Physics course serving as an algebra-based survey of classical mechanics, electricity & magnetism, thermodynamics, fluids, waves, optics, & nuclear physics. Skills of algebra, geometry, and trigonometry will be integrated freely and extensively in the course, both in the formulation of physical laws and in the solutions of problems. Students are expected to manipulate algebraic expressions involving multiple variables and should understand basic trigonometric functions. The student will be required to conduct experiments and compile data into lab reports. This course follows the AP curriculum and will prepare students for the AP Physics 2 exam.

## Environmental Science – Advanced Placement AP 362

This course will provide scientific principles, concepts, and methodologies required to understand the interrelationship of the natural world, to identify and analyze environmental problems, to evaluate risks associated with these problems and to examine alternative solutions. This class includes a strong lab component. Topics include energy flow, the biosphere, the human population, renewable and nonrenewable resources, environmental quality, and global change. This course follows the AP curriculum. This course will have a summer assignment.