

## Science

The Science program at Springfield High School is designed to expose students to a range of scientific disciplines and topics. These experiences will then lead students toward exploring elective offerings aligned to their individual interests and career goals. Leveled courses are designed to engage students based on their current academic and cognitive skill levels and challenge them through rigorous learning experiences to develop and broaden scientific thought processes. The program also places an emphasis on the application of higher order thinking skills such as analysis, synthesis, problem solving, and critical and creative thinking. Several courses within the department offer a laboratory experience where students apply concepts through practical and real-life hands-on experiments and explorations.

### GRADE 9 2024-2025 SCHOOL YEAR

General Science Principles <sup>CH</sup> Recommendation	Course 313	1.0 Credit SC	Grade: 9
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General Science Principles is modeled around the STEELS standards and covers content in the physical, Life, and earth & space sciences. The course is designed around student inquiry and investigation from a phenomenological perspective. The course engages students in the practices of, asking questions, developing models, carrying out investigations, analyzing data, using computational thinking, constructing explanations, engaging in argument from evidence, and communicating information. Successful completion of this course lays the foundation for students to pursue higher level science and engineering courses.

Prerequisite Course:

- Grade 8 Science

Hn General Chemistry <sup>CH</sup> Recommendation	Course 322	1.0 Credit SC	Grade: 9
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The major areas of study in this course include scientific measurement, atomic structure, periodic trends, bonding, reactions, stoichiometry, gas laws, solutions, rates and equilibrium, and acids and bases. Students will engage in STEELS science and engineering practices to develop scientific knowledge. This is laboratory-based course, and students will be required to conduct several experiments using various lab equipment and materials as well as compile data and prepare lab reports

Prerequisite Course:

- Grade 8 Science
- Algebra I and/or Geometry at ETR

Recommended Academic Performance Levels for Teacher Recommendation:

- 96% or higher in Grade 8 Science at the conclusion of Trimester 2
- 96% or higher in ETR Algebra I or Geometry [final grade or current at the conclusion of Trimester 2]

Hn Chemistry <sup>CH</sup> Recommendation	Course 320	1.0 Credit SC	Grades: 10
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The major areas of study in this course include 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.

Prerequisite Course:

- Biology 305 Hn or 311 CP

Recommended Academic Performance Levels for Teacher Recommendation:

- 84% or higher in Course 305
- 94% or higher in Course 311

Chemistry/CP <sup>CH</sup> Recommendation	Course 321	1.0 Credit SC	Grades: 10,11
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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.

Prerequisite Course:

- Successful completion of Biology 305 Hn or 311 CP and below % marks for Hn Chem.

Hn Physics <sup>CH</sup> Recommendation	Course 330	1.0 Credit SC	Grades: 11,12
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This course 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. Students will apply concepts and skills learned in the classroom to several laboratory investigations and activities and will:

- 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.

Prerequisite Course:

- Chemistry 320 Hn or 321 CP
- Geometry Math Analysis 420 Hn or 421 CP

Recommended Academic Performance Levels for Teacher Recommendation:

- 90% or higher in Course 320
- 94% or higher in Course 321

Physics/CP <sup>CH</sup> Recommendation	Course 331	1.0 Credit SC	Grades: 11,12
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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.

Prerequisite Course:

- Successful completion of Chemistry 321 CP or 320 Hn
- Successful completion of Algebra II 431 CP or 430 Hn

AP Physics 1 <sup>CH</sup> HAC Access <i>Advanced Placement</i>	Course 355	1.0 Credit SC	Grades :11,12
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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, and fluids. 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.

Prerequisite Course:

- Geometry/Math Analysis 420 Hn or 421 CP
- Pre-Calculus 458 Hn or 459 CP

Recommended Academic Performance Levels:

- 94% or higher in Course 421 | Course 459
- 94% or higher in Course 420 | Course 458

**Science – Additional Course Offerings**

Natural Disasters <sup>CH</sup> HAC Access	Course 360	0.5 Credit EL	Grades: 10,11,12
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This course is a survey of the Earth sciences of geology, meteorology, and oceanography in the context of natural disasters. The course is intended for students interested in the Earth sciences and how they relate to human activity. This course will utilize a variety of case studies and lab experiences to help students

understand the causes and impacts of natural disasters. Students will be expected to work with data, complete basic calculations, and interpret visual representations of data such as graphs and maps.

Hn Human Anatomy & Physiology <sup>CH</sup> HAC Access	Course 366A	0.5 Credit EL	Grades: 11,12
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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 (and is vocabulary extensive) as well as an overview of the body's major organ systems. Several of the systems will be reviewed in detail. Additionally, we will view several surgeries during this course. Students will have the opportunity to gain insight into various career options and the studies required for them.

Prerequisite Course:

- Biology 311 CP or 305 Hn
- Chemistry 321 CP or 320 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 80% or higher in Courses 311, 305, 321, 320
- Score of Proficient or Advanced on Keystone Biology Exam

Genetics <sup>CH</sup> HAC Access	Course 368	0.5 Credit EL	Grades: 11,12
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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.

Prerequisite Course:

- Biology 311 CP or 305 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 80% or higher in Course 311 or 305
- Score of Proficient or Advanced on Keystone Biology Exam

Zoology <sup>CH</sup> HAC Access	Course 369	0.5 Credit EL	Grades: 11,12
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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.

Prerequisite Course:

- Biology 311 CP or 305 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 80% or higher in Course 311 or 305
- Score of Proficient or Advanced on Keystone Biology Exam

Meteorology <sup>CH</sup> HAC Access	Course 373	0.5 Credit EL	Grades: 10,11,12
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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.

Exploring the Cosmos <sup>CH</sup> HAC Access	Course 374	0.5 Credit EL	Grades: 10,11,12
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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.

Prerequisite Course:

- Successful completion of Algebra I 411

Forensic Science <sup>CH</sup> HAC Access	Course 379	0.5 Credit EL	Grades: 10,11,12
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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 the role probability plays 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.

Prerequisite Course:

- Biology 311 CP or 305 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 80% or higher in Course 311 or 305

Hn The Great Diseases <sup>CH</sup> HAC Access	Course 380	0.5 Credit EL	Grades: 11,12
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Engaging students in the biomedical sciences while they are still in high school is a critical first step toward educating a scientifically literate citizenry. The Great Diseases course is a highly-engaging, inquiry-based curriculum that focuses on biomedical research in the context of four "great diseases" that challenge global health – infectious, neurological, metabolic and cancer. This course uses case-study and innovative, and life-relevant content to improve science engagement and health literacy. The Great Diseases curriculum, in partnership with the Tufts University School of Medicine, presents complex global health issues in ways that

are both innovative and personally relevant to high school students. This course is designed for students who successfully completed biology and chemistry.

Prerequisite Course:

- Biology 311 CP or 305 Hn
- Chemistry 321 CP or 320 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 80% or higher in Courses 311, 305, 321, 320
- Score of Proficient or Advanced on Keystone Biology Exam

<b>Hn General Anatomy and Physiology</b> HAC Access	<b>Course 367</b>	<b>1.0 Credit EL</b>	<b>Grade: 12</b>
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<b>Principles of Forensic Science</b> HAC Access	<b>Course 381</b>	<b>1.0 Credit EL</b>	<b>Grade: 12</b>
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Introduction to Astronomy HAC Access	Course 370	1.0 Credit EL	Grades: 12
4.0 Credit DCCC with final grade of 70% or higher			
<b>DCCC Course # ESS 102 Introduction to Astronomy or ESS 103 Introduction to Astronomy Laboratory (Optional)</b>			

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.

Prerequisites:

- Satisfactory score on the Accuplacer exam or SAT
- 75% or higher in Course 321 or Course 431

**Science - Advanced Placement Course Offerings**

AP Biology <sup>CH</sup> HAC Access <i>Advanced Placement</i>	Course 350BI	1.5 Credit EL	Grades: 11,12
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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.

Prerequisite Course:

- Biology 311 CP or 305 Hn
- Chemistry 321 CP or 320 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 84% or higher in Course 305 and Course 320
- 94% or higher in Course 311 and Course 321

AP Chemistry <sup>CH</sup> Course 351CH 1.5 Credit EL Grades: 11,12  
HAC Access  
*Advanced Placement*

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.

Prerequisite Course:

- Chemistry 321 CP or 320 Hn
- Algebra II 430 Hn, Geometry/Math Analysis 420 Hn, or Pre-Calculus 458 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 94% or higher in Course 305 and Course 320
- 84% to 93% in Course 320 and Course 321 [Teacher Recommendation]
- 90% or higher in Course 430 | Course 420 | Course 458

AP Physics C: Mechanics <sup>CH</sup> Course 352 1.0 Credit EL Grade: 12  
HAC Access  
*Advanced Placement*

AP Physics C is a course in advanced study or *Mechanics* 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.

Prerequisite Course:

- Advanced Placement Physics 1 355, or
- Physics 330 Hn
- Advanced Placement Calculus AB 460 or BC 461 [Completion or concurrent enrollment]

Recommended Academic Performance Levels for Teacher Recommendation:

- 84% or higher in Course 355
- 94% or higher in Course 330
- 84% to 93% in Course 330 [Teacher Recommendation]
- Concurrent Enrollment or Successful Completion of Course 460 or Course 461

AP Physics 2 <sup>CH</sup>	Course 356	1.0 Credit EL	Grades: 11,12
HAC Access			
<i>Advanced Placement</i>			

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.

Prerequisite Course:

- Advanced Placement Physics 1 355, or
- Physics 330 Hn
- Pre-Calculus 458 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 94% or higher in Course 355 or Course 330
- 84% to 93% in Course 355 or Course 330 [Teacher Recommendation]
- 90% or higher in Course 458

AP Environmental Science CH	Course 362	1.0 Credit EL	Grades: 11,12
HAC Access			
<i>Advanced Placement</i>			

Prerequisite: Teacher recommendation along with recommended standards of academic performance as follows:  
Grade of 94% or higher in 305/306, 311, 320 or 321  
Grade of 84-93% in 305, 306, 311, 320 or 321 requires teacher recommendation.

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.

Prerequisite Course:

- Biology 311 CP or 305 Hn
- Chemistry 321 CP or 320 Hn

Recommended Academic Performance Levels for Teacher Recommendation:

- 94% or higher in Courses 311, 305, 321, or 320
- 84% to 93% in Course 305, Course 311, Course 320, or Course 321 [Teacher Recommendation]