

# SCIENCE

The science department at AVHS offers core science instruction in the four major disciplines of science: Biology, Chemistry, Earth and Space Science, and Physics. Students are required to take three years of science with one year in Earth Science (On-Level or Honors), one year in a biology course (On-Level, Honors, or AP), and one year of chemistry or physics. Apple Valley High School science staff recommend students intending to enroll in college consider taking four years of science including the core earth science, biology, chemistry, and physics courses.

In addition, the department offers electives designed to enrich or enhance the science interest of students. Electives in ecology and earth science focus on specific topics at greater depth. These classes are generally one trimester long and are open to all students of the appropriate grade level. CIS Human Physiology, Advanced Placement® Biology, Advanced Placement® Chemistry, and Advanced Placement® Physics are designed to give students who are deeply interested in science or who might be planning on a career in science the opportunity to earn college credit through examination or course completion.

Many Science Elective Courses provide excellent exposure to ideas central to various careers or career preparation, including:

**CIS Physiology** - Health Professions, Athletic Training

**AP Biology** - Biologist, Pharmacist, Medicine, Biomedical Engineering

**AP Chemistry** - Chemist, Engineering, Medicine, Pharmacist, Materials Science, Food Science

**AP Physics** - Engineering

**Aquatic Ecology** - Naturalist, Environmentalist, DNR Enforcement, Environmental Policy Writer, Fisheries Biologist, Fisheries Technician, Fishing Industry Sales, Professional Fisherman, Work at a Zoo.

**Astronomy** - Researcher, Space Exploration, Aerospace Engineering and Mechanics, Astrophysics, Astronaut

**Environmental Studies** - Naturalist, Environmentalist, DNR Enforcement, Environmental Policy Writer, Environmental Engineer

**Field Geology** - Geologist, Geophysicist, Energy Engineer, Water Resources

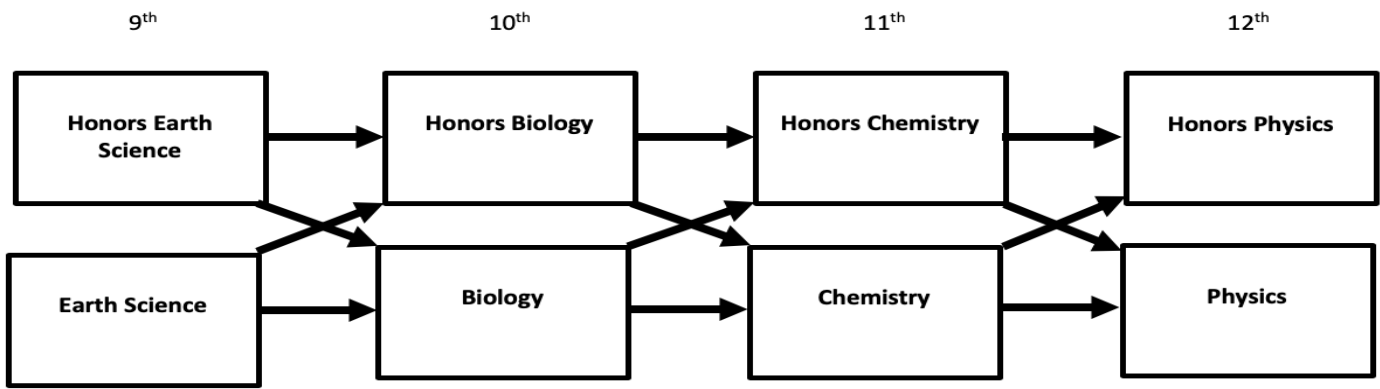
**Meteorology** - Researcher, Weather Forecasting, Weather Broadcasting, Disaster Planning, Meteorologist

**Science Olympiad** - All STEM Careers, Engineering, Medicine, Health Professionals, Materials Science, Food Science, Geologist, Chemist, Pharmacist, Astronomy, Environmentalist, Computer Programming, Forensics, Aerospace

**Terrestrial Ecology** - Naturalist, Environmentalist, DNR, Environmental Policy Writer, Landscaping, Wildlife Biologist, US Forest Service, Conservationist for Organizations such as Ducks Unlimited or Pheasants Forever, Work at a Zoo.

Science courses are not sequential, and many can be taken at any time during a student's time at AVHS. (Students should pay attention to both science and math prerequisites for some courses) As a result, there are many paths students could take through the science curriculum at AVHS. A few of these paths are shown and described on the following pages.

**Traditional Paths:**



**Other Science Electives (first year available):**

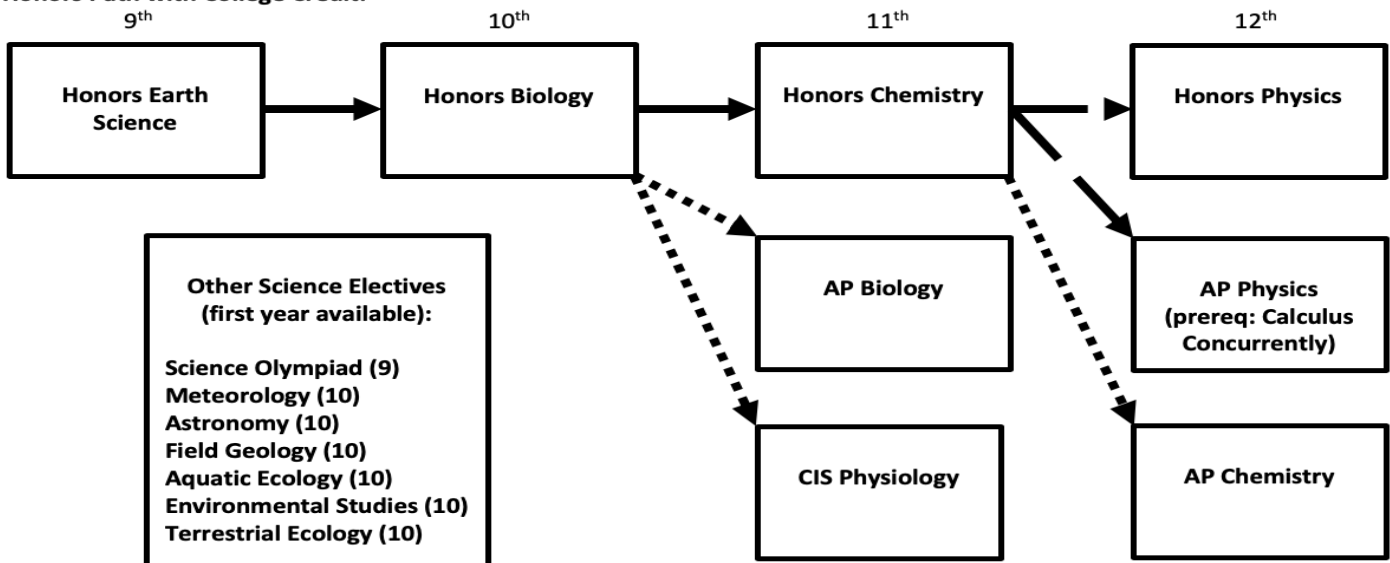
- Science Olympiad (9)
- Meteorology (10)
- Astronomy (10)
- Field Geology (10)
- Aquatic Ecology (10)
- Environmental Studies (10)
- Terrestrial Ecology (10)
- CIS Physiology (11)
- AP Biology (11)
- AP Chemistry (11)
- AP Physics (11)

**CHECK COURSES FOR PREREQUISITES!**

**Who might consider these pathways:**

- Any Student

**Honors Path with College Credit:**



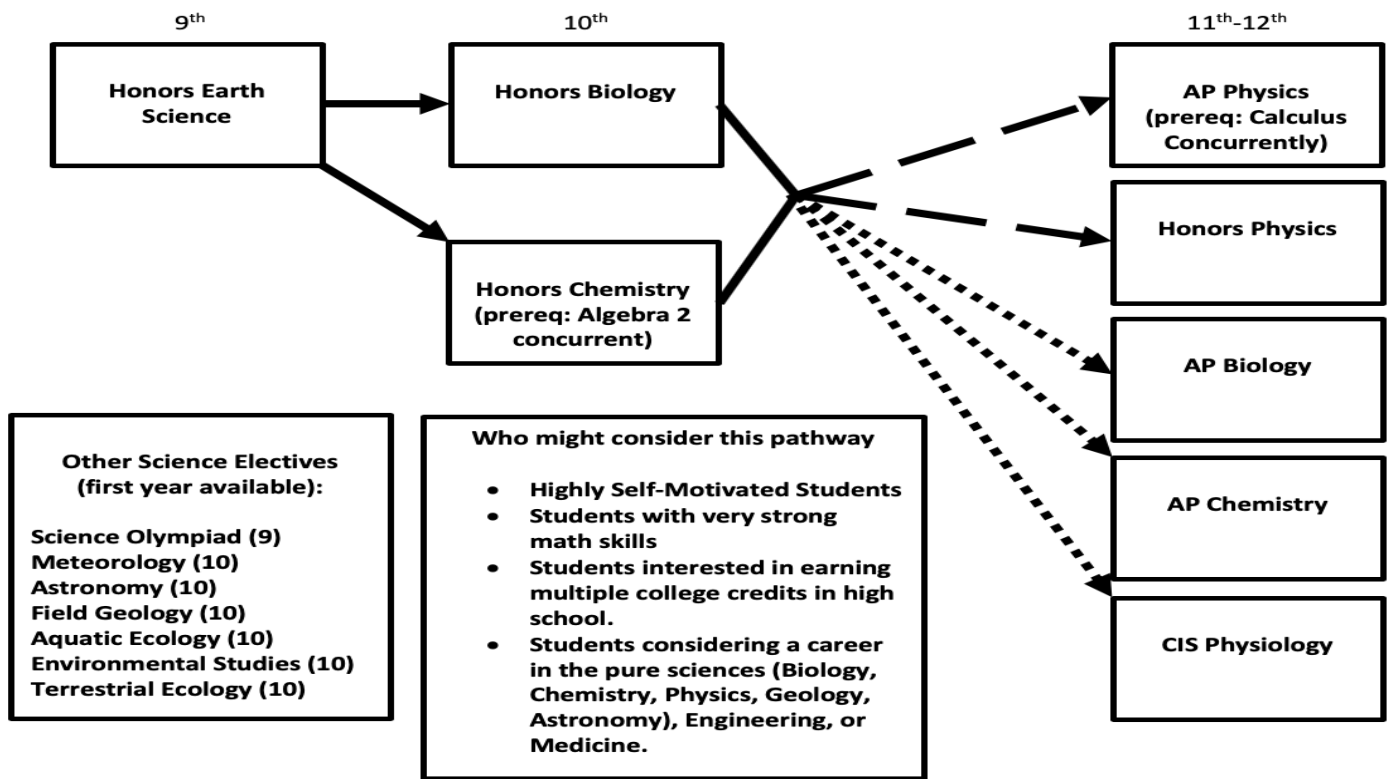
**Other Science Electives (first year available):**

- Science Olympiad (9)
- Meteorology (10)
- Astronomy (10)
- Field Geology (10)
- Aquatic Ecology (10)
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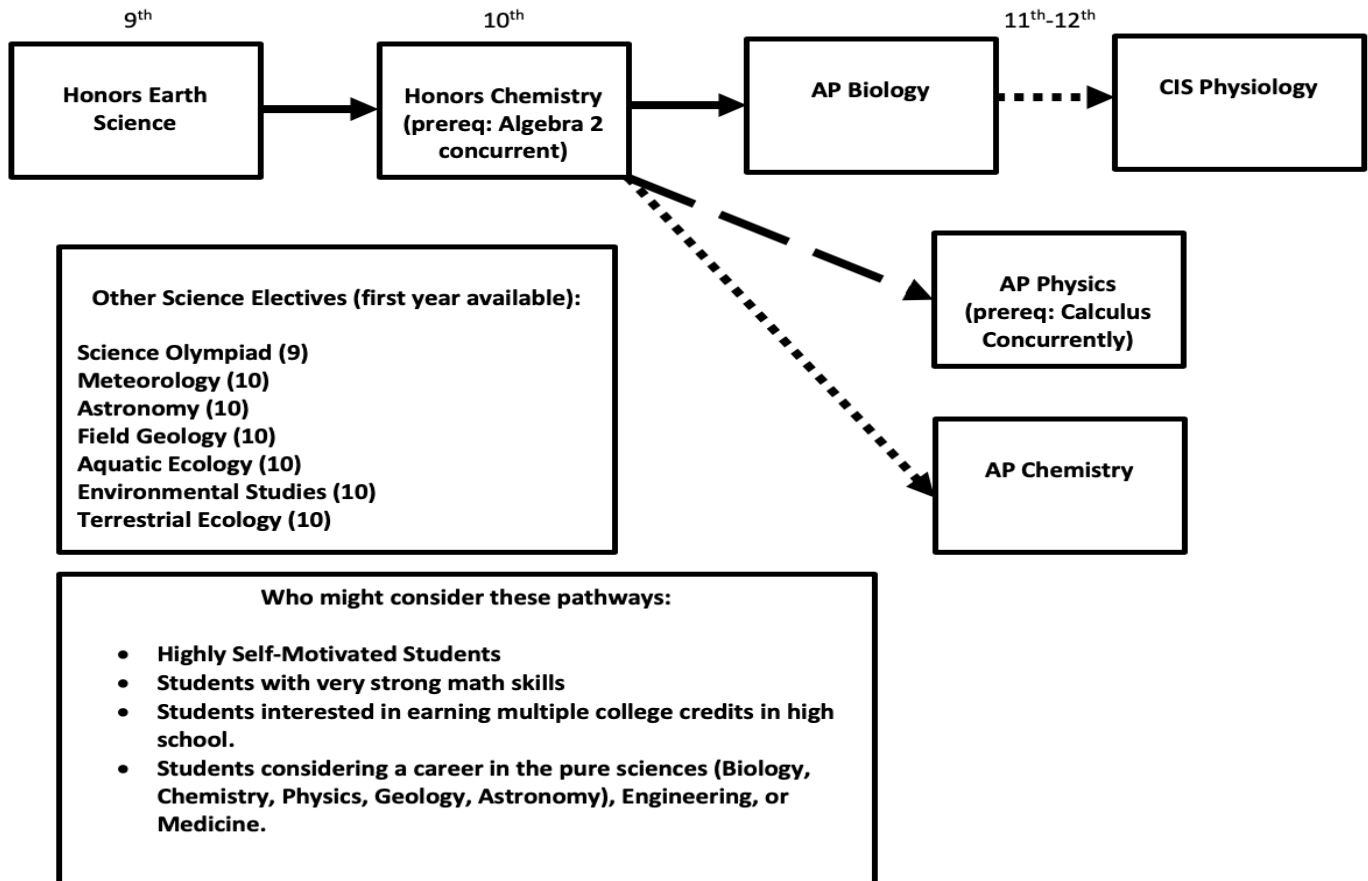
**Who might consider this pathway:**

- Motivated Students
- Students with strong math skills
- Students interested in earning college credits in high school.
- Students considering a career in the pure sciences (Biology, Chemistry, Physics, Geology, Astronomy), Engineering, or Medicine, or other Health Care Professions.

**More Challenging Honors Path: Gets to AP courses quicker.**



**Most Challenging Honors Path: Gets to AP courses fastest.**



Prerequisite: None

This class is a year-long course required of all 9<sup>th</sup> grade students. The course is an activity-centered approach to the study of the earth and space. It includes hands-on activities, cooperative learning groups, lectures, videos, and a variety of other methods to help students learn about the earth we live on and the objects in space around us. The topics for the year include: astronomy, geology, meteorology, water resources, physical science, and engineering.

**Honors Earth Science** F-5013, W-5014, S-5015

Grade: 9

Prerequisite: Strong performance in middle school science

The Honors Earth Science 9 course is a year-long course that will examine the same content areas as Earth Science 9 but will study the content areas with more depth and breadth. This advanced program is for the science-motivated student and will be more challenging than Earth Science 9.

**Biology** F-5051, W-5052, S-5053

Grades 10-11-12

Prerequisite: None

Biology is a year-long course that helps students develop an understanding of living organisms. This class is recommended by the Science Department for most 10<sup>th</sup> grade students. Laboratory activities are an integral part of each topic studied. The state standards for biological science will be covered in this course. Those students wishing to take an accelerated version of this course should consider Honors Biology. Topics addressed are: scientific method, chemistry of life, cells, cells and energy, mitosis, and meiosis; genetics, protein synthesis, evolution, classification, and ecology; ecology, homeostasis, immune system, nervous system, respiratory system, circulatory system, and plant/animal kingdom.

**Honors Biology** F-5061, W-5062, S-5063

Grade: 10-11-12

Prerequisite: Strong performance in Earth Science or Honors Earth Science.

Honors Biology is a year-long course that will focus on an in-depth study of the 9-12 Minnesota Standards for Life Science. This course provides students with an advanced understanding of the fundamental processes of all living things. Topics include ecology, biological molecules, enzymes, respiration, photosynthesis, and the molecular basis of inheritance and human systems. Students are expected to take an active role in class discussions as well as demonstrate critical thinking in conducting their own investigations. With additional study, students may choose to take the Advanced Placement<sup>®</sup> Biology Examination. During Spring Trimester, students are expected to participate in the fetal pig dissection lab.

**Advanced Placement<sup>®</sup> Biology** F-5061, W-5062, S-5063

Grades: 11-12

Prerequisite: Strong performance in Biology, Honors Biology, or Honors Chemistry

This course is equivalent to a two-semester college introductory biology course usually taken by biology majors during their first year of college. It is a rigorous course that requires advanced reading and study skills. Students will develop a conceptual framework for modern biology and an appreciation of science as a process. Bioinformatics (the application of statistics and computer science to molecular biology) will be used to analyze biological data throughout the course. Topics covered in this course are chemistry and life, cells, cellular energy, heredity, molecular genetics, evolutionary biology, diversity of organisms, structure and function of plants and animals, and ecology. One goal of this course is to prepare students to take the Advanced Placement exam in May and students in this class will register for and take the AP exam in May. There is a fee for this exam. Students may help by supporting a Lab Consumable Materials Fund to enhance their lab experience beyond the required curriculum (chemical and specimen costs).

**Chemistry** F-5071, W-5072, S-5073

Grades: 10-11-12

Prerequisite: None

Chemistry is a year-long course investigating the composition of matter and the changes in matter during chemical reactions to help us describe what objects are made of and how matter creates the world around us. Finding problems, making solutions, collaboration, and lab work are an integral part of the course. This course is appropriate for and designed for any college bound student. Students interested in studying STEM intensive fields such as pharmacy, physics, chemistry, biology, medicine, and engineering and nursing should consider taking Honors Chemistry.

**Honors Chemistry** F-5077, W-5078, S-5079

Grades: 10-11-12

Prerequisite: Completion of or concurrent enrollment in Algebra 2

Honors Chemistry is a year-long course, investigating the composition of matter and the changes in matter during chemical reactions. It helps us describe what objects are made of and how matter creates the world around us. Topics are similar to those covered in Chemistry, however, the approach is more math-intensive and concepts are explored in greater depth. This course is appropriate for and designed for students interested in studying STEM intensive fields such as pharmacy, physics, chemistry, biology, engineering and nursing in college.

**Advanced Placement® Chemistry** F-5081, W-5082, S-5083

Grades: 11-12

Prerequisite: Strong performance in Chemistry or Honors Chemistry

AP® Chemistry is a year-long course designed to be the equivalent of a general chemistry course taken during the first year of college. It should be taken as a second-year chemistry course at the high school. Content centers on four major ideas in chemistry: Scale, Proportion, and Quantity of Matter, Structure and Properties of Matter, Transformations of Matter, and Energy Changes of Matter. Lab skill development and scientific problem solving are also emphasized, including a focus on guided inquiry. Upon completion, students may elect to take the AP® Chemistry exam. Performance on this exam can earn a student college credit or advanced college placement, depending on the policies of the university or college.

**General Physics** F-5087, W-5088, S-5089

Grades: 10-11-12

Prerequisite: Teacher recommendation only. Students may not self-enroll.

General Physics is a year-long, hands-on course that focuses on learning physics concepts and how they relate to everyday life. Extensive knowledge of math is not required. The main topics of study will be motion, forces, energy, electricity, magnetism, sound and light. Highlights of the year include an annual egg crash competition, rocket launching, and a field trip to Valleyfair.

**Physics** F-5091, W-5092, S-5093

Grades: 10-11-12

Prerequisite: Completion of or concurrent enrollment in Algebra 2

Physics is a year-long course recommended for any student who is planning to go to college. In this course, students investigate everyday phenomena in an attempt to explain and describe these phenomena. We do this through direct experimentation and by learning from others. It is recommended that you take all three trimesters of the course. Topics include motion, forces, energy, electricity, waves, sound, light, and optics. Woven throughout these topics is an emphasis on experimental design and design thinking. Highlights of the year include engineering projects and a field trip to Valleyfair.

**Honors Physics** F-5097, W-5098, S-5099

Grades: 10-11-12

Prerequisite: Concurrent enrollment in Precalculus, Calculus, or higher

This course will cover the same general topics as Physics but in a much more intensive manner. Honors Physics will offer a more extensive mathematical approach to physics for students with a strong math background. This course is highly recommended for students planning on entering a STEM or health-related field of study. Topics covered: light,

waves, vectors, static electricity, electricity and magnetism, straight-line motion, force, energy, momentum, gravity and relativity.

**Advanced Placement® Physics C: Mechanics** F-5106, W-5107, S-5108

Grades: 10-11-12

Prerequisite: Concurrent enrollment in AP® Calculus or higher.

This year-long course is especially appropriate for students planning to specialize or major in physical science or engineering. The course explores topics such as kinematics; Newton's laws of motion; work, energy and power; systems of particles and linear momentum; circular motion and rotation; and oscillations and gravitation. The course applies both differential and integral calculus and promotes scientific inquiry in an engaging and rigorous setting.

**College in the Schools (CIS) - Human Physiology, Technology and Medical Devices** F-5064, W-5065, S-5066

Grades: 11-12

Prerequisite: Minimum B+ in Biology and concurrent enrollment in Chemistry

CIS Human Physiology, Technology and Medical Devices is a year-long course. The course is the study of the organization, structure, function, and interrelationships of the major systems of the human body and their response to disease. This course is a lab and activity-based course (including dissections) that requires memorization, reading, and note-taking skills. This college-credit course is recommended for students with an interest in pursuing a medical or health care career. The fall trimester covers body orientation and nomenclature, histology, the integumentary system, bones, the skeletal system, and joints. The winter trimester covers muscle anatomy and physiology. The spring trimester covers the nervous system, blood, and the cardiovascular system. This course uses a college-level textbook.

**General Science of Earth** F-5031, W-5032, S-5033

Grades: 9-10-11-12

Prerequisite: Teacher recommendation only. Students may not self-enroll.

General Science of Earth is a year-long class designed to help certain 9th through 12th grade students meet a year of their science requirement. Students will be exposed to the major concepts in biology, chemistry and physics in an integrated manner. Student learning experiences will be at a practical level with a minimum of mathematics. Topics in the first trimester deal with the scientific method, phenology, and basic concepts in environmental science. Topics also include the concepts of chemistry, chemistry in the environment and environmental issues.

**Meteorology** 5041

Grades: 10-11-12

Prerequisite: Earth Science

In this class students will gain a better understanding of the components that make up weather and climate. They will study the atmosphere, weather phenomena, how weather forms climate, and how climates are classified. This class is a good choice for students interested in weather or aviation, or those planning to go into the field of meteorology.

**Astronomy** 5045

Grades: 10-11-12

Prerequisite: Earth Science

Students in this class study our solar system. They learn how telescopes work, study about early astronomy, the moon, planets, sun, and examine the NASA space program. Students will find out how astronomers use light to learn about stars and galaxies, learn to tell star time, and study deep space objects. In addition, students discuss ideas about the nature and origin of the universe and extraterrestrial life. Some writing will be required.

**Field Geology** 5046

Grades: 10-11-12

Prerequisite: Earth Science

This course will study the Geology of Minnesota. Students learn about rocks and minerals mined and used in our state. Students will also see Minnesota's past as told by rocks we find. You will also learn how glaciers shaped Minnesota. Students will look at environmental issues which impact our state, including groundwater and mining. This course will include field trips and a possible optional overnight field study.

**Aquatic Ecology 5055**

Grades: 10-11-12

Prerequisite: None

This course is designed to study aquatic ecosystems including ponds, lakes, streams, and salt water. Topics include physical and chemical properties of water, collection and identification of aquatic organisms, aquatic food chains, and human effect on aquatic ecosystems. Field trips will be taken to the AVHS pond, a lake, and a stream where students will be wading, collecting, observing, and handling organisms, and to the Minnesota Zoo to observe the ocean ecosystem. Students are encouraged to enroll in Environmental Studies and Terrestrial Ecology.

**Environmental Studies 5057**

Grades: 10-11-12

Prerequisite: None

This course is designed to introduce the student to the problems humans have created on earth as a result of technical development and ever-increasing population growth. Sources, types, and effects of pollutants, as well as climate change will be examined. Classroom discussions, problem solving techniques, critical thinking, and classroom projects will be utilized to analyze possible causes and solutions to these environmental problems. Students are encouraged to enroll in Aquatic Ecology and Terrestrial Ecology.

**Terrestrial Ecology 5059**

Grades: 10-11-12

Prerequisite: None

Basic ecological concepts are studied using lab exercises, one field trip, population studies, and class discussions. Food webs, food chains, biomes, and energy cycles are included. Topics of ecological change and the evolution of populations are also studied. Students are encouraged to enroll in Aquatic Ecology and Environmental Studies.

**Science Olympiad 5060**

Grades: 9-10-11-12

Prerequisite: None

This one-trimester elective course is designed to encourage the students to explore Science, Technology, Engineering and Inquiry related to the competition-based Science Olympiad program. Using an inquiry-based methodology, students will use their skills and knowledge to explore a choice of challenges ranging from testing their knowledge of science topics like fossils, astronomy, and machines to honing their lab skills in chemistry or circuits to building devices, vehicles, and structures that meet specific requirements. A variety of STEM skills are integrated throughout the course.