Science

Maureen Frye, Head of Department

Required (Full Credit):
- Science (Grades 5-6)
- Integrated Life Science*
- Integrated Physical Science
- Honors Biology**
- Honors Chemistry

Required (Half Credit):
- Laboratory Techniques

Offered (Full Credit):
- AP Environmental Science
- AP Computer Science Principles
- AP Computer Science A
- AP-C Physics (Grade 12)
- AP Psychology
- Honors Human Anatomy and Physiology
- Honors Physics**

Offered (One and a Half Credits)
- AP Biology/Lab
- AP Chemistry/Lab
- AP Physics 1/Lab (Grades 11 or 12)
- AP Physics 2/Lab (Grades 12)

Offered (Half Credit)
- 7/8 Exploring Computer Science
- Advanced Computer Science- Algorithms
- Advanced Computer Science- Data and Information
- Advanced Computer Science- Programming
- Exploring Computer Science
- Intro to 3D Design and Printing
- Video Game Design Implementing STEAM (Science, Technology, Engineering, Art, and Math)

Semester Electives (Half Credit)
- Honors Brain, Culture, & Mind
- Honors Cross-Cultural Psychology
- Honors Sports Medicine
- Honors Sports Medicine II
• Robotics

*Students may elect to bypass Integrated Life Science and move to Integrated Physical Science in the 7th grade if they are taking Algebra I. In this case they are required to take AP Biology/Lab as an upper school student.

**Students may substitute AP Biology for Honors Biology and AP Physics for Honors Physics with an earned grade of “A” in previous math and science courses, letter of recommendation by previous science teacher, and approval by department chair and Head of School.

The Altamont science curriculum is concerned with the experimental and theoretical processes by which scientists explore the universe, the results of those processes, and the application of these results to contemporary problems. The laboratory orientation of all science classes encourages students to relate theory to experience. A strong advanced and AP program is offered to students with special interests in science. In addition, the science department offers several electives for those interested in challenging science courses that are not necessarily at an advanced level. Altamont’s science department requires that students in grades eight and ten participate in the science fair each year. All students are encouraged to participate in the science fair in any grade. Science projects are an important part of the science experience, especially for students who move on to the regional and international science fairs. Our science teachers seek to foster critical thinking through creative, independent research.

MIDDLE SCHOOL SCIENCES

Fifth Grade Science *(Required)*
This first course in science is designed to stimulate interest in the life, physical, and earth sciences. It explores problem solving through the use of the scientific method and introduces many modern tools of science. This project-oriented approach to scientific topics includes the tools of science, scientific measurement, models and designs, populations and ecosystems, electronics, and rocketry. Laboratory activities are taken from a variety of sources. Field trips to area exhibits, museums, and nature centers supplement the classroom experience. Students end the fifth grade year constructing and launching stage II rockets.

Sixth Grade Science *(Required)*
The second course in science incorporates a variety of hands-on projects designed to solve problems using scientific methods and to further develop research and experimental design skills through science projects. It seeks to further stimulate student interest in a broad range of science subjects. This project-oriented approach to scientific topics includes astronomy, environmental science, geology, and topography. Students are required to complete a science fair project for the junior division of our annual science fair.
**Integrated Life Science (Required)**
The third science course is designed to give students the opportunity to explore life science by participating in a variety of learning activities and hands-on, inquiry-based lab experiences that stimulate critical thinking and problem solving. Emphasis is placed on constructing and testing explanations using knowledge, models and experimental evidence. The units of study include: characteristics of life; diversity of living organisms; structure and function of cells, tissues, organs, and organ systems; heredity; interdependence of organisms and their environments; and biological evolution. The course is designed to prepare students for higher intellectual engagement offered by future science courses. Participation in the annual science fair is highly encouraged and supported.

**Integrated Physical Science (Required)**
*Prerequisite: Successful completion of sixth grade science, Integrated Life Science, and Pre-Algebra* This is an introduction to the more advanced courses of chemistry and physics. It develops an awareness of natural principles and technological applications in the everyday world and promotes the realization that the same fundamental principles apply throughout the universe. Students learn how to handle scientific apparatus, perform experiments, take measurements, and to draw valid conclusions. This course draws heavily on mathematic skills and the ability to solve simple algebraic equations.

*To take Integrated Physical Science in seventh grade the student must have earned a grade of “A” in previous math and science courses, be advanced in math, recommendation from previous science teacher and approval by department chair.*
COMPUTER SCIENCE

Computer Science Offerings
Offered (Full Credit):
• AP Computer Science Principles
• AP Computer Science A

Offered (Half-Credit):
• Exploring Computer Science
• Adv. Computer Science – Programming
• Adv. Computer Science – Web Design
• Intro to 3D Design and Printing
• Video Game Design
• Computer Systems

Course Descriptions
Exploring Computer Science
Grades: 7 – 10
Prerequisite: None
This introductory computer science focuses on computer science content and developing computational thinking. Assignments and instruction are contextualized to be socially relevant and meaningful for all students. Units utilize a variety of tools and platforms. Each unit will culminate with a final project focused on the following topics: Problem Solving, Web Design, Programming, and Data Analysis. (Half Credit)

Advanced Computer Science – Programming
Grades 8 – 12
Prerequisite: Exploring Computer Science or permission of instructor
Advanced Computer Science – Programming will dive deeper into the fundamentals of programming. Students will explore programming structures such as selection, iteration, and abstraction through the Python programming language. As students progress through the language, they will combine their content knowledge with Raspberry Pi computers to complete relevant projects each unit. With the Raspberry Pi computers, students will be exposed to basic circuit design with LEDs, sensors, and motors. (Half Credit)

Advanced Computer Science – Web Design
Grades 8 – 12
Prerequisite: Exploring Computer Science or permission of instructor
Advanced Computer Science – Web Design will dive deeper into the fundamentals of web design. Students will learn more about using HTML and CSS code to create good looking websites. Students will be introduced to the concepts of front-end and back-end design using the Javascript and Python programming languages. Projects in the class will focus on the following topics: Designing a Website with Bootstrap, Creating a Web App with Forms, Running a Website on a Python Server, and Data Scraping an HTML Page. (Half Credit)
**Video Game Design**  
Grades: 9 -12  
Prerequisite: Advanced Computer Science – Programming or permission of instructor  
Video Game Design will dive deeper into the fundamentals of creating games for computing devices. Students will apply the principles of literary theory, storytelling, aesthetics, and sociology towards the design of video games. Each unit will focus on designing a game in a new language. The languages that students will be programming in will be Scratch, App Inventor, Python, and Unity with C#. *(Half Credit)*

**Intro to 3D Design and Printing**  
Grades: 10 – 12  
Prerequisite: None  
Students will experience practical 3D printing experience and develop a critical eye for the technology’s advantages and limitations. Upon course completion, students will be able to explain current and emerging 3D printing applications in the manufacturing field, understand the advantages and limitations of each 3D printing technology, evaluate scenarios and recommend the appropriate uses of 3D printing technology and identify opportunities to apply 3D printing technology for time and cost savings. *(Half Credit)*

**Computer Systems**  
Grades: 10 – 12  
Prerequisite: AP Computer Science A or permission of instructor  
In Computer Systems students will dive deeper into how computers and computer systems work. They will explore the topics of Computer Hardware, Operating Systems, Networks, and Encryption Techniques. This course will involve research and programming as well as an introduction to working with operating systems based on Linux. *(Half Credit)*

**AP Computer Science Principles**  
Grades: 10 – 12  
Prerequisite: None  
AP Computer Science Principles is designed to introduce students to the central ideas of computing and computer science, to instill ideas and practices of computational thinking, and to have students engage in activities that show how computing and computer science change the world. The key concepts and related content that define the CSP course and exam are organized around the seven Big Ideas: Creativity, Abstraction, Algorithms, Programming, Big Data, the Internet, and Global Impact. At the end of the course, students will be given the opportunity to complete an AP Portfolio and take the AP exam to earn college credit. *(Full Credit)*

**AP Computer Science A**  
Grades: 10 – 12  
Prerequisite: None  
AP Computer Science A is designed to be an introductory computer science course at the university level. The goals of the course are to design and implement solutions by writing, running, and debugging computer programs; use and implement commonly used algorithms; develop and select appropriate algorithms to solve problems, code fluently in Java; and read and
understand a large program consisting of several class and interacting objects. At the end of the course, students will be given the opportunity to take the AP exam to earn college credit for a Computer Science course. *(Full Credit)*

**LIFE SCIENCES**

**Honors Biology (Required)**
*Prerequisite: Physical Science and Pre-Algebra*
*Recommended for ninth grade*

This first course in biology focuses on evolution and life’s diversity. The first half of the course focuses on ecological principles and man’s impact on the environment. Students explore Darwinian natural selection, Earth’s history and evolution. The second half of the course is geared towards basic cell biology, cell reproduction, and Mendelian and molecular genetics. This is an activity-based course that allows for the development of proper laboratory techniques and considerable exposure to problem solving and experimental design.

**AP Biology (Laboratory Course)**
*Prerequisite: Honors Chemistry and Algebra I*
*Recommended for tenth through twelfth grades*

*May be used to meet the biology graduation requirement with special permission.*

According to the course description found at apcentral.collegeboard.com, “The AP Biology course is designed to enable the student to develop advanced inquiry and reasoning skills, such as designing concepts in and across domains. The result will be readiness for the study of advanced topics in subsequent college courses—a goal of every AP course. This AP Biology course is equivalent to a two- semester college introductory biology course and has been endorsed enthusiastically by higher education officials. The key concepts and related content that define the revised AP Biology course and exam are organized around a few underlying principles called the big ideas, which encompass the core scientific principles, theories and processes governing living organisms and biological systems. Big Idea 1: Evolution; Big Idea 2: Cellular Processes: Energy and Communication; Big Idea 3: Genetics and Information Transfer Living systems store, retrieve, transmit, and respond to information essential to life processes; Big Idea 4: Interactions Biological systems interact, and these systems and their interactions possess complex properties.” The class meets six periods per week which allows for extensive laboratory exploration which enhances, extends and reinforces concepts discussed during lecture. Students are encouraged to take the Advanced Placement exam upon successful completion of the course.

*Grade of “A” in previous math and science course, letter of recommendation from previous science teacher and approval by department chair and Head of School*
AP Environmental Science

Prerequisite: Honors Biology, Honors Chemistry and Honors Algebra II
Recommended for eleventh and twelfth grade

AP ES is a rigorous, college-level course based on the seven themes of environmental science: Science as a process, energy conversions, ecological relationships, biogeochemical cycles, earth resources, water resources, air resources, and pollution. The goal of any environmental science course is to connect the role of humans as stewards to the biosphere. Laboratory experience in the field or in the lab will consist of 15% of the class time and activities based on content another 15% at minimum. The other 70% on class time will be used to explore content via group research, debate, field trips, recycling and exploratory using our e-books and various links. All will prepare for the AP exam with preparatory materials. The hope is to take field trips to the water treatment facility, a local river the Cahaba and our local recycling plant. We will be responsible for “green” initiatives and defend our proposals.

AP Psychology

Recommended for eleventh or twelfth grade

AP Psychology introduces students to the systematic and scientific study of behavior and mental processes with current applications of modern psychology to contemporary society. This survey course emphasizes the historical development of psychology from its philosophical roots to its current foundation in the natural and social sciences. Students are introduced to major psychological studies of the twentieth century through primary and secondary source material relevant to the major perspectives: social/cultural, biological, cognitive, behavioral, psychodynamic, and humanistic. In addition to taking notes on lectures, students gain experience in leading class discussions, reading scholarly articles, conducting case studies, participating in experiments and demonstrations, developing reach proposals, utilizing electronic databases for library research, and using APA style format for research papers. A variety of outside speakers from the community expose students to current applications of the core material.

Honors Human Anatomy and Physiology

Prerequisite: Honors Biology and Honors Chemistry
Recommended for eleventh or twelfth grade

This course emphasizes human body structures and their functions. The major body systems are discussed. Emphasis is placed on homeostatic mechanisms and human disease. The laboratory aspect of the course requires dissection of preserved animal specimens and sculpting organ systems with clay models. Other experiments include computer physiology labs and simulations. While the curriculum contains much lab work, no lab credit is earned for this course. It may be taken concurrently with any science course as an elective as long as the student has completed chemistry.

Honors Brain, Culture, & Mind (Semester Elective)

Recommended for eleventh or twelfth grade

This semester-long honors level seminar emphasizes such topics as research methodology, health and well-being, cultural variations in psychopathology and culturally bound disorders. In addition, this semester focuses on the neuroscience of meditative practices and the alliance between eastern philosophy and western developments in neuroscience.
**Honors Cross-Cultural Psychology (Semester Elective)**

*Recommended for eleventh or twelfth grade*

This semester-long honors level seminar emphasizes how cultural influences shape the personality of the individual and the society. The seminar focuses on such topics as research methodology, personality and concept of self, cultural differences in child development, and social psychology.

**Honors Sports Medicine (Semester Elective)**

*Recommended for eleventh or twelfth grade*

Sports Medicine is an area of health services that applies medical and scientific knowledge to; prevent, recognize, manage, and rehabilitate injuries related to sport, exercise, or recreational activity. Students will gain a better understanding about history of sports medicine and the various professions within the field. They will develop a deeper knowledge of the human muscular-skeletal anatomy and common injuries and illness associated with athletics. Students will learn the different methods and techniques for preventing injuries. They will learn basic skills and knowledge for injury evaluation and the rehabilitation techniques for treating those injuries. The class will have both a lecture and practical component, where they will learn the skills and then have the opportunity to practice those techniques. After completion of the class students may take the opportunity to further their education by participating in various internships or job shadowing programs with physical therapists, orthopedic physicians, or athletic trainers in both the high school and college setting.

**Honors Sports Medicine II (Semester Elective)**

*Prerequisite: Honors Sports Medicine*

*Recommended for eleventh of twelfth grade*

Students will develop an in depth knowledge of the human muscular-skeletal anatomy and common injuries and illness associated with activity. Students will learn the different methods and techniques for preventing these injuries. They will also learn basic skills and knowledge for injury evaluation, management, and rehabilitation techniques for treating those injuries. The class will have both a lecture and practical component, where they will learn the skills and then have the opportunity to practice those techniques. Students will be expected to demonstrate their knowledge through various “hands-on” practical exams. There will also be several guest speakers from orthopedic physicians, physical therapist, nutritionist, and athletic trainers. During the class students may take the opportunity to further their education by participating in various internships or job shadowing programs with physical therapists, orthopedic physicians, or athletic trainers in both the high school and college setting.
PHYSICAL SCIENCES

Honors Chemistry (Required) Prerequisite: Algebra I
Recommended for the tenth grade*
This curriculum introduces chemistry in a complete course for students in a college-preparatory program. The course helps students see how chemical principles and concepts are developed from experimental observations, and how these principles may be used to explain phenomena in daily life as well as in the laboratory. Questions and problems provide ongoing reinforcement and extension of critical thinking and problem solving skills. The course emphasizes skills that help students analyze carefully and act wisely on issues that confront us all as citizens in our technological world.
*To take Chemistry in ninth grade the student must have earned a grade of “A” in previous math and science courses and a letter of recommendation from previous science teacher and approval by department chair and Head of School

Laboratory Techniques (Required)
Prerequisite: Algebra I, Biology, and Chemistry (completed or concurring)
(Classes meets 4 times a week for 1 semester)
This laboratory is required for students enrolled in Chemistry. The course meets four times per week for one semester. The laboratory course is designed so that students focus on fundamental laboratory procedures as well as experimental methods with respect to biology and chemistry. Students relate mathematical models to experimental evidence and produce well written, lucid laboratory reports. Laboratory science prepares students for subsequent science courses at Altamont as well as collegiate science and engineering courses.

AP Chemistry (Laboratory Course)
Prerequisite: Honors Chemistry and Honors Algebra II Recommended for eleventh or twelfth grade
Advanced chemistry is designed to be the equivalent of the chemistry course usually taken during the freshman college year. Students attain a depth of understanding of fundamentals and a reasonable competence in dealing with chemical problems. The course contributes to the development of the student’s ability to think clearly and to express their ideas, orally and in writing with clarity and logic. Topics include structure of matter, kinetic molecular theory, thermodynamics, kinetics, gases, electrochemistry, nuclear chemistry, and basic concepts of equilibrium. This course meets six periods per week which allows time for lab periods that enhance and reinforce the concepts covered during lectures. Students are encouraged to take the Advanced Placement Chemistry exam upon successful completion of this course.

Honors Physics
Prerequisite Honors Algebra II
Recommended for eleventh grade
Physics is a high-school level algebra-based, introductory survey of physics from mechanics to the ideas of relativity. Not nearly as intense as the AP physics courses, students are introduced to the concepts of physics with light mathematical applications. They become familiar with solving motion and other equations, interpreting graphs, and graphically depicting data derived from
various experiments. This course enhances higher order thinking skills and prepares students for higher level science courses.

**AP Physics 1** *(Laboratory Course)*  
**Prerequisite:** Honors Pre-Calculus  
**Recommended for eleventh or twelfth grade**  
*May be used to meet the physics graduation requirement with special permission.*  
AP Physics 1 is an intense algebra- and trigonometry-based, introductory college course. The curriculum includes instruction in kinematics, dynamics, rotational dynamics, angular momentum, work, energy, and power; and mechanical waves and sound. It will also introduce electric circuits. Laboratory experiments illuminate principles developed in the classroom. The purpose of this course is to introduce students to the workings of the universe and to enhance higher order thinking skills. This course also prepares students for the Physics Advanced Placement exam (Physics 1).  
*Grade of “A” in previous math and science courses, letter of recommendation from previous science teacher and approval by department chair and Head of School*

**AP Physics 2** *(Laboratory Course) Prerequisite: AP Physics 1*  
**Recommended for eleventh or twelfth grade**  
AP Physics 2 is equivalent to the second semester of an introductory college course. Topics will include fluid mechanics; thermodynamics; electricity and magnetism; optics; and atomic and nuclear physics. Laboratory experiments illuminate principles developed in the classroom. The purpose of this course is to introduce students to the workings of the universe and to enhance higher order thinking skills. This course also prepares students for the Physics 2 Advanced Placement exam (Physics 2).  
*Grade of “A” in previous math and science courses, letter of recommendation from previous science teacher and approval by department chair and Head of School.*

**AP-C Physics**  
**Prerequisite:** AP Physics 1 and AP Calculus BC **Recommended for twelfth grade**  
Altamont’s AP-C Physics introduces students to calculus-based mechanics or to electricity and magnetism, which includes differentiation and integration. This course develops a greater degree of analysis than the AP Physics course and an increased sophistication in problem-solving techniques and critical thinking. Students are encouraged to take the Physics Advanced Placement exam (Physics – C) upon the successful completion of this course.

**Robotics** *(Upper School Elective)*  
Robotics is a semester long course that will take place during the Fall Semester. It will focus on developing programming skills, building skills, engineering design and teamwork. As part of the course we will participate in the BEST robotics competition, and we will spend some time working with the LEGO Mindstorms Robots. Before and after the BEST competition we will have in class competitions with the LEGO Mindstorms Robots. Students will be expected to complete a final challenge at the end of the semester that will include a paper discussing their problem-solving process, design challenges and methods of testing.