AOS Course Descriptions

Academy of Science Courses

Mathematics

AOS Pre-Integrated Math
Course Code 552000
Grade(s): 8-9
1 Credit

AOS Pre-Integrated Math is an honors-level alternative to Geometry for highly motivated mathematics students. The greater depth, breadth and rigor of the course is intended to prepare students for success in advanced mathematics courses. The course covers the study of plane, solid, and coordinate geometric concepts. Investigations of lines, planes, congruence, similarity, areas, volumes, circles, and three-dimensional shapes are incorporated to provide a complete course of study. Formal and informal deductive reasoning skills are developed and applied to the construction of formal proofs. An emphasis on reasoning, problem solving, and proof is embedded in the course and includes two-column proofs, paragraph proofs, and coordinate proofs. Computers and graphing calculator technologies are incorporated into the curriculum to allow students opportunities to explore concepts, engage in inquiry-based learning, provide visual models to support the learning of geometric concepts, and as powerful tools for solving and verifying solutions to equations and inequalities. Mathematical communication and reasoning are emphasized throughout the course.

AOS Integrated Math I
Course Code
Grade(s): 9
1 Credit
Prerequisite: None

This course is the first in a two-year sequence of integrated math courses designed for AOS students. Students study an integrated progression of math topics including content typically taught in geometry, advanced algebra, trigonometry, math analysis, and AP Calculus A. The course places emphasis on mathematical communication, reasoning, authentic problem solving, critical thinking, and multiple representations of mathematical concepts. The course is inquiry-based with much of the content learned through investigations, applications, simulations, and problem-based exercises. Mathematical concepts in this course are connected to topics in AOS Integrated Science courses.

AOS AP Integrated Math II
Course Code 566800
Grade(s): 10
Prerequisite: AOS Integrated Math I

This course provides a continuation and expansion of the study of elementary, transcendental, and logistic functions, as well as parametric, polar, matrix, and linear algebra systems. Infinite sequences and series, limits, continuity, and rates of change as an introduction to the derivative are major topics introduced in this second course. Differential calculus concepts are thoroughly explored, and integration is introduced to prepare students for the AP Calculus course the following year. The inquiry-based methodology and transformation approach utilized in the previous course are continued as unifying themes in this second course. Inferential statistics topics, including both parametric and non-parametric tests are major components of the course and are introduced in project-based activities that complement the integrated science course and provide a foundation for independent science research in the 11th and 12th grades. Heavy emphasis is placed on mathematical communication, reasoning, authentic problem solving, critical thinking, and multiple representations of mathematical concepts.

AOS AP Calculus AB
Course Code 561100
Grade(s): 11-12
1 Credit
Prerequisite: AOS AP Integrated Math II
This course covers all the topics in the College Board's description of an AB level AP Calculus course. In addition, the students experience use of one or more differential equations to create models for a variety of dynamic processes of the types studied in the physical and biological sciences. Students have the opportunity to take the AP AB Calculus Exam in May with the possibility of earning college credit.

AOS AP Calculus BC
Course Code 571100
Grade(s): 11-12
1 Credit
Prerequisite: AOS AP Integrated Math II or AOS AP Calculus AB
This course covers all of the topics in the College Board's description of a BC level AP Calculus course. In addition, the students experience use of one or more differential equations to create models for a variety of dynamic processes of the types studied in the physical and biological sciences. Students have the opportunity to take the AP BC Calculus Exam in May with the possibility of earning college credit.

AOS Multivariable Calculus
Course Code 583001
Grade(s): 12
1 Credit
Prerequisite: AOS AP Calculus BC (students must receive a 3 or higher on the AP exam)
This is a course in vector calculus. There is a special emphasis on using vector fields to the model motion of particles and fluids in two and three dimensions. The software

tool *Mathematica* is used through the course to create interactive graphics to enhance the meaning of calculations. In this context students discover methods for computing or approximating double and triple integrals. The work includes the use of the theorems of Gauss, Green, and Stokes to measure flow and turbulence.

Science

AOS Integrated Science I
Course Code 664900
Grade(s): 9
1 Credit
SOL TEST This course is the first in a series of integrated science courses (two-year sequence of courses) designed for AOS students. Students study the physical sciences, physics, chemistry, and earth science as an integrated progression of science topics and learn content typically taught in these courses. The course is inquiry-based with much of the content learned through laboratory exercises, many of which are student-designed. Students take the Earth Science and Chemistry SOL tests during the AOS Integrated Science course progression. AOS Integrated Science I, II, and III prepare students for the advanced study of physical sciences in the junior and senior years. This course is required for all AOS 9th graders.

AOS Integrated Science II
Course Code 645900
Grade(s): 9
1 Credit
Co-requisite: AOS Integrated Science I
SOL TEST This course is the second in a series of integrated science courses (two-year sequence of courses) designed for AOS students. Students study the physical sciences, physics, chemistry, and earth science as an integrated progression of science topics and learn content typically taught in these courses. The course is inquiry-based with much of the content learned through laboratory exercises, many of which are student-designed. Students take the Earth Science and Chemistry SOL tests during the AOS Integrated Science course progression. AOS Integrated Science I, II, and III prepare students for the advanced study of physical sciences in the junior and senior years. This course is required for all AOS 9th graders.

AOS Integrated Science III
Course Code 654900
Grade(s): 10
1 Credit
Prerequisite: AOS Integrated Science I and II
SOL TEST This course is the third in a series of integrated science courses (two-year sequence of courses) designed for AOS students. Students study the physical sciences, physics, chemistry, and earth science as an integrated progression of science topics

and learn content typically taught in these courses. The course is inquiry-based with much of the content learned through laboratory exercises, many of which are student-designed. Students take the Earth Science and Chemistry SOL tests during the AOS Integrated Science course progression. AOS Integrated Science I, II, and III prepare students for the advanced study of physical sciences in the junior and senior years. This course is required for all AOS 10th graders.

AOS Sophomore Science Research
Course Code 651900
Grade(s): 10
1 Credit
Prerequisite: AOS Integrated Science I and II
In this course students conduct a series of interdisciplinary science research activities designed to involve students in the application and use of inquiry-based methodology and to learn the use of techniques, equipment, and protocols typically used in scientific research laboratories. This course also enhances the ability of students to read and write scientific papers at the publication level. During the second semester, students begin work on a science research project of their own design that can be continued throughout their years as an AOS student. Sophomore Science Research is offered in conjunction with AOS Integrated Science III. This course is required for all AOS 10th graders.

AOS Junior Science Research
Course Code 661900
Grade(s): 11
1 Credit
Prerequisite: AOS Sophomore Science Research
Students continue to conduct interdisciplinary science research activities using inquiry-based methodology and increase their skill level with laboratory techniques and protocols in this course. This course also enhances the ability of students to read and write scientific papers at the publication level. Based on their interests, students begin to develop a research plan for an independent science research project that they complete in the Senior Science Research course. With a faculty mentor, they conduct a literature search, develop laboratory protocols, develop a materials list, create a budget, and work as a bench scientist. Regular presentation of results is an expectation for all research students. While it is intended that most of the bench-work can be conducted at AOS, some students interact with local scientists who act as mentors during both the school year and summer.

AOS Senior Science Research
Course Code 671900
Grade(s): 12
1 Credit
Prerequisite: AOS Junior Science Research

In this course students continue to conduct interdisciplinary science research activities using inquiry-based methodology and increase their skill level with laboratory techniques and protocols. This course also enhances the ability of students to read and write scientific papers at the publication level. Students in senior research continue their work on the plan created during the junior research course. They conduct their bench-work with the guidance of a faculty mentor. Regular presentation of results is an expectation for all research students. While it is intended that most of the bench-work can be carried out at AOS, some students interact with local scientists who act as mentors during both the school year and summer.

AOS AP Biology
Course Code 664100
Grade(s): 12
1 Credit
Prerequisite: AOS Integrated Science III
This advanced course is a college-level, fast-paced course that follows the course outline of the College Board's AP Biology program. The course emphasizes cellular biology, biochemical processes of cellular respiration and photosynthesis, vertebrate anatomy and physiology, advanced genetics, evolution, plant anatomy and physiology, and ecology. Students have the opportunity to take the AP Biology Exam in May with the possibility of earning college credit.

AOS AP Environmental Science
Course Code 674100
Grade(s): 12
1 Credit
Prerequisite: AOS Integrated Science III
This advanced course is a college-level, fast-paced course in Environmental Science that follows the course outline of the College Board's AP Environmental Science program. The course includes field work and many extended lab procedures. The course emphasizes population biology; ecosystems; geologic and earth science concepts; atmospheric science; land and water use topics including energy and energy use, consumption, and conservation, and pollution; and global change. Students have the opportunity to take the AP Environmental Science Exam in May with the possibility of earning college credit.

AOS AP Chemistry
Course Code 669100
Grade(s): 12
1 Credit
Prerequisite: AOS Integrated Science III
This advanced course is a college-level, fast-paced course in Chemistry that follows the course outline of the College Board's AP Chemistry program. The course includes many extended lab procedures. In addition, such fields as organic chemistry, biochemistry, nuclear chemistry, coordination complexes, and semi-micro qualitative analysis are

introduced. Students have the opportunity to take the AP Chemistry Exam in May with the possibility of earning college credit.

AOS AP Physics
Course Code 662100
Grade(s):12
1 Credit
Prerequisite: AOS Integrated Science III
This course is a college-level, fast-paced course in that follows the course outline of the College Board's AP Physics program. Emphasis is placed on mechanics, and the student has the option to study additional topics. Precalculus and calculus skills are used to develop concepts and solve problems. Students have the opportunity to take the AP Physics Exam in May with the possibility of earning college credit.