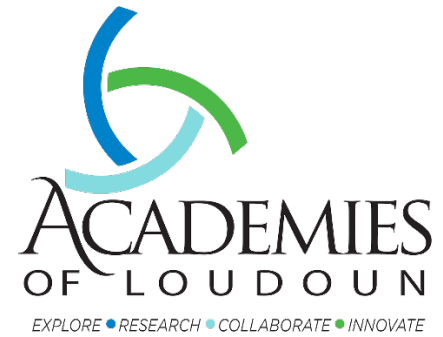# AET Course Descriptions

AET Mathematics Courses

AET Integrated Mathematics I, *weighted 0.5*   566100
Grade 9   Credit: 1

This course is the first in a series of integrated math courses (two-year sequence of courses) designed for AET students. Students study Algebra 2 with Trigonometry and Math Analysis as an integrated progression of math topics and learn additional content typically taught in geometry, advanced algebra, trigonometry, precalculus, and introductory calculus. The course is inquiry-based with much of the content learned through investigations, applications, simulations, and problem-based exercises.

AET Integrated Mathematics II, *weighted 0.5*   566200
Grade 10   Credit: 1

Prerequisite: AET Integrated Math I

SOL TEST This course is the second in a series of integrated math courses (two-year sequence of courses) designed for AET students. Building upon the first year course, students study the relationships and practical applications of trigonometry, conic sections, polar graphing, parametric equations and vectors. The course is inquiry-based with much of the content learned through investigations, applications, simulations, and problem-based exercises. This course prepares students to take an Advanced Placement Calculus course the following year.

AET AP Calculus AB, *weighted 1.0*   566300
Grade(s) 11-12   Credit: 1

Prerequisite: AET Integrated Math II or Math Analysis

AET AP Calculus AB explores the topics of limits/continuity, derivatives, and integrals. These ideas are examined using a multi- layered approach including the verbal, numerical, analytical, and graphical analysis of polynomial, rational, trigonometric, exponential, and logarithmic functions and their inverses. The student is expected to relate the connections among these approaches. Students are also required to synthesize knowledge of the topics of the course to solve applications that model physical, social, and/or economic situations. These applications emphasize derivatives as rates of change, local linear approximations, optimizations and curve analysis, and integrals as Reimann sums, area of regions, volume of solids with known cross sections, average value of functions, and rectilinear motions. Emerging technologies are incorporated into the curriculum as they become available. Students have the opportunity to take the AP Calculus AB Exam in May with the possibility of earning college credit.

AET AP Calculus BC, *weighted 1.0*   566400
Grade(s) 11-12   Credit: 1

Prerequisite: AET Integrated Math II or Math Analysis

AET AP Calculus BC is intended for students who have a thorough knowledge of analytic geometry and elementary functions in addition to college-preparatory algebra, geometry, and trigonometry. Although all of the elements of the AP Calculus AB course are included, the course provides a more rigorous treatment of these introductory calculus topics. The course also includes the development of the additional topics required by the College Entrance Examination Board in its syllabus for AP Calculus BC. Among these are parametric, polar, and vector functions; the rigorous definition of limit; advanced integration techniques; Simpson's Rule; length of curves; improper integrals; Hooke's Law; and the study of sequences and series. Additionally, investigations into the applications of calculus extend into physics, computer science and other content areas. The use of graphing technology is fully integrated into instruction and students are expected to confirm and interpret results of problem situations that are solved using available technology. Emerging technologies are incorporated into the curriculum as they become available.

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

AET AP Statistics, *weighted 1.0*   598200
Grade 12   **Credit: 1**

Prerequisite: AET AP Calculus AB

The AP Statistics course explores the concepts and skills according to the syllabus available through the College Entrance Examination Board. These topics include collecting and interpreting data through numerical methods, binomial and normal distribution, probability, linear correlation and regression, analysis of variance, and other descriptive statistical methods. Students should be able to transform data to aid in data interpretation and prediction and test hypotheses using appropriate statistics. Emerging technologies are incorporated into the curriculum as they become available. Students have the opportunity to take the AP Statistics exam in May with the possibility of earning college credit.

AET Multivariable Calculus *weighted 1.0*   583300
Grade 12   **Credit: 1**
Prerequisite: AET AP Calculus BC (students must receive a 3 or higher on the AP exam)
This course covers differential, integral and vector calculus for functions of more than one variable. These mathematical tools and methods are used extensively int eh physical sciences, engineering, economics and computer graphics. Students discover methods for computer double and triple integrals, investigate and simulate practical applications of such methods. The tool Mathematica is interwoven into the course to enhance the understanding and meaning of computations. The work includes the use of the theorems of Gauss, Green, and Stokes to measure flow and turbulence.

AET Science Courses

AET Integrated Science I, *weighted 0.5*   667100
Grade 9   **Credit: 1**

This course is the first in a series of integrated science courses (two-year sequence of courses) designed for AET students. Students study the physical sciences, physics and chemistry, 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. Students take the Chemistry SOL test during the AET Integrated Science course progression. AET Integrated Science I and II prepare students for the advanced study of physical sciences in the junior and senior years. This course is required for all AET Engineering and Entrepreneurship freshman.

AET Integrated Science II, *weighted 0.5*   667200
Grade 10   **Credit: 1**
Prerequisite: AET Integrated Science I

SOL TEST This course is the second and final in the series of integrated science courses (two-year sequence of courses) designed for AET students. Students study the physical sciences, physics and chemistry, 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. Students take the Chemistry SOL test during the AET Integrated Science course progression. AET Integrated Science I and II prepare students for the advanced study of physical sciences in the junior and senior years. This course is required for all AET Engineering and Entrepreneurship sophomores.

AET Physics, *weighted 0.5*   671300
Grade 9   **Credit: 1**

The AET Physics course is the first science course required for all AET IT pathway students. AET physics is a rigorous academic course preparing students for college level work. The course is inquiry-based with much of the content learned through laboratory exercises. Algebra skills are used to develop concepts and solve problems.

AET Research Biology, weighted 0.5   **650400**
Grade(s): 9-12   **Credit: 1**

This course is designed to provide students with a rigorous curriculum with an extensive understanding of living systems. The course is a problem/inquiry-based program where a scientific dilemma is posed. Students identify problems, answer questions, and complete lab activities relevant to the topic covered. Students will investigate biochemical life processes, cellular organization, mechanisms of inheritance, dynamic relationships among organisms, and the changes in organisms through time. The importance of scientific research that validates or challenges ideas is emphasized throughout the course. Tools and technology, including calculators, computers, probes, sensors, and microscopes are used. Mathematics, statistical analysis, computational thinking, experiences in the engineering design process, and experiential learning are incorporated in AET Research Biology to advance students' scientific thinking. AET Research Biology students may participate in the process leading to possible selection for participation in the Loudoun County Regional Science and Engineering Fair (RSEF).

AET Research Chemistry, *weighted 0.5*   **661500**
Grade 10   **Credit: 1**
The AET Research Chemistry course is one of the science courses required for all AET IT pathway students. AET Research Chemistry is a rigorous academic course preparing students for college level work. Students have multiple experiences conducting science research as a means to develop chemistry content knowledge and scientific thinking. Students interpret chemical information and utilize technology, and chemistry protocols to organize and analyze data. Students learn the role that scientific evidence and scientific thinking plays in development of new scientific knowledge in the field of chemistry. Students are expected to collect and communicate data with descriptive statistics and graphical representations. In addition, students answer research questions using scientific data and draw conclusions using their chemical content knowledge. During Research Chemistry, students develop the science thinking and process skills required to generate a scientific research question and design an investigation to collect data that will answer their question. Additionally, students develop a deeper understanding of the role of inferential statistics in data analysis and drawing conclusions.

AET AP Advanced Computer Science, *weighted 1.0*   **668000**
Grade 10   **Credit: 1**
Prerequisite: AET Information Technology & Computer Science

AP TEST This course is the second in the series of computer science courses (two-year sequence of courses) designed for AET IT pathway students. This is a college-level, fast-paced course that completes the course outline of the College board's AP Computer Science program. The course emphasizes many extended lab procedures and has elements of research and design.   Course content includes sorting algorithms (selection, insertion, merge, quick and heap) and data structures (arrays, recursion, linked lists, stacks, queues, trees, sets, maps and graphs). The programming language is JAVA. Students have the opportunity to take the AP Computer Science Exam in May with the possibility of earning college credit.

AET AP Physics, *weighted 1.0*   **671400**
Grade 11   **Credit: 1**
Prerequisite: AET Integrated Science II

This course is a college-level, fast-paced course that follows the course outline of the College Board's AP Physics program. Emphasis is placed on mechanics. Students study concepts in each of the following six content areas: kinematics, Newton's laws of motion; work, energy, and power; systems of particles and linear momentum; circular motion and rotation; and oscillations and gravitation. Pre-calculus 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.

AET Engineering Studies III, Junior Research, *weighted 0.5*   855103
Grade 11   **Credit: 1**
Prerequisite: AET Engineering Studies II
This 11th grade engineering course continues to build on the knowledge and skills obtained in AET Engineering I and II. Students explore engineering and research through a series of problem based labs that focus on the following engineering disciplines: Aerospace, Civil, Electrical & Biomedical. Throughout the year, students will have

the opportunity to complete labs as individuals and in collaborative in teams. High priority will be given to microcontroller programming, prototyping, biomedical design, and robotics. In addition, students will learn the critical steps needed to plan and implement a thorough research project.

AET Computer Science Investigations, **Junior Research** *weighted 0.5*   668100
Grade 11   **Credit: 1**
Prerequisite: AET AP Advanced Computer Science
The 11th grade Information Technology elective continues to build on the programming skills and knowledge obtained in AET Information Technology & Computer Science and AET AP Advanced Computer Science. With a strong computer science background, student's will explore the quickly growing fields of Artificial Intelligence, Machine Learning, & Mobile/Web Application Development. Throughout the year, students will have the opportunity to complete multiple labs and problem sets as individuals and in collaborative teams.   In addition, students will learn the critical steps needed to plan and implement a thorough research project.

AET AP Biology, *weighted 1.0*   **655200**
Grade 12   **Credit: 1**
Prerequisite: AET Research Biology, Research Biology, or Biology
This advanced course is a college-level, fast-paced course that follows the course outline of the College Board's AP Biology program. Students cultivate their understanding of biology through inquiry-based investigations as they explore the following topics: evolution, cellular processes, energy and communication, genetics, information transfer, ecology, and interactions. Students in this course will spend significant instructional time completing advanced laboratory work with an emphasis on inquiry-based investigations that provide students with opportunities to apply scientific processes. Students have the opportunity to take the AP Biology Exam in May with the possibility of earning college credit.

AET AP Environmental Science, *weighted 1.0*   **674300**
Grade 12
Prerequisite: AET Research Biology, Research Biology, or Biology   **Credit: 1**
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; earth systems; 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.

AET AP Chemistry, *weighted 1.0*   **665200**
Grade 12   **Credit: 1**
Prerequisite: AET Integrated Science II
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.

AET Senior Research – Computer Systems, *weighted 0.5*   **668200**
Grade 12   **Credit: 1**
Prerequisite: AET Junior Research
In this course students continue to conduct interdisciplinary science research activities using inquiry-based methodology and increase their skill level with research and development 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 research and development with the guidance of a faculty mentor. Regular presentation of results is an expectation for all research students.

AET Senior Research – Engineering, *weighted 0.5*   **668300**
Grade 12   **Credit: 1**

Prerequisite: AET Junior Research

In this course students continue to conduct interdisciplinary science research activities using inquiry-based methodology and increase their skill level with the engineering design process, research and development 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 research and development with the guidance of a faculty mentor. Regular presentation of results is an expectation for all research students.

AET Specialty Courses

AET Information Technology & Computer Science, *weighted 0.5*   829300
Grade 9   **Credit: 1**

This course is the first of the computer science courses specifically designed for AET IT pathway students who wish to engage in an intensive study of computer science and information technologies. It is designed for students with no programming experience. The course will cover object-oriented programming, graphics and animation, GUI interfaces, arrays and files, sorting, recursion and ethics. The programming language is JAVA. All AET IT students will be required to design, develop and conduct multiple programming and research projects while attending the AET.

AET Engineering Studies I, *weighted 0.5*   855101
Grade 9   **Credit: 1**

This course is the first in a series of engineering studies courses specifically designed for AET Engineering students. The course is designed for students who wish to engage in an intensive study of engineering, including the engineering design process. The course is inquiry-based with much of the content learned through investigation and problem-based exercises. Students will practice engineering fundamentals, using mathematical and scientific concepts, and they will apply the engineering design process through participation in hands-on engineering projects. Students communicate project-related information through team-based presentations, proposals, and technical reports. All AET Engineering I students will be required to complete multiple engineering projects while attending the AET.

AET Engineering Studies II, *weighted 0.5*   855102
Grade 10   **Credit: 1**

Prerequisite: AET Engineering Studies I

This course is the second in a series of Engineering studies courses specifically designed for AET Engineering students. Engineering Studies prepares students by emphasizing integration of mathematics, science, and English concepts and skills into engineering problems in a curriculum demanding rigorous study habits and other college-level skills. Students are encouraged to become routinely inquisitive through brainstorming and prototyping. Students practice engineering skills and communication of technical information while applying the engineering design process to complete multiple engineering projects while attending the AET.

AET Entrepreneurship I, *weighted 0.5*   824201
Grade 9   **Credit: 1**

This course is the first in a series of Entrepreneurship studies courses specifically designed for AET Entrepreneurship students. Students will learn to think entrepreneurially and to recognize opportunities in the marketplace that will enrich the lives of their community and the world. Students will learn core curriculum in business ownership, economics, finance, customer service and sales, and marketing in order to turn their STEM related entrepreneurial ideas into action. Designed for students who are interested in STEM fields and wish to engage in an intensive study of developing, marketing and managing STEM related businesses. All AET Entrepreneurship students will be required to develop multiple, STEM focused business and marketing plans.

AET Entrepreneurship II DE, *weighted 1.0*   824406
Grade 10   **Credit: 1**

Prerequisite: AET Entrepreneurship I

This course is the second in a series of Entrepreneurship studies courses specifically designed for AET

Entrepreneurship students. Students will concentrate on advanced strategies for entrepreneurship with an emphasis on opportunities in the STEM industries. It will build on concepts introduced in AET Entrepreneurship I and focus on the development of a start-up business plan using Lean Methodologies. Designed for students who are interested in STEM fields and wish to engage in an intensive study of developing, marketing and managing STEM related businesses. All AET Entrepreneurship students will be required to develop a STEM focused Start-up from initial concept to final investor pitch.