GEOMETRY - ALGEBRA I

This course is for those students who either have not had a full year of Algebra I or need to strengthen their algebra skills before heading into Algebra II and subsequent curriculum. It covers properties of the real number system, linear and quadratic equations, and properties of exponents and radicals while also introducing students to Euclidian geometry of two and three dimensions. Students develop competence with the graphs of linear, quadratic, and exponential equations, and master multiple techniques for solving equations and simplifying algebraic expressions. This course emphasizes the development of algebraic and geometric skills and utilizes Desmos, Delta Math, Problem Attic, and Geogebra. Students who successfully complete this course will have met the diploma requirement for Geometry and be prepared for Algebra II.

GEOMETRY

This course in Euclidean geometry investigates the definitions, postulates, and theorems of two- and three-dimensional figures and develops students' proficiency in analyzing and communicating mathematically ideas effectively. An emphasis is placed on deductive reasoning, proofs, and geometric problem-solving. When appropriate, students utilize technology to enhance the learning process. Algebraic skills are solidified through the application of geometrical properties with numerical solutions. Prerequisite: Algebra I

ADVANCED GEOMETRY

This course covers the same materials as Geometry but at a faster pace, in greater depth, and with greater rigor. In addition, students will complete a more thorough study of trigonometry and coordinate geometry. This course is designed for qualified students who have had two full years of algebra and a demonstrated motivation for the study of mathematics. Prerequisite: Algebra II and permission of the department

ALGEBRA II

This course reinforces and further develops the concepts presented in Algebra I and Geometry - Algebra I, including linear and quadratic equations and inequalities. It then goes on to explore functions involving radical expressions and rational polynomials and finally considers logarithmic and exponential functions and their applications. Beyond traditional algebraic techniques, students learn numerical and graphical solution techniques with the guided use of technology. Additional topics such as trigonometry, complex numbers, and sequences and series may be introduced along the way. Prerequisite: Algebra I or Geometry - Algebra I

ADVANCED ALGEBRA II

This course is designated for students who have excelled in comprehensive first-year algebra course and have demonstrated motivation for the study of mathematics. It covers the same material as Algebra II at a faster pace, in more detail, and with greater emphasis on problem solving and logical reasoning. In addition, students begin their study of precalculus exploring sequences and series, complex numbers and fractals, transformations and combinations of functions, and unit circle trigonometry. A focus throughout the course is the development of students' problem-solving skills and conceptual understanding. Placement for new students will be determined by the department. Prerequisite: Algebra I and permission of the department

PRECALCULUS

The Precalculus course continues the study of functions and relations that was begun in Algebra II. This course is intended for students who have completed both Algebra II and Geometry and who aspire to take calculus or one of the statistics offerings in the following year. Students study the properties, graphs, and applications of a variety of different families of functions including linear, quadratic, polynomial, exponential, logarithmic, and trigonometric functions. These functions are explored graphically, algebraically, and numerically. The analysis of the functions is aided by the guided use of technology. While students have exposure to all the classic functions of high school math, the course is not intended for those who wish to move into the CL Calculus program. Additionally, the course includes material from discrete math, including sequences, series, combinatorics, and an introduction to probability and statistics.

ADVANCED PRECALCULUS

This course is for students who have a strong background in algebra and geometry and who plan on taking CL Calculus AB or possibly CL Statistics. Students study the properties, graphs, and applications of a variety of families of functions including linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric. Technology is used as an aid for students to make observations and investigate connections among algebraic, graphical, and numerical representations of functions. In Advanced Precalculus there is less emphasis on the discrete topics of probability and statistics than in the Precalculus course; however, trigonometric functions and their inverses as well as the notion of limits are covered in greater depth and detail since these topics are critical foundations for the CL Calculus program.

ADVANCED PRECALCULUS WITH DIFFERENTIAL CALCULUS

This course is for students who have a strong background in algebra, plan on taking the CL Calculus BC course, and have demonstrated the motivation to tackle the course's increased demands. The course moves at an accelerated pace, assumes strong foundational skills and conceptual understanding, and challenges students to think deeply about the content. During the fall and winter terms, students complete the precalculus curriculum, including a review of exponential and logarithmic functions and a study of trigonometry, probability, and parametric and polar equations. Then, during the spring term, students have a rigorous introduction to differential calculus—a prerequisite for entry into the CL Calculus BC course. This course emphasizes critical thinking, problem solving, and synthesis of the material. Some students may opt to study CL Statistics in addition to, or instead of, CL Calculus after this course.

TOPICS IN DISCRETE MATHEMATICS

fall term

This course explores multiple real-life mathematical applications and the theory behind them. Topics include voting/election theory, the mathematics of fair division, and the mathematics of apportionment pertaining to government bodies. As time permits, students will also explore further topics including financial literacy, gerrymandering, electoral college system, graph theory, and the mathematics of scheduling. This course is designed for both those who intend to take statistics in the winter and spring terms and those who have an interest in an elective mathematics course strongly based in theory and real-world applications. Prerequisite: Algebra II

STATISTICS I GESC *(winter)*
STATISTICS II GESC *(spring)*

two-term course/winter only or winter and spring

This course offers a more hands-on approach to the material presented in CL Statistics. The course emphasizes problem-solving, student-generated studies, and group work. Students analyze a significant global issue while completing culminating projects in which they utilize the techniques learned throughout the course. These projects will have components of both written and public presentation. Throughout the course, students utilize a variety of current technologies, including, but not limited to, Desmos, spreadsheet software like MS Excel, and web-based data analysis packages like Gapminder, in order to analyze and present data. Prerequisite: Algebra II *Note: Statistics II may only be taken when following Statistics I.*

CL STATISTICS GESC

This course is equivalent to a one-semester, introductory, non-calculus-based college statistics course. The course incorporates four themes: exploring data, learning designs for data collection and experiments, anticipating patterns in advance, and drawing conclusions from data. Computers and the TI-84 calculator are important tools for completing data analysis and understanding more sophisticated statistical concepts. This data-based approach involves group activities and student-generated studies of global topics. The course emphasizes reading and communicating statistical information accurately in real world situations. Prerequisite: Advanced Precalculus with Differential Calculus or Advanced Precalculus and permission of the department

CALCULUS

This course introduces students to most of the theories, techniques, and applications of a first-year college calculus course. By mixing theory and application and by using both discrete and continuous examples, the course offers students a solid foundation of the basic techniques of differential and integral calculus and explores the utility of calculus in a variety of fields. Although not covering trigonometric functions, among other topics in the AP program, this course prepares students for a rigorous first-year calculus course in college and enables them to use calculus concepts in other disciplines. Prerequisite: Precalculus

CL CALCULUS AB

This course covers the standard material found in a first-year college calculus. In the course, students will develop an understanding of the concepts of calculus, learn the techniques of differential and integral calculus, and apply these understandings and techniques to a variety of applications. The calculus topics are explored algebraically, numerically, verbally, and graphically with the aid of technology. Students wishing to take the College Board AP Calculus AB exam will find that this course covers most of the content on the exam. Prerequisite: Advanced Precalculus or Advanced Precalculus with Differential Calculus and permission of the department

CL CALCULUS BC

Following the Advanced Placement BC Calculus syllabus, this course begins with a brief review of differential calculus before moving to a rigorous, college-level introduction to the integral and its connection to the derivative. In the course, students will develop an understanding of the concepts of calculus, learn the techniques of differential and integral calculus, and apply these understandings and techniques to a variety of applications. Beyond the topics from CL Calculus AB, students do significant work with sequences and series and explore calculus concepts as they apply to vector functions, parametric equations, and polar functions. The calculus topics are explored algebraically, numerically, verbally, and graphically with the aid of technology. Prerequisite: Advanced Precalculus with Differential Calculus and permission of the department

CL STATISTICS ACCELERATED

half course

This course is intended for independent math students who have excelled in a CL Calculus class. The class moves quickly covering the full Advanced Placement Statistics curriculum (see course description for CL Statistics) while meeting half as often as full courses. Unlike CL Statistics, this accelerated course will also include some work with statistics that is calculus based. While the course develops the tools necessary to analyze data and make projections in a variety of real-world situations, students should also come to appreciate the logical principles underlying the inferences. Students will use some of the powerful statistical tools of the TI-84 calculator to organize data and help make appropriate inferences. Prerequisite: A- or higher in BC Calculus or A or higher in AB Calculus and departmental approval

CL MULTIVARIABLE CALCULUS

For students who have successfully completed CL Calculus BC, this course seeks to solidify calculus content while also providing exposure to the larger realm of advanced mathematics, emphasizing a deep conceptual understanding of abstract material. Students will first learn about various topics that they may encounter when studying mathematics in the future, before focusing in on calculus and where it fits within this larger picture. From there, the course will extend the definitions and concepts of single-variable calculus to higher-dimensional functions. The concepts of limits, continuity, differentiation, and integration are developed rigorously in the context of functions with multiple input and/or output variables. Various applications to physics, computer science, and other areas will be explored. Prerequisite: CL Calculus BC and permission of the department

CL LINEAR ALGEBRA

Linear Algebra is intended for students who have distinguished themselves in their study of mathematics. The course begins by exploring linear systems and matrices, focusing on determinants and other matrix properties. The study of matrices prepares the class for its study of the main objects of linear algebra: vector spaces and linear transformations. By approaching the subject this way, the class serves as an introduction to conceptual mathematical systems that form the basis of abstract algebra. Throughout the course, emphasis is placed on learning the structure of formal mathematical proof writing. Topics that are typically covered in addition to vector spaces and linear transformations are set theory, eigenvectors, and inner product spaces. Prerequisite/Co-requisite: Multivariable Calculus and permission of the department. The course can be taken concurrently with CL Mathematical Modeling with Differential Equations.

CL MATHEMATICAL MODELING WITH DIFFERENTIAL EQUATIONS

This course gives a comprehensive introduction to ordinary differential equations with an emphasis on the applications of differential equations in a variety of fields. Students will develop, simulate, and analyze dynamic mathematical models (models that study how processes change in time) utilizing differential equations and technology to understand the

behavior of various biological, ecological, physiological, and medical problems. Topics covered include first order differential equations, phase planes and bifurcation diagrams, higher order differential equations, Laplace transforms, numerical methods, boundary value and initial value problems, qualitative analysis of solutions, and applications of differential equations. Students will leverage Matlab and Simulink software to visualize and solve differential equations. Prerequisite: CL Multivariable Calculus. The course can be taken concurrently with CL Linear Algebra.

TOPICS IN LOGIC

term course/juniors and seniors

Please see description under History, Philosophy & Religious Studies offerings. Students interested in logical foundations of mathematics and in greater sophistication in methods of proof may consider this course. Prerequisite: Geometry

INDEPENDENT STUDIES IN MATHEMATICS

term course

A student who has exhausted the offerings of the Mathematics Department or who desires to study a math-related topic not offered as a course may propose an Independent Study Project for credit. The student must arrange for a project advisor from within the department, **submit a written proposal**, and obtain approvals from the academic advisor, project advisor, department head, and dean of faculty.