

COURSE SEQUENCE AND SELECTION GUIDE

MATHEMATICS DEPARTMENT BARD HIGH SCHOOL EARLY COLLEGE QUEENS

The Mathematics Department offers students at BHSEC Queens a range of courses in pure and applied mathematics and computer science.

WHY TAKE COURSES IN MATHEMATICS?

To develop problem solving skills; to develop quantitative and computational thinking; to gain exposure to a wide array of mathematical topics and mathematical ways of thinking that are useful across a large variety of contexts and disciplines, including the physical, social, and life sciences.

NY STATE REGENTS DIPLOMA AND BARD A.A. DEGREE REQUIREMENTS

Three years of mathematics are required to graduate from high school in New York State. At BHSEC, this consists of four semesters of high school mathematics plus at least two semesters of college mathematics, which are required to graduate from BHSEC with an A.A. degree.

HIGH SCHOOL PROGRAM

All students take an Algebra and Geometry course in 9th grade, followed by Algebra II and Trigonometry in 10th grade. A small subset of the student body participates in an honors 10th grade course designed to prepare students for calculus at the beginning of the college program.

COLLEGE PROGRAM (pre-requisites listed in parentheses)

Core Sequence

- *College Algebra* (Trigonometry): A course designed for students to strengthen their computational and problem-solving skills as they enter the college program.
- *Pre-Calculus* (College Algebra or at least C+ in Trigonometry): A course designed to deepen knowledge of topics from the high school program and prepare students for calculus.
- *Foundations of Applied Mathematics* (Pre-Calculus): A course that develops advanced topics that do not require calculus but are not encountered in Pre-Calculus.
- *Calculus I* (At least C+ in Foundations of Applied Math or at least B+ in Pre-Calculus): A first course in calculus, including the basics of differentiation and some integration.
- *Calculus II* (At least C+ in Calculus I): A continuation of the calculus sequence, focusing on series and methods of integration.
- *Calculus III* (At least C+ in Calculus II): A first course in multivariable calculus.

Electives

- *Computing: Graphics and Games* (College Algebra or Pre-Calculus or permission of instructor): An introduction to computer programming using the Processing language.
- *Object-Oriented Programming* (Computing: Graphics and Games): An introduction to data structures and algorithms for engineers and computer scientists. Taught in Java.
- *Statistics* (At least C+ in Pre-Calculus or permission of instructor): This first course on statistics focuses on data analysis and statistical inference. The language R is taught in a series of labs.
- *Groups and Symmetry* (College Algebra or Pre-Calculus or permission of instructor): The course is a first course in basic group theory and related geometry taught in an inquiry-based style.
- *Knots and Surfaces* (College Algebra or Pre-Calculus or permission of instructor): This is an introduction to the fields of graph theory, topology, and knot theory taught in an inquiry-based style.

- *Linear Algebra* (Calculus I, with Calculus II recommended): An elective dedicated to the theory of matrices and vector spaces.
- *Advanced Applied Mathematics* (Calculus II, with Calculus III recommended): A course designed for students who intend to study mathematics, the physical sciences, or engineering. Topics covered include differential equations and complex variables.

Recommendations

Students have several choices for how they proceed through the core sequence and at what point they choose to take electives or no mathematics class. To find the next course in the college program that best fits them, students should consider their prior work in math classes, the recommendation of their current mathematics teacher, how much time they are willing to commit to math outside of class, and their future plans at BHSEC, other institutions, and beyond.

It is strongly recommended that students proceed as far as they intend to in the core sequence before taking electives, although some electives (such as statistics or computer science) may often be taken concurrently with other math classes. A student who does not meet the prerequisite for a course is required to meet individually with the instructor to request permission to enroll.

It is recommended for all students to take a full four semesters of math in the college program, but especially so for those determined to study mathematics, engineering, the physical sciences, the social sciences, the life sciences, or computer science at a four-year college.

Below are recommendations for courses in math, organized by the field of study that a student may pursue in the future. *Some courses may be skipped, if students meet certain prerequisites (see above).*

<p>MATHEMATICS College Algebra, Pre-Calculus, and/or Foundations of Applied Math Calculus I Calculus II Calculus III Groups and Symmetry As many electives as possible, based on interest</p>	<p>PHYSICAL SCIENCES AND ENGINEERING* College Algebra, Pre-Calculus, and/or Foundations of Applied Math Calculus I Calculus II Computing: Graphics and Games Object-Oriented Programming Statistics Linear Algebra Advanced Applied Math</p>
<p>LIFE SCIENCES, MEDICINE, AND SOCIAL SCIENCES College Algebra, Pre-Calculus, and/or Foundations of Applied Math Calculus I Statistics Computing</p>	<p>ARTS AND HUMANITIES College Algebra and/or Pre-Calculus Computing: Graphics and Games Statistics Groups and Symmetry Knots and Surfaces</p>

* Please see science course sequence for more information on the Bard/Columbia 3-2 Engineering program.