

Introduction

A&S requires that we have at least 39 required credit hours for a program. All 39 hours do not have to have the math prefix. We can count courses from other departments that would be relevant to the major.

Currently **Option A** has:

- Pre-major requirements: 11 hours
- Major Core requirements: 10 hours
- Other Course work: 32 hours (18 from the major department + 14 from outside the department)

Currently **Option B** has:

- Pre-major requirements: 11 hours
- Major requirements: 29 hours
- Other course work: 15 (6 from the major department + 9 from outside the department)

The Major requirements for Option B include 7 hours from CS and STA courses. Both Options include 3 credits for CS 115. Thus, both Options are requiring only 36 hours of Math classes. Overall the requirements are:

- 53 credit hours for Option A;
- 55 credit hours for Option B.

In comparison, we currently have fewer requirements than other STEM departments.

We propose a revision of the math undergraduate program that requires 41 or 42 credit hours of coursework (39 in math and 2 or 3 in CS/EGR). In addition to the UK Core and A&S requirements, students would then just need free electives to reach the 120 credit hours.

We have designed six different tracks and have worked to include in the various tracks almost all the courses we currently offer. Originally, we also had a specific track to accommodate the current requirements for the STEM ED students. The leadership team from the College of Education commented that a specific math education track would present a negative connotation of “less than” and they think that the remaining six tracks we have laid out with additional coursework are attractive for them.

Proposal

New Course: As part of the proposal, we will create a new course (MA 395) that will eventually substitute our current MA 398 and MA 399. We can check if this can be done as a minor course change of MA 398, for instance.

MA 395 – Independent Work in Mathematics 1.0-3.0 (variable) credits

Prereq: Declared major in Mathematics and a standing of 3.0 in the department.

Course description: An independent work in an area of mathematics under the direction of a faculty mentor. A research contract must be signed by the student and the faculty research mentor. May be repeated up to a maximum of 6 credits, but a maximum of 3 credits may be used to satisfy the requirements of a B.A. or B.S. in Mathematics.

We will also change the prerequisites for MA 391 to fit the program change.

MA 391 – Mathematics: Composition and Communication (3 credits)

NEW Prereq: The student must satisfy each of the following 4 conditions: (1) complete the major core requirements, (2) complete one of MA 261 or MA/STA 320, (3) complete any MA 300 level required courses specified within a mathematics major track, with the exclusion of MA/STA 320, or any MA 400+ level course, and (4) complete at least 30 credit hours. The student may also seek permission to enroll through consent of the department.

Program Change: The Department of Mathematics offers six tracks leading to the B.A. or B.S. degree. Students may major in mathematics by completing the requirements for one of the following tracks: General Mathematics, Foundations of Mathematics, Applied Mathematics, Combinatorial Structures and Optimization, Mathematics of Data and Computation, Stochastic Processes and Financial Mathematics. The common requirements as well as the specific requirements for these tracks are outlined below.

Pre-Major requirements:

Total credits (Pre-major, Major Core and GCCR): 20 or 21

- **MA 113 OR MA 137** (4 credits)
- **MA 114 OR MA 138** (4 credits)
- **CS 115** (Intro to Computer Programming, 3 credits) OR
EGR 102 (Fundamentals of Engineering Computing, 2 credits)

Major Core requirements:

- **MA 213** (4 credits)
- **MA 322** (3 credits)

GCCR requirement:

- **MA 391** (3 credits)

TRACKS

In each track below the required courses are listed in bold. We indicate in parenthesis the current prerequisites for the course.

General Mathematics Track (additional 21 credits)

This is the default option for students who do not declare another track.

Complete 21 credit hours of additional MA courses above MA 213, with the exclusion of MA 241 and MA 308. Of these 21 credit hours, a maximum of 3 hours can be independent work in mathematics (MA 395). Students pursuing this track must plan their coursework in such a way to be compliant with the prerequisites of MA 391.

Foundations of Mathematics Track (additional 21 credits)

The Foundations of Mathematics track trains students in the practice of modern mathematics. Students in this track learn the core topics of analysis, algebra, and topology, and take elective mathematics courses according to their interests and career goals. Through their coursework, students will gain valuable experience in problem solving as well as the construction and communication of logical arguments – skills valued by industry, government, and academia. The goal of the Foundations of Mathematics track is to prepare students to be competitive for both careers in industries that prize creativity and for graduate programs in mathematics or related fields such as data science, statistics, or applied mathematics.

MA 261

Pick three of the following **MA 351, MA 352** (MA 261 and MA 213 coreq)
 MA 361 (MA 261, MA 322 coreq), **MA 362** (MA 361)
 MA 433G (MA 213)
 MA 471G (MA 213 and MA 322), **MA 472G** (MA 471G)

Complete 9 additional credit hours of MA courses above MA 213, with the exclusion of MA 241 and MA 308. Of these 9 credit hours, a maximum of 3 hours can be independent work in mathematics (MA 395).

Applied Mathematics Track (additional 21 credits)

The Applied Mathematics track provides a broad background in mathematics and its applications, with a focus on mathematical modeling and algorithms used in interdisciplinary settings such as in economics, biology, and biomedicine. Students will learn about fundamental results in probability, game theory, mathematical modeling, stability analysis, and uncertainty quantification, along with topics in elective mathematics courses that align with students' personal interests and career goals. Students will understand both how mathematical approaches are applied to solve problems and why the underlying mathematical theory is correct. The goal of the Applied Mathematics track is to prepare students for a career in pharmaceutical companies or financial institutions, industrial or government research, public policy, security analysis, K-12 and higher education, technical or scientific writing, and more.

MA/STA 320 (MA 213)

MA 327 (needs B or better in MA 113 or MA 137)

MA 432G (MA 213)

MA 337 (needs B or better in MA 114 or MA 138)

Complete 9 additional credit hours of MA courses above MA 213, with the exclusion of MA 241 and MA 308. Of these 9 credit hours, a maximum of 3 hours can be independent work in mathematics (MA 395).

Combinatorial Structures and Optimization Track (additional 21 credits)

The Combinatorial Structures and Optimization track provides a broad background in mathematics, with a focus on mathematical concepts and algorithms that arise in contexts such as scheduling and routing problems, network analysis, secure communications, and resource allocation. Students will learn about fundamental results in number theory, abstract algebra, graph theory, enumeration, probability, and linear programming, along with topics in elective mathematics courses that align with students' personal interests and career goals. Students will understand both how mathematical ideas are applied to solve problems and why the underlying mathematical theory is correct. The goal of the Combinatorial Structures and Optimization track is to prepare students for a career in industrial or government research, public policy, security analysis, K-12 and higher education, technical or scientific writing, and more.

MA/STA 320 (MA 213)

MA/CS 340 (MA 213 or MA 322)

MA/CS 415G (MA 213 or MA 322)

MA/CS 416G (MA 213 and MA 322)

Complete 9 additional credit hours of MA courses above MA 213, with the exclusion of MA 241 and MA 308. Of these 9 credit hours, a maximum of 3 hours can be independent work in mathematics (MA 395).

Mathematics of Data and Computation Track (additional 21 credits)

The Mathematics of Data and Computation track provides a broad background in computational mathematics, with a focus on mathematical concepts and algorithms that arise in data science and machine learning. Students will learn about fundamental results in computational mathematics, probability, machine learning algorithms, and some related applications, along with topics in elective mathematics courses that align with students' personal interests and career goals. Students will learn how mathematical models and computational algorithms are used to solve real-world problems and will understand why they work. The goal of the Mathematics of Data and Computation track is to prepare students for a career in data science and in computational science and engineering, whether they are interested in applying mathematics to solve real-world problems or building a mathematical foundation for advanced studies in a related discipline.

MA/STA 320 (MA 213)

MA/CS 321 (MA 114)

MA 323 (MA 213 and MA 322)

MA 421G (MA/STA 320 or STA 524, MA/CS 321, MA 322)

Complete 9 additional credit hours of MA courses above MA 213, with the exclusion of MA 241 and MA 308. Of these 9 credit hours, a maximum of 3 hours can be independent work in mathematics (MA 395).

Stochastic Processes and Financial Mathematics Track (additional 21 credits)

The Stochastic Processes and Financial Mathematics Track provides students with tools needed to model and analyze a wide range of phenomena in fields such as finance, physics, engineering, and biology with emphasis on models that study the behavior of financial markets and assets. These tools come from the fields of probability, statistics, differential equations, and optimization. Students will also have the opportunity to choose additional elective mathematics courses that align with their personal interests and career goals. The goal of the Stochastic Processes and Financial Mathematics track is to prepare students for careers in a variety of fields that require strong quantitative skills and deep understanding of the role uncertainty plays in finance, engineering, physics, and biology.

MA/STA 320 (MA 213)

MA 417G (MA/STA 320)

MA 420G (MA/STA 320 or STA 524)

MA 427G (MA/STA 320 or STA 524)

Complete 9 additional credit hours of MA courses above MA 213, with the exclusion of MA 241 and MA 308. Of these 9 credit hours, a maximum of 3 hours can be independent research (MA 395).