MATHEMATICS, APPLIED MATHEMATICS CONCENTRATION (BS IN MATHEMATICS)

Description of Courses

Note: A student cannot receive credit for any mathematics course that is a prerequisite for another mathematics course for which the student has already received credit. The department chair may authorize individual exceptions to this rule.

Graduate Program

See the Computational Operations Research Concentration description in the Computer Science Department section of the graduate catalog and the Applied Mathematics program in the Applied Science Department.

Mathematics Core Requirements

23-24 Credits

Major Writing Requirement

3-6 Credits

A student in any Mathematics major concentration satisfies the upper-division mathematics writing requirement in one of the following ways:

- Completion of the course MATH 400 Mathematical Connections Credits: (3) or a MATH course with COLL 400 attribute and writing requirement
- Completion of an Honors Thesis in MATH 495 Honors/MATH 496 Honors Credits: (6)
- Completion of MATH 300 Mathematical Sciences Writing Credits: (1) with a grade of C- or better, through the completion of a supervised expository individual writing project.

Options 1 and 2 above will also count as the student's COLL 400 requirement. A student should only choose option 3 in MATH 300 Mathematical Sciences Writing if that student is taking the COLL 400 requirement in another department (through an honors thesis or otherwise). For option 1 in MATH 400 Mathematical Connections, the student just needs to register for this course. For options 2 and 3, the student should first communicate with a faculty member about supervising the honors thesis or writing project. The student can then register for the course in a section corresponding to the faculty member who has agreed to supervise the student. Note that the MATH 400 Mathematical Connections option above is a standard course which meets regularly, while the other two options are individually supervised and do not have a lecture component. For students In the Pre-College Mathematics Teaching Concentration, the writing requirement must incorporate some element of the history of mathematics.

Major Computing Requirement

A student in any Mathematics major concentration must show proficiency in some high-level computer programming language at the level of CSCI 141 Modern Programming Fundamentals. This is normally done by receiving a grade of at least C- in CSCI 141 Modern Programming Fundamentals. Exceptions require the department chair's permission.

In addition, students in the Applied Mathematics Concentration must demonstrate proficiency at the level of CSCI 241 Data Structures or MATH 240 Programming for the Mathematical Sciences. This is normally done by taking and passing one of these courses.

Core Course Requirements

Code	Title	Hours
MATH 109 & 109L	Linear Algebra and Computational Linear Algebra Lab	3
MATH 111	Calculus I	4
or MATH 131	Calculus I for Life Sciences	
MATH 112	Calculus II	4
or MATH 132	Calculus II for Life Sciences	
MATH 212	Introduction to Multivariable Calculus	3-4
or MATH 213	Multivariable Calculus for Science and Mathematics	
MATH 214	Foundations of Math	3
Total Hours		**17-18**

Mathematics Major with Applied Mathematics Concentration

This concentration is designed for students who want to pursue applications of mathematics or a double major in mathematics and another discipline. The requirements of the Mathematics Major with Applied Mathematics Concentration are:

Code	Title	Hours
A Core Consisting Of		
MATH 109 & 109L	Linear Algebra and Computational Linear Algebra Lab	4
MATH 111	Calculus I	4
or MATH 131	Calculus I for Life Sciences	
MATH 112	Calculus II	4
or MATH 132	Calculus II for Life Sciences	
MATH 212	Introduction to Multivariable Calculus	3-4
or MATH 213	Multivariable Calculus for Science and Mathematics	
MATH 214	Foundations of Math	3
Computer Proficiency Requirements		
CSCI 241	Data Structures	3
or MATH 240	Programming for the Mathematical Sciences	
Additional Requirements		
Select one of the following:		3
MATH 307	Abstract Algebra	
MATH 307H	Honors Abstract Algebra	
MATH 311	Elementary Analysis	
MATH 311H	Honors Elementary Analysis	
Select one of the following options: [1]		18-21
Option 1:		
At least six distinct three-credit mathematicss courses at the 300-400 level with at least four being chosen from the applied mathematics courses listed below [2]		
Option 2:		
MATH 495	Honors	

MATH 496	Honors	
Plus at least five distinct three-credit mathematic courses at the 300-400 level with at least four being chosen from the applied mathematics courses listed below [2]		
Applied Mathematics Courses		
Select four of the following:		12
MATH 302	Ordinary Differential Equations	
MATH 323	Operations Research: Deterministic Models	
MATH 345	Introduction to Mathematical Biology	
or MATH 356	Random Walks in Biology	
MATH 408	Matrix Analysis	
MATH 413	Introduction to Numerical Analysis I	
or MATH 414	Introduction to Numerical Analysis II	
MATH 424	Operations Research: Stochastic Models	
MATH 441	Nonlinear Dynamics	
or MATH 442	Partial Differential Equations	
MATH 451	Probability	
MATH 465	Mathematics of Financial Economics	
Total Hours		**54-58**

[1] Note that in both of the options, students with at least a 3.0 grade point average, with permission, may take graduate level courses (https://powerforms.docusign.net/057fc25d-84e8-4b08-957d-1baa3813a95e?env=na2&acct=8417ecd9-2f28-4194-9447-8a5b05e428c2&BannerNumber=930117625&wmkey=0cb87e56-3766-427e-a1e4-f509758ca748&accountId=8417ecd9-2f28-4194-9447-8a5b05e428c2) from the Computational Operations Research M.S. degree program for undergraduate level credit to count towards the Applied Mathematics Concentration.

[2] Not including MATH 400, 495, 496 or MATH course counted as the COLL 400 requirement`(for a total of at least seven upper-division courses).

[3] Not including MATH 400 or MATH courses counted as the COLL 400 requirement (for a total of at least eight upper-division courses)

Major Writing Requirement

A student in any Mathematics major concentration satisfies the upper-division mathematics writing requirement in one of the following ways:

- Completion of the course MATH 400 Mathematical Connections
- Completion of an Honors Thesis in MATH 495 Honors-MATH 496 Honors with a grade of C- or better.
- Completion of MATH 300 Mathematical Sciences Writing with a grade of C- or better, through the completion of a supervised expository individual writing project.

Options 1 and 2 above will also count as the student's COLL 400 requirement. A student should only choose option 3 in MATH 300 Mathematical Sciences Writing if that student is taking the COLL 400 requirement in another department (through an honors thesis or otherwise). For option 1 in MATH 400 Mathematical Connections, the student just needs to register for this course. For options 2 and 3, the student should first communicate with a faculty member about supervising the honors thesis or writing project. The student can then register for the course in a section corresponding to the faculty member who has agreed to supervise the student. Note that the MATH 400 Mathematical Connections option above is a standard course which meets regularly, while the other two options are individually supervised and do not have a lecture component. For students In the Pre-College Mathematics Teaching Concentration, the writing requirement must incorporate some element of the history of mathematics.

Enriching the Mathematics Major

The requirements described below are the minimal requirements for the mathematics major, and most mathematics majors take courses beyond that minimum. Students wishing to obtain a deeper understanding of mathematics (e.g., in preparation for graduate school) should take additional upper-division courses. Second courses to make year-long sequences in linear algebra, analysis, abstract algebra, numerical analysis, statistics, or operations research are particularly recommended.

Advanced Standing

Entering students may receive credit for mathematics courses through AP or IB and transfer credit. In each of the mathematics major concentrations, well-prepared students may begin their studies beyond MATH 111 Calculus I without receiving credit for earlier courses listed in the core requirements section of each concentration. Each skipped course for which the student does not receive credit must be replaced by an additional three-credit 300-400 level mathematics course.