

UMSL Mathematics & Computer Science

Why UMSL?

In the Department of Mathematics and Computer Science at UMSL, students will study in a rigorous academic program with faculty who are leaders in their field. Classes at the upper level are small in size, and seniors often take classes along with graduate students. Our students have the opportunity to finish their program by taking mathematics and computer science courses in the day or in the evening. This attracts the working student as well as the traditional student who plans to become a professional or enter graduate school. Degree requirements are streamlined to allow students to conveniently complete a double degree, either within this department or with another department. This is a particularly attractive option for computer science majors who would like to also obtain a degree in mathematics.

General Information

Degrees and Areas of Concentration

The Department of Mathematics and Computer Science offers work leading to the Bachelor of Arts (BA) in mathematics, the Bachelor of Science (BS) in mathematics, the BS in computer science, and, in cooperation with the College of Education, the Bachelor of Science in Education (BSEd) in secondary education with an emphasis in mathematics. The department also offers minors in computer science, mathematics and statistics.

At the graduate level, the department offers a Master of Arts (MA) degree in mathematics, a Master of Science (MS) degree in computer science and a Doctor of Philosophy (PhD) in applied mathematics – with options in mathematics and computer science.

The program leading to the BA in mathematics provides a broad grounding in different areas of mathematics, giving students the depth necessary to pursue various aims such as graduate studies or other career choices.

The BS in mathematics provides a substantial background in mathematics, statistics and computer science to produce graduates who can work as mathematicians. Both the BA and the BS in mathematics allow optional courses that enable the student to focus on areas of interest like pure or applied mathematics. Students pursuing the BA or the BS in mathematics will graduate with ana-

lytic and writing skills in mathematics and will have knowledge of content in core areas of the subject. They will have been exposed to applications of mathematics and they will possess critical thinking and quantitative skills.

The BSEd in secondary education with an emphasis in mathematics introduces students to those branches of mathematics most relevant to the teaching of secondary school mathematics.

The BS in computer science curriculum provides a firm foundation for both more traditional computer science as well as for the technical aspects of the emerging information technology areas. This is accomplished through fundamental courses in mathematics and statistics, a rigorous list of core computer science courses, as well as by emphasizing written and oral communication skills, problem solving and exposure to modern technology. In addition, the program offers a variety of interest specific electives such as graphics, image processing, AI, database systems, networking, security, object - oriented and web-based technology. Given the every-widening impact of digital technology on daily life, it appears that Computer Science graduates will enjoy significant employment opportunities.

Students pursuing the MA degree in mathematics may choose an emphasis in either pure or applied mathematics. The pure mathematics emphasis is well suited for students preparing to teach at the high school, junior college, or four-year liberal arts college level. Those who concentrate on applied courses in the MA program build a foundation for the application of mathematics in industry and the continuation of their education in the PhD program in applied mathematics. Our graduates will have abilities in the basic areas of algebra and analysis and a breadth of knowledge in core subjects at the graduate level. They will study at least one area of mathematics or statistics in depth and will understand some of the contemporary research in applied mathematics and statistics. They will develop the ability to prepare and deliver oral and written presentations and the ability to pursue mathematical knowledge independently.

The MS degree in computer science emphasizes practical aspects of the field. Our graduates will develop expertise in at least one modern programming language. They will possess a breadth of knowledge of core areas in computer

science and will develop depth of knowledge in one area of the subject. They will be prepared to independently learn and adapt new technology and they will develop the ability to read current research in some areas. They will have the capability to prepare and deliver oral and written presentations on topics in computer science.

The PhD in applied mathematics has options in mathematics and computer science. The mathematics option prepares students for a leadership role involving research and development in both industrial and academic settings. Students choosing this option will develop abilities in the basic areas of algebra and an analysis and will possess breadth of knowledge in core subjects at the graduate level. They will study at least one area of mathematics and statistics. They will develop the ability to prepare and deliver oral and written presentations, and they will possess the ability to pursue and produce mathematical knowledge independently.

Students choosing the computer science option will develop a breadth of abilities in the core areas of computer science at the graduate level. They will gain a depth of ability in contemporary research in their chosen sub field of computer science and will be able to pursue independent research in their area of specialization.

Students may enroll in any of these graduate programs on a part-time basis.

Career Outlook

A degree in mathematics or computer science prepares well-motivated students for interesting careers. Our graduates find positions in industry, government and education. The demand for individuals well trained in statistics, computer science and applied mathematics is greater than the available supply. In addition, a number of graduates in mathematics have elected careers in business, law and other related fields where they find logical and analytical skills valuable.

Graduates in computer science and mathematics from UMSL are located throughout the country, and they have a strong local presence. They have careers in banking, health care, engineering and manufacturing, law, finance, public service, management and actuarial management.

Many are working in areas such as systems management, information systems and data management, scientific computing and scientific positions in the armed services. Others have careers in education, especially at secondary and higher levels.

Undergraduate Studies

General Education Requirements

All majors must satisfy the University and appropriate School or College general education requirements. All mathematics courses may be used to meet the University's general education breadth of study requirement in natural sciences and mathematics.

Satisfactory/Unsatisfactory Restrictions

Majors in mathematics and computer science may not take mathematical sciences or related area courses on a satisfactory/unsatisfactory basis. Students considering graduate study should consult with their advisors about taking work on a satisfactory/unsatisfactory basis.

Degree Requirements

All mathematical sciences courses presented to meet the degree requirements must be completed with a grade of C- or better. At least four courses numbered 3000 or above must be taken in residence. Students must have a 2.0 grade point average in the mathematical sciences courses completed.

Students enrolling in introductory mathematics courses should check the prerequisites to determine if a satisfactory score on the Mathematics Placement Test is necessary. The dates on which this test is administered are given on the department's website. Placement into introductory courses assumes a mastery of two years of high school algebra.

A minimum grade of C- is required to meet the prerequisite requirement for any course except with permission of the department.

Note: Courses that are prerequisites for higher-level courses may not be taken for credit or quality points if the higher-level course has been satisfactorily completed.

Many students are qualified, as a result of having studied calculus in high school, to begin their major with MATH 1900, Analytic Geometry and Calculus II, or MATH 2000, Analytic Geometry and Calculus III. These students are urged to consult with the department before planning their programs. Credit for MATH 1800, Analytic Geometry and Calculus I, will be granted to those students who complete MATH 1900 with a grade of C- or better.

Similarly, students who are ready to begin their computer science studies with CMP SCI 2250, Programming and Data Structures, will be granted credit for CMP SCI 1250, Introduction to Computing, once they complete CMP SCI 2250 with a grade of C- or better.

Degree Requirements in Mathematics

All mathematics majors in all undergraduate programs must complete the mathematics core requirements.

Core Requirements

1. The following courses are required:
 - CMP SCI 1250, Introduction to Computing
 - MATH 1320, Applied Statistics I
 - MATH 1800, Analytic Geometry and Calculus I
 - MATH 1900, Analytic Geometry and Calculus II
 - MATH 2000, Analytic Geometry and Calculus III
 - MATH 2020, Introduction to Differential Equations
 - MATH 2450, Elementary Linear Algebra
 - MATH 3000, Discrete Structures
 - MATH 4100, Real Analysis I

2. The related area requirements as described below must be satisfied.

Students seeking a double degree, either within this department or with another department, do not have to fulfill the related area requirements.

Bachelor of Arts in Mathematics

In addition to the core requirements and the College of Arts and Sciences' foreign language requirement, three mathematics courses at the 4000-level or higher must be completed. Of these, one must be MATH 4400, Introduction to Abstract Algebra.

BS Ed. in Secondary Education with an Emphasis in Mathematics

In addition to the core requirements and the required education courses, three mathematical/statistics courses at the 4000-level or higher must be completed. Of these, one must be MATH 4400, Introduction to Abstract Algebra, and one must be chosen from: MATH 4660, Foundations of Geometry or MATH 4670, Introduction to Non-Euclidean Geometry.

Bachelor of Science in Mathematics

In addition to the core requirements, the BS in Mathematics degree requires:

1. Completing all of the following:
 - MATH 4160, Complex Analysis I
 - MATH 4400, Introduction to Abstract Algebra
 - MATH 4450, Linear Algebra

2. Completing an additional three courses numbered above 4000 in mathematics, statistics, or computer science, at least one of which must be in mathematics/statistics.

Related Area Requirements for Majors in Mathematics

Candidates for the BA in Mathematics must satisfy the requirements in one of the groups below with a grade of C- or better. Candidates for the BS Ed. in Secondary Education with emphasis in mathematics and the BS in Mathematics must satisfy the requirements in two of the groups below with a grade of C- or better.

If candidates choose group 2, then they cannot apply either of the two courses listed in that group towards the additional 4000-level mathematics courses (beyond the core requirements) that must be completed for each of these degrees.

Students seeking a double degree, either within this department or with another department, do not have to fulfill the related area requirements.

Related Area Courses

1. Computer Science:

Two courses from the following list:

- CMP SCI 2250, Programming and Data Structures
- CMP SCI 2700, Computer Architecture and Organizations
- CMP SCI 3130, Design and Analysis of Algorithms
- CMP SCI 4140, Theory of Computation
- CMP SCI 4410, Computer Graphics
- CMP SCI 4440, Digital Image Processing

2. Statistics:

- MTH 4200, Mathematical Statistics I
- MTH 4210, Mathematical Statistics II

3. Biology:

- BIOL 2102, General Ecology
- BIOL 2103, General Ecology Laboratory

4. Biology:

- BIOL 2012, Genetics
- BIOL 4182, Population Biology

5. Chemistry:

- CHEM 1111, Introductory Chemistry I
- CHEM 1121, Introductory Chemistry II

6. Chemistry:

- CHEM 3312, Physical Chemistry I and another 3000-level, or above, chemistry course.

7. Economics:

ECON 1001, Principles of Microeconomics
ECON 1002, Principles of Macroeconomics
ECON 4100, Introduction to Econometrics

8. Philosophy:

PHIL 3360, Formal Logic
PHIL 3380, Philosophy of Science
PHIL 4460, Advanced Formal Logic

9. Physics:

PHYSICS 2111, Physics: Mechanics and Heat
PHYSICS 2112, Physics: Electricity, Magnetism and Optics

10. Physics:

PHYSICS 3221, Mechanics and another 3000-level, or above, physics course.

11. Business Administration:

LOG OM 3320, Introduction to Operations Management

And one of the following:

LOG OM 4321, Production and Operations Management
LOG OM 4326, Quality Assurance in Business
LOG OM 4330, Business – Logistics Systems
LOG OM 4350, Management Science Methods

12. Engineering:

ENGR 2310, Statics
ENGR 2320, Dynamics.

Degree Requirements in Computer Science

Candidates for the BS in Computer Science degree must complete the following work:

1. Computer Science Core

CMP SCI 1250, Introduction to Computing
CMP SCI 2250, Programming and Data Structures
CMP SCI 2261, Object-Oriented Programming
CMP SCI 2700, Computer Architecture and Organization
CMP SCI 2750, System Programming and Tools
CMP SCI 3010, Web Programming
CMP SCI 3130, Design and Analysis of Algorithms
CMP SCI 4250, Programming Languages
CMP SCI 4280, Program Translation
CMP SCI 4500, Software Engineering
CMP SCI 4760, Operating Systems

2. Computer Science Electives

Five more elective computer science courses, numbered above 3000.

3. Mathematics and Statistics

MATH 1320, Applied Statistics I
MATH 1800, Analytic Geometry and Calculus I
MATH 1900, Analytic Geometry and Calculus II
MATH 2450, Elementary Linear Algebra
MATH 3000, Discrete Structures

4. Additional Skills

ENG 3130, Technical Writing
There are no related area requirements for majors in Computer Science.

Minor Requirements

The Department offers minors in computer science, mathematics and statistics. All courses presented for any of these minors must be completed with a grade of C- or better.

Minor in Computer Science

The requirements for the minor are:

CMP SCI 1250, Introduction to Computing
CMP SCI 2250, Programming and Data Structures
and three additional computer science courses numbered 2000 or above.

A minimum of two computer science courses numbered above 2000 must be taken in residence in the Department of Mathematics and Computer Science at UMSL.

Minor in Mathematics

The requirements for the minor are:

MTH 1800, Analytic Geometry and Calculus I
MTH 1900, Analytic Geometry and Calculus II
MTH 2000, Analytic Geometry and Calculus III
and two additional three-hour mathematics courses numbered above 2400, excluding 2510.

Note: A minimum of two mathematics courses numbered 2000 or above must be taken in residence in the Department of Mathematics and Computer Science at UMSL.

Minor in Statistics

The requirements for the minor are:

MTH 1320, Applied Statistics I
MTH 4200, Mathematical Statistics I
and two additional courses in statistics numbered above 4200.

Note: A minimum of two statistics courses numbered above 2000 must be taken in residence in the Department of Mathematics and Computer Science at UMSL.