

MATHEMATICAL SCIENCES, BACHELOR OF SCIENCE (B.S.) WITH A CONCENTRATION IN GENERAL MATHEMATICAL SCIENCES

The curriculum in mathematical sciences promotes understanding of the mathematical sciences and their structures, uses and relationships to other disciplines. To this end, the scholarly growth of the faculty and students in the mathematical sciences is nurtured through study, research and a high standard of teaching. The curriculum provides a sound foundation for the student seeking to enter a career with a technological orientation or for the student who wishes to pursue graduate study in applied mathematics, biomathematics, mathematics, operations research, statistics, teaching mathematics in secondary schools or related fields.

A Bachelor of Science is offered jointly by the Department of Mathematics and Applied Mathematics and the Department of Statistical Sciences and Operations Research.

Student learning outcomes

Upon completing this program, students will know how to do the following:

Bachelor of Science in Mathematical Sciences core outcomes

- Solve mathematical problems
- Solve and interpret mathematical problems which originate from applications outside of mathematics
- Use technology to solve and/or explore mathematics problems

General mathematical sciences concentration-specific outcomes

- Write mathematics (not including mathematical proofs) clearly, concisely and correctly
- Write mathematical proofs clearly, concisely and correctly
- Read and comprehend mathematical works
- Collaborate on projects
- Make effective presentations to demonstrate their understanding of mathematical ideas
- Write prose about mathematics
- Demonstrate an understanding of a breadth of mathematical ideas

Special requirements

The B.S. in Mathematical Sciences requires a minimum of 120 credits. Along with the general education requirements of the College of Humanities and Sciences and the undergraduate degree requirements, students are required to take core courses and fulfill specific requirements for the degree.

Based on the results of the Mathematics Placement Test, students may be required to take MATH 151. No more than one course in mathematics (MATH) at the 100 level can count for the general requirements toward

the degree. Credit for 100-level mathematical sciences courses cannot be applied toward the mathematical sciences courses required for the major in mathematical sciences.

Double major

Students who meet the requirements for two of the concentrations within the mathematical sciences curriculum can receive a double major. To initiate a double major, students must obtain the appropriate form from the Office of Records and Registration.

Second baccalaureate degree

For students possessing a bachelor's degree and wishing to gain undergraduate preparation in an area of mathematical sciences, second baccalaureate degrees are offered through the department. For detailed information about these programs, refer to the "Academic regulations and general degree requirement" section of this bulletin.

Degree requirements for Mathematical Sciences, Bachelor of Science (B.S.) with a concentration in general mathematical sciences

Course	Title	Hours
General education (http://bulletin.vcu.edu/undergraduate/undergraduate-study/general-education-curriculum/)		
Select 30 credits of general education courses in consultation with an adviser.		30
Major requirements		
• Major core requirements		
MATH 201	Calculus with Analytic Geometry II ¹	4
MATH 307	Multivariate Calculus ¹	4
MATH 310	Linear Algebra ¹	3
• Additional major requirements		
MATH 300	Introduction to Mathematical Reasoning ¹	3
• Concentration requirements		
Select one of the two course groups.		12-13
Group 1		
MATH 407	Real Analysis	
MATH 490	Mathematical Expositions	
MATH 255	Introduction to Computational Mathematics	
or CMSC 245	Introduction to Programming Using C++	
or EGRE 245	Engineering Programming	
MATH 301	Differential Equations	
or OPER 327	Mathematical Modeling	
Group 2		
SSOR 480	Consulting Using Advanced Analytics	
SSOR 485	Career Planning and Professional Development for Statistics and Operations Research	
STAT 309	Introduction to Probability Theory	
STAT 321	Introduction to Statistical Computing	
or MATH 255	Introduction to Computational Mathematics	
or CMSC 245	Introduction to Programming Using C++	
or EGRE 245	Engineering Programming	
STAT 403	Introduction to Stochastic Processes	

Concentration electives		
Select one of the following options:		12-18
Additional upper-division credits in MATH, STAT or OPER, with at least nine credits from course offerings at 400 to 500 level		
Additional upper-division credits in MATH, STAT or OPER, with at least six credits from course offerings at 400 to 500 level and complete a minor or double major		
Ancillary requirements		
HUMS 202	Choices in a Consumer Society	1
MATH 200	Calculus with Analytic Geometry I (satisfies general education quantitative foundations) ¹	4
STAT 212	Concepts of Statistics	3
Experiential fine arts ²		1-3
Foreign language through the 102 level (by course or placement)		0-6
Natural science sequence: Select one sequence from list below (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)		8-10
Natural science elective (different from chosen science sequence)		3-5
Open electives		
Select any course.		21-41
Total Hours		120

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These courses/credits require a minimum grade of C.

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Course offered by the School of the Arts

The minimum number of credit hours required for this degree is 120.

Natural science sequence

Course	Title	Hours
Select one of the following sequences:		
Sequence 1		8-10
BIOL 151	Introduction to Biological Sciences I (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)	3
BIOZ 151	Introduction to Biological Science Laboratory I	1
BIOL 152	Introduction to Biological Sciences II	3
BIOZ 152	Introduction to Biological Science Laboratory II	1
Sequence 2		
CHEM 101	General Chemistry I (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)	3
CHEZ 101	General Chemistry Laboratory I (satisfies general education AOI for scientific and logical reasoning)	1
CHEM 102	General Chemistry II	3
CHEZ 102	General Chemistry Laboratory II	1
Sequence 3		

PHYS 201	General Physics I (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)	4
PHYS 202	General Physics II	4
Sequence 4		
PHYS 207	University Physics I (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)	5
PHYS 208	University Physics II	5

What follows is a sample plan that meets the prescribed requirements within a four-year course of study at VCU. Please contact your adviser before beginning course work toward a degree.

Freshman year		Hours
Fall semester		
MATH 200	Calculus with Analytic Geometry I (satisfies general education quantitative foundations)	4
UNIV 101	Introduction to the University	1
UNIV 111	Focused Inquiry I (satisfies general education UNIV foundations)	3
Play course	video for Focused Inquiry I	
General education course (select AOI in consultation with adviser)		3
General education course		3
Term Hours:		14
Spring semester		
HUMS 202	Choices in a Consumer Society	1
MATH 201	Calculus with Analytic Geometry II	4
STAT 212	Concepts of Statistics	3
UNIV 112	Focused Inquiry II (satisfies general education UNIV foundations)	3
Play course	video for Focused Inquiry II	
Experiential fine arts		1-3
General education course (select AOI in consultation with adviser)		3
Term Hours:		15-17
Sophomore year		
Fall semester		
MATH 300	Introduction to Mathematical Reasoning	3
MATH 307	Multivariate Calculus	4
UNIV 200	Advanced Focused Inquiry: Literacies, Research and Communication (satisfies general education UNIV foundations)	3
Foreign language 101		3
Group course		3
MATH 255	Introduction to Computational Mathematics (Group 1)	-
STAT 321	Introduction to Statistical Computing (Group 2)	-
Term Hours:		16

Spring semester

MATH 310	Linear Algebra	3
Select one:		3
MATH 301	Differential Equations	-
OPER 327	Mathematical Modeling (Group 1)	-
STAT 309	Introduction to Probability Theory (Group 2)	-
Foreign language 102		3
General education course (select BOK to complete breadth of knowledge requirement)		3
General education course (select BOK to complete breadth of knowledge requirement)		3

Term Hours: 15

Junior year

Fall semester

Select one:		3
MATH 407	Real Analysis (Group 1)	-
STAT 403	Introduction to Stochastic Processes	-
Natural sciences sequence (select one of the following) (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)		4-5
BIOL 151 & BIOZ 151	Introduction to Biological Sciences I and Introduction to Biological Science Laboratory I	-
CHEM 101 & CHEZ 101	General Chemistry I and General Chemistry Laboratory I	-
PHYS 201	General Physics I	-
PHYS 207	University Physics I	-
Open electives		6

Term Hours: 13-14

Spring semester

Concentration electives (upper level)		6
Natural sciences sequence (Select one of the following with appropriate matching course.)		4-5
BIOL 152 & BIOZ 152	Introduction to Biological Sciences II and Introduction to Biological Science Laboratory II	-
CHEM 102 & CHEZ 102	General Chemistry II and General Chemistry Laboratory II	-
PHYS 202	General Physics II	-
PHYS 208	University Physics II	-
Open electives		6

Term Hours: 16-17

Senior year

Fall semester

SSOR 480	Consulting Using Advanced Analytics (Group 2 capstone)	3
SSOR 485	Career Planning and Professional Development for Statistics and Operations Research (taken by Group 2 only)	1
Concentration electives (400-500 level; Group 1 takes six credits; Group 2 takes three credits)		3-6
Natural sciences elective ¹		3-5
Open electives		6

Term Hours: 16-17

Spring semester

MATH 490	Mathematical Expositions (Group 1 capstone)	3
Concentration elective (upper-level) or elective to complete minor or double major		3
Concentration elective (400-500 level) or elective to complete minor or double major		3-6
Open electives		6

Term Hours: 15

Total Hours: 120-125

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Different science than chosen for sequence.

The minimum number of credit hours required for this degree is 120.