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 the University Registrar.

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 (https://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 (satisfies AI literacy ancillary requirement) [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 255	Introduction to Computational Mathematics	
or CMSC 210	Computers and Programming	
MATH 301	Differential Equations	
or OPER 327	Mathematical Modeling	
MATH 407	Real Analysis	
MATH 490	Mathematical Expositions	
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 for Data Science	
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
12 additional upper-division credits (300 level or higher) in MATH, STAT or OPER, and complete a minor or double major		
18 additional upper-division credits (300 level or higher) in MATH, STAT or OPER		
Ancillary requirements		
MATH 200	Calculus with Analytic Geometry I (satisfies general education quantitative foundations) [1]	4
STAT 212	Concepts of Statistics	3
Natural science sequence (select one sequence from the list below)		8-10
Natural science elective (different from chosen science sequence)		3-4
AI literacy elective (any three credit course offered through the minor in AI studies in humanities and sciences)		3
Open electives		
Select any course.		35
Total Hours		**120**

[1] These courses/credits require a minimum grade of C.

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

Natural science sequence

Course	Title	Hours
Select one of the following sequences:		8-10
Sequence 1		
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	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)	4
PHYZ 207	University Physics I Laboratory (satisfies general education BOK for natural sciences and AOI for scientific and logical reasoning)	1
PHYS 208	University Physics II	4
PHYZ 208	University Physics II Laboratory	1

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.

Recommended course sequence/plan of study

Freshman year

Fall semester		**Hours**
MATH 200	Calculus with Analytic Geometry I (satisfies general education quantitative foundations)	4
UNIV 101	Introduction to the University (recommended) [1]	1
UNIV 111 Play course video for Introduction to Focused Inquiry: Investigation and Communication	Introduction to Focused Inquiry: Investigation and Communication (satisfies general education UNIV foundations)	3
General education courses		7
	Term Hours:	**14**
Spring semester		
MATH 201	Calculus with Analytic Geometry II	4
MATH 310	Linear Algebra (satistifies AI literacy ancillary requirement)	3
UNIV 200	Advanced Focused Inquiry: Literacies, Research and Communication (satisfies general education UNIV foundations)	3
General education courses		6
	Term Hours:	**16**

Sophomore year

Fall semester		
MATH 300	Introduction to Mathematical Reasoning	3
Group course (select one of the two groups)		3-4
MATH 255 or CMSC 210	Introduction to Computational Mathematics (Group 1) or Computers and Programming	-
STAT 212	Concepts of Statistics	3
STAT 321 or MATH 255 or CMSC 245 or EGRE 245	Introduction to Statistical Computing for Data Science (Group 2) or Introduction to Computational Mathematics or Introduction to Programming Using C ++ or Engineering Programming	-
General education course		3
Open elective		3
	Term Hours:	**15**

Spring semester		
MATH 307	Multivariate Calculus	4
Group course (continue group from fall semester)		3
MATH 301 or OPER 327	Differential Equations (Group 1) or Mathematical Modeling	-
STAT 309	Introduction to Probability Theory (Group 2)	-
General education course		4
Open electives		5
	Term Hours:	**16**
Junior year		
Fall semester		
Group course (continue group from previous semesters)		3
MATH 407	Real Analysis (Group 1)	-
STAT 403	Introduction to Stochastic Processes (Group 2)	-
Natural science sequence (select one of the following) (BIOL 151, CHEM 101, PHYS 201, PHYS 207 and PHYZ 207 satisfy 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 & PHYZ 207	University Physics I and University Physics I Laboratory	-
Open electives		8
	Term Hours:	**15**
Spring semester		
Concentration electives (300 level or higher)		6
Natural science sequence (continue sequence from fall semester)		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 & PHYZ 208	University Physics II and University Physics II Laboratory	-
Open electives		6
	Term Hours:	**16**
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 (300 level or higher) — Group 1 takes 6 credits; Group 2 takes 3 credits		3-6
Natural science elective [2]		3-4
Open electives		7
	Term Hours:	**13**
Spring semester		
MATH 490	Mathematical Expositions (Group 1 capstone)	3
Concentration electives (300 level or higher) — Group 1 takes 6 credits of concentration electives or 6 credits of open electives to complete minor or double major; Group 2 takes 9 credits of concentration electives or 3 credits of concentration electives and 6 credits of open electives to complete minor or double major		6-9
Open electives		6
	Term Hours:	**15**
	Total Hours:	**120**

[1]

Recommended course to apply as open elective; credits currently not included in displayed semester total credit hours. Open elective credits required in later semesters will need to be adjusted accordingly.

[2]

Different science than chosen for sequence.

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