

# MATHEMATICAL SCIENCES, MASTER OF SCIENCE (M.S.) WITH A CONCENTRATION IN APPLIED MATHEMATICS

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## Program goal

The Department of Mathematics and Applied Mathematics and the Department of Statistical Sciences and Operations Research jointly offer the M.S. in Mathematical Sciences.

The mission of the Department of Mathematics and Applied Mathematics is to foster excellence in mathematical research and to offer a strong undergraduate and graduate education that will prepare students for stimulating and rewarding employment, career and lifelong learning opportunities. In addition, the department strives to help all VCU students achieve a level of quantitative literacy and analytical skills enabling them to deal effectively with the quantitative issues that they will encounter throughout their lives.

The program offers maximum flexibility by allowing students, in consultation with their graduate committees, to design a course of study that will best develop competence in those areas most relevant to their scholarly and professional objectives. Students may obtain a designation on their transcripts indicating that their graduate study has emphasized the applied mathematics concentration by completing the requirements that are listed here. A student who has not satisfied the requirements for one of the program concentrations offered, but who has otherwise fulfilled all the requirements for a master's degree, will be awarded a degree of Master of Science in Mathematical Sciences without any specialization.

## Student learning outcomes

### Master of Science in Mathematical Sciences core outcomes

1. Students will develop creative-thinking skills to apply to mathematical problems and proofs.
2. Students will be able to analyze mathematical arguments and write their own arguments and proofs.
3. Students will be able to read and interpret mathematical literature, including technical articles, within their chosen mathematical subfield.
4. Students will be able to use technology, including specialized computational and graphics software, to test the validity of certain conjectures, to solve problems, to conduct mathematical experiments and do mathematical research.

### Applied mathematics concentration-specific outcome

1. Students will use graduate-level techniques to construct and investigate mathematical models of real-world problems.

## VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs

The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the Graduate School website (<http://www.graduate.vcu.edu/>) and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the [academic regulations section for additional information on academic regulations for graduate students.](https://bulletin.vcu.edu/academic-regs/) (<https://bulletin.vcu.edu/academic-regs/>)

## Degree candidacy requirements

A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master's or doctoral status according to the degree candidacy requirements of the student's graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student's faculty regarding the student's academic achievements and the student's readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the [academic regulations section for additional information on degree candidacy requirements.](https://bulletin.vcu.edu/academic-regs/grad/candidacy/) (<https://bulletin.vcu.edu/academic-regs/grad/candidacy/>)

## Graduation requirements

As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the [academic regulations section for additional information on graduation requirements.](https://bulletin.vcu.edu/academic-regs/grad/graduation-info/) (<https://bulletin.vcu.edu/academic-regs/grad/graduation-info/>)

Apply online today. (<https://www.vcu.edu/admissions/apply/graduate/>)

## Admission requirements

Degree:	Semester(s) of entry:	Deadline dates:	Test requirements:
M.S.	Fall	Mar 1	TOEFL (international students only)
	Spring	Oct 1	

## Special requirements

- Students should follow priority deadlines for funding consideration.

In addition to the general admission requirements of the VCU Graduate School (<https://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/>), the following requirements represent the minimum acceptable standards for admission:

1. Thirty credit hours in undergraduate mathematical sciences, computer science or related areas of which at least 18 credit hours must represent upper-level courses
2. Three letters of recommendation pertaining to the student's potential ability as a graduate student in mathematical sciences

**The GRE is not required for admission into this program.**

Provisional admission may be granted when deficiencies exist. These deficiencies must be removed by the end of the first year of residence, or its part-time equivalent, when the student's application will be re-examined. Courses that are remedial or designed to remove deficiencies will not be accepted for credit hours toward the fulfillment of the course requirements for the master's degree.

## Degree requirements

In addition to the VCU Graduate School graduation requirements (<https://bulletin.vcu.edu/academic-regs/grad/graduation-info/>), students are required to complete course work in core and elective courses and to meet the following requirements.

1. Credit hour requirements: Students in the M.S. in Mathematical Sciences program are required to earn a minimum of 30 graduate-level credit hours. At least one-half of the credit hours presented for graduation must be at the 600 level or higher.
2. Other requirements: Students who are completing the non-thesis option must pass a comprehensive exam in the core courses and selected elective courses determined by the Department of Mathematics and Applied Mathematics.

## Curriculum requirements

### Thesis option

Course	Title	Hours
<b>Concentration courses</b>		
MATH 507	Bridge to Modern Analysis	3
MATH 515	Numerical Analysis	3
MATH 535	Introduction to Dynamical Systems	3
MATH 556	Graph Theory	3
MATH 610	Advanced Linear Algebra	3
<b>Additional courses</b>		

SYSM 681	Research Exploration	1
MATH 690	Research Seminar	2
MATH 697	Directed Research <sup>1</sup>	1-3
MATH 698	Thesis (three or six hours) <sup>1,2</sup>	1-3
Mathematics electives (Choose courses from list one below.) <sup>2</sup>		3,6
Mathematical sciences or allied field electives (Choose courses from list two below.)		3
<b>Total Hours</b>		<b>30</b>

1

A maximum total of six credit hours for MATH 697 and MATH 698 may count toward the degree.

2

A minimum of 12 credits from mathematics electives (list one) and thesis are required for the degree.

**The minimum number of graduate credit hours required for this degree is 30.**

### Non-thesis option

Course	Title	Hours
<b>Concentration courses</b>		
MATH 507	Bridge to Modern Analysis	3
MATH 515	Numerical Analysis	3
MATH 535	Introduction to Dynamical Systems	3
MATH 556	Graph Theory	3
MATH 610	Advanced Linear Algebra	3
<b>Additional courses</b>		
SYSM 681	Research Exploration	1
MATH 690	Research Seminar	2
MATH 697	Directed Research <sup>1</sup>	1-3
Mathematics electives (Choose courses from list one below)		6-9
Mathematical sciences or allied field electives (Choose courses from list two below)		3
<b>Total Hours</b>		<b>30</b>

1

A maximum of three credit hours for MATH 697 may count toward the degree.

**The minimum number of graduate credit hours required for this degree is 30.**

### List one: Approved mathematics electives

Course	Title	Hours
500-, 600- or 700- level MATH courses except the following:		
MATH 592	Teaching and Communicating Mathematics	
MATH 661	Number and Operations	
MATH 662	Geometry and Measurement	
MATH 663	Functions and Algebra	
MATH 664	Statistics and Probability	

MATH 665	Rational Numbers and Proportional Reasoning
MATH 667	Functions and Algebra II
MATH 668	Modeling With Mathematics

**List two: Approved electives in mathematical sciences or allied field**

Course	Title	Hours
500-, 600- or 700-level MATH, OPER, STAT or SYSM courses except the following:		
MATH 592	Teaching and Communicating Mathematics	
MATH 661	Number and Operations	
MATH 662	Geometry and Measurement	
MATH 663	Functions and Algebra	
MATH 664	Statistics and Probability	
MATH 665	Rational Numbers and Proportional Reasoning	
MATH 667	Functions and Algebra II	
MATH 668	Modeling With Mathematics	
STAT/SOCY 508	Introduction to Social Statistics	
STAT 543	Statistical Methods I	
STAT/SOCY 608	Statistics for Social Research	
SYSM 681	Research Exploration	
SYSM 682	Systems Seminar II	
SYSM 683	Systems Seminar III	

**Accelerated opportunities**

The department offers opportunities for qualified undergraduate students to earn both an undergraduate and graduate degree in a minimum of five years by completing approved graduate courses during the senior year of their undergraduate program. See the individual concentration pages in the Undergraduate Bulletin for details.

- B.S. in Mathematical Sciences with a concentration in applied mathematics and M.S. in Mathematical Sciences with a concentration in applied mathematics (<https://bulletin.vcu.edu/undergraduate/college-humanities-sciences/departmentofmathematicsandappliedmathematics/mathematical-sciences-bs-concentration-applied-mathematics/>)
- B.S. in Mathematical Sciences with a concentration in biomathematics and M.S. in Mathematical Sciences with a concentration in applied mathematics (<https://bulletin.vcu.edu/undergraduate/college-humanities-sciences/departmentofmathematicsandappliedmathematics/mathematical-sciences-bs-concentration-biomathematics/>)

**Contact**

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**Program website:** [math.vcu.edu](http://www.math.vcu.edu/) (<http://www.math.vcu.edu/>)

**Program email:** [mathgrad@vcu.edu](mailto:mathgrad@vcu.edu)