

# MATHEMATICS MAJOR WITH APPLIED COMPUTATIONAL MATHEMATICS OPTION

## Program Curriculum

Code	Title	Credits
<b>Degree Core Requirements</b>		
MATH 2114	Introduction to Linear Algebra <sup>1</sup>	3
<i>Multi-D Calculus</i>		
Select two of the following:		6
MATH 2204	Introduction to Multivariable Calculus <sup>1</sup>	
MATH 2214	Introduction to Differential Equations <sup>1</sup>	
MATH 3214	Calculus of Several Variables <sup>1</sup>	
MATH 3034	Introduction to Proofs <sup>1</sup>	3
MATH 3144	Linear Algebra I <sup>1</sup>	3
MATH 3224	Advanced Calculus <sup>1</sup>	3
<i>Computer Programming</i>		
Select one of the following:		3
MATH 1454	Introduction to Programming for Mathematical Problem-Solving <sup>1</sup>	
MATH 3054	Programming for Mathematical Problem Solving <sup>1</sup>	
CS 1044	Introduction to Programming in C	
CS 1114	Introduction to Software Design	
Subtotal		21
<b>Option Required Courses</b>		
<i>Remaining Multi-D Calculus<sup>3</sup></i>		
MATH 2204	Introduction to Multivariable Calculus	3
or MATH 2214 Introduction to Differential Equations		
or MATH 3214 Calculus of Several Variables		
or MATH 3034 Introduction to Proofs		
or MATH 3144 Linear Algebra I		
or MATH 3224 Advanced Calculus		
<i>Numerical Analysis, Mathematical Modeling, and Scientific Computing</i>		
MATH 4425	Fourier Series and Partial Differential Equations <sup>1</sup>	3
MATH 4426	Fourier Series and Partial Differential Equations <sup>1</sup>	3
or CMDA 4604 Intermediate Topics in Mathematical Modeling		
MATH 4445	Introduction to Numerical Analysis	6
MATH 4446	and Introduction to Numerical Analysis <sup>1</sup>	
MATH 4414	Issues in Scientific Computing <sup>1</sup>	3
or MATH 4454 Applied Mathematical Modeling		
Subtotal		18
<b>Restricted Electives</b>		
<i>Mathematics Electives</i>		
Select six credits <sup>2</sup>		6
<i>Applied Area Courses</i>		
Select 12 credits approved by the Undergraduate Program Committee		12
Subtotal		18
<b>Free Electives</b>		

Select sufficient credits to achieve the 120 credit graduation requirement		16
Subtotal		16
<b>Pathways to General Education</b>		
<i>Pathways Concept 1 - Discourse</i>		
ENGL 1105	First-Year Writing (1F)	3
ENGL 1106	First-Year Writing (1F) <sup>1</sup>	3
Select three credits in Pathway 1a ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01A">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G01A</a> )		3
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>		
Select six credits in Pathway 2 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02</a> )		6
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>		
Select six credits in Pathway 3 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03</a> )		6
<i>Pathways Concept 4 - Reasoning in the Natural Sciences</i>		
Select six credits in Pathway 4 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G04">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G04</a> )		6
<i>Pathways Concept 5 - Quantitative and Computational Thinking</i>		
MATH 1225	Calculus of a Single Variable (5F) <sup>1</sup>	4
MATH 1226	Calculus of a Single Variable (5F) <sup>1</sup>	4
MATH 2214	Introduction to Differential Equations (5A) <sup>1</sup>	3
<i>Pathways Concept 6 - Critique and Practice in Design and the Arts</i>		
Select 6 credits = 3 in design + 3 in arts or 6 in integrated design and arts		6
<i>Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States</i>		
Select three credits in Pathway 7 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G07</a> )		3
Subtotal		47
<b>Total Credits</b>		<b>120</b>

<sup>1</sup> Some courses listed on this checksheet may have prerequisites and/or corequisites; please consult the University Course Catalog or check with your advisor.

<sup>2</sup> The six hours of math electives must be chosen from the Mathematics courses numbered between MATH 4044 History of Mathematics and MATH 4454 Applied Mathematical Modeling, with the following exceptions:

1. MATH 3124 Modern Algebra<sup>1</sup> can be used to satisfy three of the six hours.
2. No more than three hours from MATH 4044 History of Mathematics<sup>1</sup> can be used.
3. Math Undergraduate Policy & Curriculum Committee approval required to use 4974, 4984, or 4994. Consult your advisor.

<sup>3</sup> Course selected for here must be unused from Multi-D section above, this includes MATH 2204, 2214, 3214, 3034, 3144, & 3214. **However, if 2204, 2214, or 3214 was not used to satisfy Multi-D, one of them must be taken for this requirement.**

In other words, if 3214 not used for degree core, 3214; if 2214 not used for degree core, 2214; if 2204 not used for degree core, 2204

## Outcomes Assessment

Each student is required to participate in the department's Outcomes Assessment procedures as determined by each year's Undergraduate Program Committee and approved by the Chair.

MATH 3624	Early Teaching Experience In Mathematics	4
MATH 4574	Vector and Complex Analysis for Engineers	3
MATH 4625	Mathematics for Secondary Teachers	3
MATH 4626	Mathematics for Secondary Teachers	3
MATH 4644	Secondary School Mathematics With Technology	3
MATH 4664	Senior Math Education Seminar	2

## Minimum Hours Required for Graduation

120 Credits

## Foreign Language Requirement

Students who did not successfully complete at least two years of a single foreign, classical, or sign language during high school must successfully complete six credit hours of a single foreign, classical, or sign language at the college level. Courses taken to meet this requirement do not count toward the hours required for graduation. Please consult the Undergraduate Catalog for details.

## Satisfactory Progress to Degree

Upon having attempted 36 semester credits, the student must have completed 12 credits of the Pathways General Education Requirements.

Upon having attempted 72 credits (including transfer, advanced placement, advanced standing, credit by examination, and course withdrawal), the student must have completed 24 credits of the Pathways General Education Requirements. In addition, satisfactory progress toward the B.S. in mathematics requires that:

1. Within the previous two semesters, the student must pass at least one mathematics course that is used in the in-major GPA calculation.
2. Upon having attempted 45 semester credits, students must have an in-major GPA of 2.2 or above.
3. Upon having attempted 72 semester credits (including transfer, advanced placement, advanced standing, credit by examination, and course withdrawal), students must have completed the following courses with grades of C- or better: MATH 1225 Calculus of a Single Variable, MATH 1226 Calculus of a Single Variable, MATH 2114 Introduction to Linear Algebra, MATH 2204 Introduction to Multivariable Calculus, MATH 2214 Introduction to Differential Equations, and MATH 3034 Introduction to Proofs, and not have taken any of these courses more than twice, including attempts ending in course withdrawal.

## Minimum GPA Required for Graduation

Students are required to have a 2.0 GPA and a 2.0 in-major GPA for Graduation. In-major GPA for this option is computed using all MATH courses with the exception of the following:

Code	Title	Credits
MATH 1014	Precalculus with Transcendental Functions	3
MATH 1025	Elementary Calculus	3
MATH 1026	Elementary Calculus	3
MATH 1524	Business Calculus	4
MATH 1535	Geometry and Mathematics of Design	3
MATH 1536	Geometry and Mathematics of Design	3
MATH 1614	Numbers and Operations for Teachers	3
MATH 1624	Geometry for Teachers	3
MATH 2024	Intermediate Calculus	3
MATH 2534	Introduction to Discrete Mathematics	3
MATH 2644	Mathematics Tutoring	1