

Applied Mathematics (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

The B.S. program in Applied Mathematics shares many basic features with the B.S. program in Mathematics. The primary difference is that this program includes a strong interdisciplinary concentration in a related field. The applied concentration, which must be approved by a student's adviser, should be structured to promote specific career or educational objectives.

Undergraduate research opportunities include:

- Society for Industrial and Applied Mathematics
- NC State Research Experiences for Undergraduates in Mathematics
- The Mathematical Biology Research Training Group
- Industrial Mathematical & Statistical Modeling (IMSM) Program by SAMSI
- Study abroad opportunities in applied mathematics
- SUM Club

For more information about this program visit our website (<https://math.sciences.ncsu.edu/undergraduate/undergraduate-programs/applied-mathematics/>).

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Plan Requirements

Code	Title	Hours	Counts towards
Orientation			
COS 100	Science of Change	1	
or E 115	Introduction to Computing Environments		
Advanced Writing			
Select one of the following:		3	
ENG 331	Communication for Engineering and Technology		
ENG 332	Communication for Business and Management		
ENG 333	Communication for Science and Research		

ENG 101	Academic Writing and Research ¹	4	
Basic Mathematics			
MA 141	Calculus I ¹	4	
MA 241	Calculus II ¹	4	
MA 242	Calculus III ¹	4	
MA 225	Foundations of Advanced Mathematics ¹	3	
MA 341	Applied Differential Equations I ¹	3	
Basic Science ⁴			
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory ¹	4	
or			
CH 103 & CH 104	General Chemistry I for Students in Chemical Sciences and General Chemistry Laboratory I for Students in Chemical Sciences ¹		
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4	
or PY 201 University Physics I			
Basic Science Elective (p. 2) ¹		4	
Statistics Electives (p. 3) ¹		6	
Select one of the following		3	
Introduction to Programming courses: ¹			
CSC 112	Introduction to Computing-FORTRAN		
CSC 113	Introduction to Computing - MATLAB		
CSC 116	Introduction to Computing - Java		
MA 116	Introduction to Scientific Programming (Math)		

PY 251	Introduction to Scientific Computing	
Advanced Mathematics ⁴		
MA 402	Mathematics of Scientific Computing ¹	3
MA 405	Introduction to Linear Algebra ¹	3
MA 407	Introduction to Modern Algebra for Mathematics Majors ¹	3
MA 425	Mathematical Analysis I ¹	3
	Methods of Applied Math Elective (p. 3) ¹	3
	Math Electives (p. 3) ¹	9
	In-Dept Co-Requirement (verify requirement) ²	
Major Electives		
	Applied Electives ²	15
	Applied electives are courses at 200-level or above designed to allow students to concentrate in a specific area related to their academic goals (at least 9 hours are at the 300-level or above). Courses used to fulfill this requirement should use advanced mathematical tools and are selected by students after consultation and approval by their advisors or the Director of the Undergraduate Program.	
GEP Courses		
	GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	6
	GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	6
	GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2
	GEP US Diversity, Equity, and Inclusion (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/)	3
	GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	5

GEP Global Knowledge (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/>) (verify requirement)

Foreign Language Proficiency (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/>) (verify requirement)

Free Electives

Free Electives (12 Hr S/U Lmt) ^{2,3}	12
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Total Hours	120
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¹ A grade of C- or higher is required.

² Students should consult their academic advisors to determine which courses fill this requirement.

³ Free elective courses cannot be MA 100, MA 101, MA 103, MA 107, MA 108, MA 111, MA 121, MA 131, MA 231, PY 131, PY 211, PY 212, ENG 100, 100-level Foreign Language Course (FL*, LAT, GRK, PER).

⁴ At most one grade below a C- is permitted

Basic Science Electives

Code	Title	Hours	Counts towards
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
CH 201 & CH 202	Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory	4	
PY 202	University Physics II	4	
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4	

Statistics Electives

Code	Title	Hours	Counts towards
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Statistics Sequence 1

ST 371 & ST 372	Introduction to Probability and Distribution Theory and Introduction to Statistical Inference and Regression	6	
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Statistics Sequence 2

ST 421 & ST 422	Introduction to Mathematical Statistics I and Introduction to Mathematical Statistics II	6	
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Statistics Sequence 3

MA 421 & ST 380	Introduction to Probability and	6	
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Statistics Sequence 4

MA 421 & ST 370	Introduction to Probability and Probability and Statistics for Engineers	6	
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Statistics Sequence 5

MA 421 & ST 422	Introduction to Probability and Introduction to Mathematical Statistics II	6	
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Methods of Applied Math Electives

Code	Title	Hours	Counts towards
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BMA 573	Mathematical Modeling of Physical and Biological Processes I	3	
BMA 574	Mathematical Modeling of Physical and Biological Processes II	3	
E 531	Dynamic Systems and Multivariable Control I	3	
MA 450	Methods of Applied Mathematics I	3	
MA 451	Methods of Applied Mathematics II	3	

MA 531	Dynamic Systems and Multivariable Control I	3	
MA 573	Mathematical Modeling of Physical and Biological Processes I	3	
MA 574	Mathematical Modeling of Physical and Biological Processes II	3	
OR 531	Dynamic Systems and Multivariable Control I	3	

Math Electives

Code	Title	Hours	Counts towards
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LOG 335	Symbolic Logic	3	
MA 325	Introduction to Applied Mathematics	3	
MA 335	Symbolic Logic	3	
MA 351	Introduction to Discrete Mathematical Models	3	
BMA 573	Mathematical Modeling of Physical and Biological Processes I	3	
BMA 574	Mathematical Modeling of Physical and Biological Processes II	3	
CSC 416	Introduction to Combinatorics	3	
CSC 427	Introduction to Numerical Analysis I	3	
CSC 428	Introduction to Numerical Analysis II	3	
CSC 565	Graph Theory	3	
CSC 580	Numerical Analysis I	3	
CSC 583	Introduction to Parallel Computing	3	
E 531	Dynamic Systems and Multivariable Control I	3	

ECG 528	Options and Derivatives Pricing	3	MA 491	Reading in Honors Mathematics	1-6
FIM 528	Options and Derivatives Pricing	3	MA 493	Special Topics in Mathematics	1-6
FIM 548	Monte Carlo Methods for Financial Math	3	MA 499	Independent Research in Mathematics	1-6
FIM 549	Financial Risk Analysis	3	MA 501	Advanced Mathematics for Engineers and Scientists I	3
ISE 505	Linear Programming	3	MA 502	Advanced Mathematics for Engineers and Scientists II	3
MA 401	Applied Differential Equations II	3	MA 504	Introduction to Mathematical Programming	3
MA 408	Foundations of Euclidean Geometry	3	MA 505	Linear Programming	3
MA 410	Theory of Numbers	3	MA 512		3
MA 412	Long-Term Actuarial Models	3	MA 513	Introduction To Complex Variables	3
MA 413	Short-Term Actuarial Models	3	MA 515	Analysis I	3
MA 416	Introduction to Combinatorics	3	MA 518	Geometry of Curves and Surfaces	3
MA 421	Introduction to Probability	3	MA 520	Linear Algebra	3
MA 426	Mathematical Analysis II	3	MA 521	Abstract Algebra I	3
MA 427	Introduction to Numerical Analysis I	3	MA 522	Computer Algebra	3
MA 428	Introduction to Numerical Analysis II	3	MA 523	Linear Transformations and Matrix Theory	3
MA 430	Mathematical Models in the Physical Sciences	3	MA 524	Combinatorics I	3
MA 432	Mathematical Models in Life Sciences	3	MA 526	Mathematical Analysis II	3
MA 437	Applications of Algebra	3	MA 528	Options and Derivatives Pricing	3
MA 440		3	MA 531	Dynamic Systems and Multivariable Control I	3
MA 444	Problem Solving Strategies for Competitions	1	MA 532	Ordinary Differential Equations I	3
MA 450	Methods of Applied Mathematics I	3	MA 534	Introduction To Partial Differential Equations	3
MA 451	Methods of Applied Mathematics II	3	MA 537	Nonlinear Dynamics and Chaos	3

MA 540	Uncertainty Quantification for Physical and Biological Models	3
MA 544	Computer Experiments In Mathematical Probability	3
MA 546	Probability and Stochastic Processes I	3
MA 547	Stochastic Calculus for Finance	3
MA 548	Monte Carlo Methods for Financial Math	3
MA 549	Financial Risk Analysis	3
MA 551	Introduction to Topology	3
MA 555	Introduction to Manifold Theory	3
MA 561	Set Theory and Foundations Of Mathematics	3
MA 565	Graph Theory	3
MA 573	Mathematical Modeling of Physical and Biological Processes I	3
MA 574	Mathematical Modeling of Physical and Biological Processes II	3
MA 580	Numerical Analysis I	3
MA 583	Introduction to Parallel Computing	3
MA 584	Numerical Solution of Partial Differential Equations--Finite Difference Methods	3
MA 587	Numerical Solution of Partial Differential Equations--Finite Element Method	3
MA 591	Special Topics	1-6
MBA 528	Options and Derivatives Pricing	3

OR 504	Introduction to Mathematical Programming	3
OR 505	Linear Programming	3
OR 531	Dynamic Systems and Multivariable Control I	3
OR 565	Graph Theory	3
ST 412	Long-Term Actuarial Models	3
ST 413	Short-Term Actuarial Models	3
ST 546	Probability and Stochastic Processes I	3

Semester Sequence

This is a sample.

First Year

Fall Semester		Hours
MA 141	Calculus I ^{1,2}	4
CH 101	Chemistry - A Molecular Science ²	3
CH 102	General Chemistry Laboratory ²	1
ENG 101	Academic Writing and Research	4
COS 100	Science of Change	2
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		17

Spring Semester

MA 241	Calculus II ^{1,2}	4
PY 205	Physics for Engineers and Scientists I ²	3
PY 206	Physics for Engineers and Scientists I Laboratory ²	1
Introduction to Programming Elective (p. 1) ²		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		15

Second Year

Fall Semester		
MA 242	Calculus III ^{1,2}	4
MA 225	Foundations of Advanced Mathematics ^{1,2}	3
PY 208	Physics for Engineers and Scientists II ²	3
PY 209	Physics for Engineers and Scientists II Laboratory ²	1
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1

ST 371	Introduction to Probability and Distribution Theory ²	3
Hours		15
Spring Semester		
MA 341	Applied Differential Equations I ^{1,2}	3
MA 405	Introduction to Linear Algebra ²	3
ST 372	Introduction to Statistical Inference and Regression ²	3
Free Elective		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		15
Third Year		
Fall Semester		
MA 407	Introduction to Modern Algebra for Mathematics Majors ²	3
Methods of Applied Math Elective (p. 3) ²		3
Applied Elective (p. 1)		3
Advanced Writing/Speaking Elective (p. 1)		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		15
Spring Semester		
MA 425	Mathematical Analysis I ²	3
MA 402	Mathematics of Scientific Computing ²	3
Applied Elective (p. 1)		3
Free Elective		3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3
Hours		15
Fourth Year		
Fall Semester		
Select one of the following: ²		3
MA 426	Mathematical Analysis II	
MA Elective (p. 3)		
Advanced Mathematics Elective (p. 1) ²		3
Applied Electives (p. 1)		6
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		3
Hours		15
Spring Semester		
Advanced Mathematics Elective (p. 1) ²		3
Applied Elective (p. 1)		3
Free Electives (2 courses)		5
GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)		2
Hours		13
Total Hours		120

satisfying the Basic Science requirements. No grades below a C- are permitted in Basic Mathematics courses.

¹ A grade of C- or higher is required.

² At most one grade below a C- is permitted in Advanced Mathematics courses and at most one grade below a C- is permitted in courses