MATHEMATICS, 4+1 BS/ APPLIED MATHEMATICS, MS

Introduction

Please click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/mathematical-statistical-sciences/) to see Mathematical and Statistical Sciences department information.

This is a unique program where a student can obtain both a BS in Mathematics and MS in Applied Mathematics in five years through a specialized course sequence. The program requires 12 fewer credits than if both degrees were earned separately.

These degree requirements are subject to periodic revision by the academic department, and the College of Liberal Arts and Sciences reserves the right to make exceptions and substitutions as judged necessary in individual cases. Therefore, the College strongly urges students to consult regularly with their major and graduate advisor and CLAS advisor to confirm the best plans of study before finalizing them.

Program Delivery

This is an on-campus program.

Declaring This Major

Click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/#policiestext) to go to information about declaring a major.

General Requirements

To earn a degree, students must satisfy all requirements in each of the three areas below, in addition to their individual major requirements.

- CU Denver General Graduation Requirements (http://catalog.ucdenver.edu/cu-denver/undergraduate/graduation/)
- CU Denver Core Curriculum (http://catalog.ucdenver.edu/cu-denver/undergraduate/graduation-undergraduate-core-requirements/)
- College of Liberal Arts & Sciences Graduation Requirements (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/#graduationrequirementstext)
- Click here (http://catalog.ucdenver.edu/cu-denver/undergraduate/academic-policies-procedures/) for information about Academic Policies

Program Requirements

While students are completing a BS degree in Mathematics, (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/mathematical-statistical-sciences/mathematics-bs/#degreerequirementstext) they may also complete some of the requirements for an MS degree in Applied Mathematics (http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/college-liberal-arts-sciences/mathematical-statistical-sciences/applied-mathematics-ms/) by participating in the BS/MS program using the following guidelines:

1. The student must apply and be accepted for participation in the BS/MS program prior to completion of the BS degree in consultation with both the undergraduate and graduate advisors. Students must complete a 4+1 intent form to formally declare this program, as they work very closely with undergraduate and graduate advisors to ensure they are on track and completing requirements as necessary.

2. Students should declare their intent to complete this program in their junior or senior year to the Director of the Program in Applied Mathematics after completing MATH 1401 Calculus I, MATH 2411 Calculus II, MATH 2421 Calculus III, MATH 3000 Introduction to Abstract Mathematics, MATH 3191 Applied Linear Algebra, MATH 4310 Introduction to Real Analysis I. A 3.0 grade point average (GPA) is required over all mathematics courses.

3. Students must complete a total of 45 credit hours, including a minimum of 42 MATH credit hours.

4. Students must complete at least 30 upper-division (3000-level and above) credit hours in the major.

5. Students must earn a minimum grade of C- (1.7) in all undergraduate courses that apply to the major and must achieve a minimum cumulative undergraduate major GPA of 2.25. Students must earn a minimum grade of B- (2.7) in all graduate courses and must achieve a minimum cumulative major GPA of 3.0, for all courses that will apply to the MS. Courses taken using P+/P/F or S/U grading cannot apply to major and graduate requirements.

6. Students must complete a minimum of 15 upper-division level MATH credit hours and all graduate level credit hours with CU Denver faculty.

7. Students must complete a 4+1 intent form (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/physics/physics-bs/BMA_form_1_1_.pdf) to formally declare this program, as they work very closely with undergraduate and graduate advisors to ensure they are on track and completing requirements as necessary. Students must apply and be accepted to the Applied Mathematics, MS during the last semester of their undergraduate career. A maximum of 12 credit hours of graduate level courses that are applied to the undergraduate degree will apply to the graduate degree.

8. Students will be advised to take MATH 4320 Introduction to Real Analysis II as an elective for the B.S.

9. In the semester in which the student intends to complete their BS, students must apply for admission into MS degree in Applied Mathematics (http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/college-liberal-arts-sciences/mathematical-statistical-sciences/applied-mathematics-ms/). Students must complete either the requirements for the M.S. degree without concentration area or specific coursework requirements in one of the following areas: Applied Probability, Applied Statistics, Discrete Mathematics, Mathematics of Engineering and Science, Numerical Analysis, or Operations Research.

10. The following MATH courses will **not** count toward a graduate degree: MCKE 5000 Algebraic Patterns and Functions I-MCKE 5009 Math Modeling--Using and Applying Math, MATH 5010 History of Mathematics, MATH 5012 An Advanced Perspective on Number and Operation-MATH 5015 Capstone Course for Secondary Teachers, MATH 5017 Topics in Mathematics for Teachers, MATH 5198 Mathematics for Bioscientists, and MATH 5830 Applied Statistics.

Mathematics, BS Course Requirements
Programming Requirements

Code	Title	Hours
Complete one of the following programming requirements:		**3-4**
MATH 1376	Programming for Data Science	
CSCI 1410 & CSCI 1411	Fundamentals of Computing and Fundamentals of Computing Laboratory	

Mathematics Courses

Code	Title	Hours
Complete all of the following Mathematics courses:		**24**
MATH 1401	Calculus I	
MATH 2411	Calculus II	
MATH 2421	Calculus III	
MATH 3000	Introduction to Abstract Mathematics	
MATH 3191	Applied Linear Algebra	
MATH 3310	Introduction to Real Analysis I	
MATH 3382	Statistical Theory	

Electives

Code	Title	Hours
Complete two approved MATH electives (at least six semester hours) above the 3000 level, excluding MATH 3195, MATH 3511, MATH 3800, MATH 3999, and MATH 4830.		**6**
MATH 3200	Elementary Differential Equations	
MATH 3301	Introduction to Optimization	
MATH 3376	Data Wrangling & Visualization	
MATH 3440	Introduction to Symbolic Logic	
MATH 3810	Introduction to Probability	
MATH 4010	History of Mathematics	
MATH 4027	Topics in Mathematics	
MATH 4110	Theory of Numbers	
MATH 4140	Introduction to Modern Algebra	
MATH 4320	Introduction to Real Analysis II	
MATH 4337	Intro to Statistical and Machine Learning	
MATH 4387	Applied Regression Analysis	
MATH 4388	Machine Learning Methods	
MATH 4390	Game Theory	
MATH 4408	Applied Graph Theory	
MATH 4409	Applied Combinatorics	
MATH 4450	Complex Variables	
MATH 4650	Numerical Analysis I	
MATH 4660	Numerical Analysis II	
MATH 4733	Partial Differential Equations	
MATH 4792	Probabilistic Modeling	

MATH numbered 5000 or above

Note that these courses taken during the undergraduate career with be used for the B.S. and apply to the 30 hours of course work and satisfy the core requirement for the Applied Mathematics.

Code	Title	Hours
Complete the following:		**12**
MATH 5779	Math Clinic	
or MATH 633:	Workshop in Statistical Consulting	
Complete nine semester hours of MATH numbered 5000 or above from the list below.		
MATH 5070	Applied Analysis	
or MATH 613:	Real Analysis	
MATH 5135	Functions of a Complex Variable	
MATH 5310	Probability	
MATH 5320	Statistical Inference	
MATH 5387	Applied Regression Analysis	
MATH 5390	Game Theory	
MATH 5490	Network Flows	
MATH 5593	Linear Programming	
MATH 5660	Numerical Analysis I	
MATH 5661	Numerical Analysis II	
MATH 5733	Partial Differential Equations	
MATH 5792	Probabilistic Modeling	
MATH 6023	Topics in Discrete Math	
MATH 6101	Uncertainty Quantification	
MATH 6131	Real Analysis	
MATH 6380	Stochastic Processes	
MATH 6384	Spatial Data Analysis	
MATH 6388	Statistical and Machine Learning	
MATH 6404	Applied Graph Theory	
MATH 6595	Nonlinear Programming	
MATH 6653	Introduction to Finite Element Methods	
MATH 6960	Research Methods in Mathematics and Statistics	

To learn more about the undergraduate Student Learning Outcomes for this program, please visit our website (https://clas.ucdenver.edu/mathematical-and-statistical-sciences/undergraduate-goals-and-objectives/).

To learn more about the graduate Student Learning Outcomes for this program, please visit our website (https://clas.ucdenver.edu/mathematical-and-statistical-sciences/ms-applied-mathematics-program-goals-objectives/).