MATHEMATICS - DATA SCIENCE OPTION, BS

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.

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 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/#policies) 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
1. Students must complete a total of 67-68 credit hours, from approved courses.
2. Students must complete at least 30 upper-division (3000-level and above) credit hours in the major.
3. Students must earn a minimum grade of C- (1.7) in all courses that apply to the major and must achieve a minimum cumulative major GPA of 2.25. Courses taken using P+/P/F or S/U grading cannot apply to major requirements.
4. Students must complete a minimum of 15 upper-division level MATH credit hours with CU Denver faculty.

Program Restrictions, Allowances and Recommendations
1. Students may not use any of the following MATH courses to count toward major requirements:
   • MATH 3195 Linear Algebra and Differential Equations
   • MATH 3800 Probability and Statistics for Engineers
   • MATH 4830 Applied Statistics

NEW COURSE LIST:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI</td>
<td>Fundamentals of Computing</td>
<td>43-44</td>
</tr>
<tr>
<td>1410/1411</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ISMG 3110</td>
<td>Data Governance and Ethics</td>
<td></td>
</tr>
<tr>
<td>MATH 1401</td>
<td>Calculus I</td>
<td></td>
</tr>
<tr>
<td>MATH 2411</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>MATH 2421</td>
<td>Calculus III</td>
<td></td>
</tr>
<tr>
<td>MATH 3376</td>
<td>Data Wrangling &amp; Visualization</td>
<td></td>
</tr>
<tr>
<td>MATH 3382</td>
<td>Statistical Theory</td>
<td></td>
</tr>
<tr>
<td>MATH 3810</td>
<td>Introduction to Probability</td>
<td></td>
</tr>
<tr>
<td>MATH 4387</td>
<td>Applied Regression Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Choose one:
- CSCI 2980 Foundations of Data Science
- MATH 2830 Introductory Statistics

Choose one:
- MATH 3191 Applied Linear Algebra
- MATH 3195 Linear Algebra and Differential Equations

Choose one path:
- UNIV 1110 College Success
- BUSN 2110 Cultivating Emotional Intelligence
- BUSN 3110 Career and Professional Development
- BMIN 2200 Career and Professional Development

Choose one (All courses but MATH 4779 requires the approval of the Director of Data Science and an advisor for the courses. CSCI 4840 or 4939 will only be approved for the Computer Science option. Must be taken for 3 credit hours)
- CSCI 4840 Independent Study
- CSCI 4939 Internship
- ISMG 3939 Internship
- ISMG 4840 Independent Study
- MATH 3939 Internship
- MATH 4779 Math Clinic
- MATH 4840 Independent Study

Complete the additional required courses:
- Options: General, Business, Chemistry, Economics, Geography, or Mathematics
- BMIN 1000 Introduction to Business
- ISMG 2050 Business Problem Solving Tools
- ISMG 3500 Business Data and Database Management
- MATH 4388 Machine Learning Methods
Choose one:  
BANA 4110 Business Analytics Process  
BANA 4120 Forecasting Techniques  
BANA 6610 Statistics for Business Analytics  
BANA 6620 Computing for Business Analytics  
BANA 6670 Prescriptive Analytics with Optimization  
BANA 6710 Causal Analytics  
BANA 6770 Evaluative Analytics  

Option: Computer Science  
CSCI 2312 Object Oriented Programming  
CSCI 2421 Data Structures and Program Design  
CSCI 2511 Discrete Structures  
CSCI 3412 Algorithms  
CSCI 3287 Database System Concepts  
CSCI 4580 Data Science  

OLD COURSE LIST:  

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1376</td>
<td>Programming for Data Science</td>
<td>3-4</td>
</tr>
<tr>
<td>CSCI 1410 &amp; CSCI 1411</td>
<td>Fundamentals of Computing and Fundamentals of Computing Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1401</td>
<td>Calculus I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 2411</td>
<td>Calculus II</td>
<td>5</td>
</tr>
<tr>
<td>MATH 2421</td>
<td>Calculus III</td>
<td>5</td>
</tr>
<tr>
<td>MATH 3000</td>
<td>Introduction to Abstract Mathematics</td>
<td>5</td>
</tr>
<tr>
<td>MATH 3191</td>
<td>Applied Linear Algebra</td>
<td>5</td>
</tr>
<tr>
<td>MATH 3310</td>
<td>Introduction to Real Analysis I</td>
<td>5</td>
</tr>
<tr>
<td>MATH 3376</td>
<td>Data Wrangling &amp; Visualization</td>
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<td>Applied Regression Analysis</td>
<td>5</td>
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<tr>
<td>MATH 4779</td>
<td>Math Clinic</td>
<td>5</td>
</tr>
<tr>
<td>MATH 4337</td>
<td>Intro to Statistical and Machine Learning</td>
<td>5</td>
</tr>
<tr>
<td>MATH 4388</td>
<td>Machine Learning Methods</td>
<td>5</td>
</tr>
</tbody>
</table>

Complete two MATH elective courses (at least six credit hours) above the 3000 level, excluding MATH 3041, MATH 3195, MATH 3511, MATH 3800, MATH 4015, and MATH 4830.  

Complete 9 additional credit hours (typically 3 courses), countable towards a major in one of the following subjects, at any level:  
Business (p. 2)  
Biology (p. 2)  
Chemistry (p. 3)  
Computer Science (p. 3)  
Economics (p. 3)  
Geography and Environmental Science (p. 3)  
Health and Behavioral Science (p. 3)  
Physics (p. 3)  
Sociology (p. 3)  

Business  
- Accounting, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/accounting-bs/)  
- Entrepreneurship, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/entrepreneurship-bs/)  
- Finance, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/finance-bs/)  
- Information Systems, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/information-systems-bs/)  
- International Business, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/international-business-bs/)  
- Management, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/management-bs/)  
- Marketing, BS in Business Administration (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/business-school/business-administration/marketing-bs/)  

Biology  
- Biology - Biotechnology Track, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/integrative-biology/biology—biotechnology-track-bs/)  
• Biology - Integrative Biology Track, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/integrative-biology/biology-integrative-biology-track-bs/)
• Biology - Microbiology Track, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/integrative-biology/biology-microbiology-track-bs/)
• Biology - Organisms and Ecosystems Track, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/integrative-biology/biology-organisms-ecosystems-track-bs/)

Chemistry
• Chemistry, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/chemistry/chemistry-bs/)

Computer Science
• Computer Science, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-engineering-design-computing/computer-science-engineering/computer-science-ba/)
• Computer Science, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-engineering-design-computing/computer-science-engineering/computer-science-bs/)

Economics
• Economics, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/economics/economics-ba/)

Geography and Environmental Science
• Geography - Environment, Society and Sustainability Option, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/geography-environmental-sciences/geography-environment-society-sustainability-option-ba/)
• Geography - Environmental Science Option, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/geography-environmental-sciences/geography-environmental-science-option-ba/)
• Geography - Urban Studies and Planning, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/geography-environmental-sciences/geography-urban-studies-planning-ba/)
• Geography, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/geography-environmental-sciences/geography-ba/)

Health and Behavioral Science
• Public Health, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/health-behavioral-sciences/public-health-ba/)

Physics
• Physics - Pure and Applied Physics Option, BS (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/physics/physics-pure-applied-physics-option-bs/)

Sociology
• Sociology - Gender and Society Concentration, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/sociology/sociology-gender-society-concentration-ba/)
• Sociology, BA (http://catalog.ucdenver.edu/cu-denver/undergraduate/schools-colleges-departments/college-liberal-arts-sciences/sociology/sociology-ba/)

Other areas allowable on a case-by-case basis.

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

To review the Degree Map for this program, please visit our website (https://www.ucdenver.edu/student/advising/undergraduate/degree-maps/clas/).