The data science and mathematics combined major combines computer science, data science, and mathematics into an integrated curriculum. The program provides the rigorous theoretical background necessary for success in the data science field.

### Program Requirements
Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

### University-Wide Requirements
All undergraduate students are required to complete the University-Wide Requirements ([http://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/](http://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/)).

### NUpath Requirements
All undergraduate students are required to complete the NUpath Requirements ([http://catalog.northeastern.edu/undergraduate/university-academics/nupath/](http://catalog.northeastern.edu/undergraduate/university-academics/nupath/)).

### Computer Science Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1200</td>
<td>First Year Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CS 1210</td>
<td>Professional Development for Khoury Co-op</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Programming Sequence Pathways
Choose one of two options 12

**Computer Science Option**
- CS 2500 and CS 2501: Fundamentals of Computer Science 1 and Lab for CS 2500
- CS 2510 and CS 2511: Fundamentals of Computer Science 2 and Lab for CS 2510
- CS 3500: Object-Oriented Design

**Data Science Option**
- DS 2000 and DS 2001: Programming with Data and Data Science Programming Practicum
- DS 2500 and DS 2501: Intermediate Programming with Data and Lab for DS 2500
- DS 3500: Advanced Programming with Data

#### Computer Science Required Courses
- CS 1800 and CS 1802: Discrete Structures and Seminar for CS 1800 (Integrative course)
- CS 3200: Database Design

#### Data Science Foundations
- DS 3000: Foundations of Data Science
- DS 4200: Information Presentation and Visualization
- DS 4300: Large-Scale Information Storage and Retrieval

### Mathematics Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MATH 1365</td>
<td>Introduction to Mathematical Reasoning</td>
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<tr>
<td>MATH 1341</td>
<td>Calculus 1 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1342</td>
<td>Calculus 2 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2321</td>
<td>Calculus 3 for Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2331</td>
<td>Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2341</td>
<td>Differential Equations and Linear Algebra for Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3081</td>
<td>Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3175</td>
<td>Group Theory</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3527</td>
<td>Number Theory 1</td>
<td>4</td>
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#### Mathematics Elective Requirement
Complete four courses in the following range: 16
- MATH 3001 to MATH 4999 but not MATH 4000

### Integrative Requirement

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>DS 4400</td>
<td>Machine Learning and Data Mining 1</td>
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<tr>
<td>DS 4420</td>
<td>Machine Learning and Data Mining 2</td>
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### Integrative Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>DS 4400</td>
<td>Machine Learning and Data Mining 1</td>
<td>4</td>
</tr>
<tr>
<td>DS 4420</td>
<td>Machine Learning and Data Mining 2</td>
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### Computer Science Writing Requirement

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ENGW 1111</td>
<td>First-Year Writing</td>
<td>4</td>
</tr>
<tr>
<td>ENGW 3302</td>
<td>Advanced Writing in the Technical Professions</td>
<td>4</td>
</tr>
<tr>
<td>or ENGW 3315</td>
<td>Interdisciplinary Advanced Writing in the Disciplines</td>
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</table>

### Advanced Writing in the Disciplines

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGW 1111</td>
<td>First-Year Writing</td>
<td>4</td>
</tr>
<tr>
<td>ENGW 3302</td>
<td>Advanced Writing in the Technical Professions</td>
<td>4</td>
</tr>
<tr>
<td>or ENGW 3315</td>
<td>Interdisciplinary Advanced Writing in the Disciplines</td>
<td>4</td>
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### Required General Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Complete 20 credits of general electives.</td>
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### Khoury College GPA Requirement
Minimum 2.000 GPA required in all CS, CY, DS, and IS courses
NUpath Requirements Satisfied

• Engaging with the Natural and Designed World
• Conducting Formal and Quantitative Reasoning
• Analyzing and Using Data
• Writing in the First Year
• Advanced Writing in the Disciplines
• Writing-Intensive in the Major
• Demonstrating Thought and Action in a Capstone

Integrating Knowledge and Skills Through Experience is satisfied through co-op.

Program Requirement
128 total semester hours required

Plan of Study
Sample Patterns:
Four Years, Two Co-ops in Summer 2/Fall

Year 1

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours Spring</th>
<th>Hours Summer 1</th>
<th>Hours Summer 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 1200</td>
<td>1 CS 2510</td>
<td>5 MATH 2321</td>
<td>4</td>
</tr>
<tr>
<td>and CS 2511</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CS 1800</td>
<td>5 MATH 1342</td>
<td>4 CS 3500</td>
<td>4</td>
</tr>
<tr>
<td>and CS 1802</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>CS 2500</td>
<td>5 MATH 1365</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>and CS 2501</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 1341</td>
<td>4 Elective</td>
<td>4</td>
<td></td>
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<tr>
<td>ENGW 1111</td>
<td>4</td>
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Year 2

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<tbody>
<tr>
<td>MATH 2331</td>
<td>4 CS 1210</td>
<td>1 MATH 3081</td>
<td>4 Co-op</td>
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<tr>
<td>MATH 2341</td>
<td>4 MATH 3527</td>
<td>4 Elective</td>
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<tr>
<td>CS 3200</td>
<td>4 DS 4200</td>
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<td>DS 3000</td>
<td>4 MATH elective</td>
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Year 3

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</tr>
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<tbody>
<tr>
<td>Co-op</td>
<td>0 MATH 3175</td>
<td>4 ENGW 3302</td>
<td>4 Co-op</td>
</tr>
<tr>
<td></td>
<td>0 DS 4200</td>
<td>4 Elective</td>
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<tr>
<td></td>
<td>0 DS 4300</td>
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Year 4

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<tbody>
<tr>
<td>Co-op</td>
<td>0 MATH 3527</td>
<td>4 Elective</td>
<td>4 Co-op</td>
</tr>
<tr>
<td></td>
<td>0 DS 4400</td>
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Year 5

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</thead>
<tbody>
<tr>
<td>Co-op</td>
<td>0 DS 4420</td>
<td>4</td>
<td>Khoury elective</td>
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Total Hours: 133

Five Years, Three Co-ops in Summer 2/Fall

Year 1

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<tbody>
<tr>
<td>CS 1800</td>
<td>5 CS 2510</td>
<td>5 Vacation</td>
<td>0 Co-op</td>
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<tr>
<td>and CS 1802</td>
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<td>CS 2500</td>
<td>5 MATH 1342</td>
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<tr>
<td>and CS 2501</td>
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<tr>
<td>MATH 1341</td>
<td>4 MATH 1365</td>
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</tr>
<tr>
<td>ENGW 1111</td>
<td>4 Elective</td>
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<td>CS 1200</td>
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Year 2

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<tbody>
<tr>
<td>CS 3500</td>
<td>4 CS 1210</td>
<td>1 Vacation</td>
<td>0 Co-op</td>
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<tr>
<td>MATH 2321</td>
<td>4 CS 3200</td>
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<tr>
<td>DS 3000</td>
<td>4 MATH 2331</td>
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<tr>
<td>MATH 2341</td>
<td>4 MATH 3081</td>
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Year 3

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<th>Hours Summer 2</th>
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</thead>
<tbody>
<tr>
<td>Co-op</td>
<td>0 MATH 3175</td>
<td>4 ENGW 3302</td>
<td>4 Co-op</td>
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<tr>
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<td>0 DS 4200</td>
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Year 4

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<tr>
<th>Fall</th>
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<tbody>
<tr>
<td>Co-op</td>
<td>0 MATH 3527</td>
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<td>4 Co-op</td>
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<td>0 DS 4400</td>
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Year 5

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<thead>
<tr>
<th>Fall</th>
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<tbody>
<tr>
<td>Co-op</td>
<td>0 DS 4420</td>
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<tr>
<td>Course</td>
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