MAJOR IN MATHEMATICS, APPLIED MATHEMATICS CONCENTRATION

The Applied Mathematics concentration prepares students for careers as applied mathematicians working in business, government, and industry. It is recommended that students supplement the core mathematical program with courses in their chosen application area; for example, engineering, public health, finance, electronics, or geology. Course requirements emphasize mathematical foundations as well as the application of mathematics in other disciplines. In particular, students receive training in numerical analysis, mathematical modeling, statistics, and computing, as well as a solid preparation for further study.

Requirements
Effective Fall 2018
A minimum grade of C is required in all mathematics, statistics, and computer science courses that are required for graduation.

<table>
<thead>
<tr>
<th>Freshman</th>
<th>AUCC</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 150</td>
<td>College Composition (GT-CO2)</td>
<td>1A</td>
</tr>
<tr>
<td>MATH 160</td>
<td>Calculus for Physical Scientists I (GT-MA1)</td>
<td>1B</td>
</tr>
<tr>
<td>MATH 161</td>
<td>Calculus for Physical Scientists II (GT-MA1)</td>
<td>1B</td>
</tr>
<tr>
<td>MATH 192</td>
<td>First Year Seminar in Mathematical Sciences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arts and Humanities</td>
<td>3B</td>
</tr>
<tr>
<td></td>
<td>Global and Cultural Awareness</td>
<td>3E</td>
</tr>
<tr>
<td></td>
<td>Historical Perspectives</td>
<td>3D</td>
</tr>
<tr>
<td></td>
<td>Social and Behavioral Sciences</td>
<td>3C</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Credits</td>
<td></td>
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<table>
<thead>
<tr>
<th>Sophomore</th>
<th>AUCC</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 235</td>
<td>Introduction to Mathematical Reasoning</td>
<td></td>
</tr>
<tr>
<td>MATH 261</td>
<td>Calculus for Physical Scientists III</td>
<td></td>
</tr>
<tr>
<td>MATH 369</td>
<td>Linear Algebra I</td>
<td>4A</td>
</tr>
<tr>
<td>PH 141</td>
<td>Physics for Scientists and Engineers I (GT-SC1)</td>
<td>3A</td>
</tr>
<tr>
<td>PH 142</td>
<td>Physics for Scientists and Engineers II (GT-SC1)</td>
<td>3A</td>
</tr>
<tr>
<td>STAT 315</td>
<td>Statistics for Engineers and Scientists</td>
<td></td>
</tr>
<tr>
<td>Select one course from the following:</td>
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<td>4</td>
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<tr>
<td>MATH 340</td>
<td>Introduction to Ordinary Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 345</td>
<td>Differential Equations</td>
<td></td>
</tr>
<tr>
<td>Select one group from the following:</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Group A:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 163 or 164</td>
<td>Java (CS1) No Prior Programming</td>
<td></td>
</tr>
<tr>
<td>CS 164</td>
<td>Java (CS1) Prior Programming</td>
<td></td>
</tr>
<tr>
<td>Group B:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS 155</td>
<td>Introduction to Unix</td>
<td></td>
</tr>
<tr>
<td>CS 156</td>
<td>Introduction to C Programming I</td>
<td></td>
</tr>
<tr>
<td>In addition, to complete Group B, select at least two of the following:</td>
<td></td>
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<tr>
<td>CS 157</td>
<td>Introduction to C Programming II</td>
<td></td>
</tr>
<tr>
<td>CS 158/MATH 158</td>
<td>Mathematical Algorithms in C</td>
<td></td>
</tr>
<tr>
<td>MATH 151</td>
<td>Mathematical Algorithms in Matlab</td>
<td></td>
</tr>
<tr>
<td>MATH 152</td>
<td>Mathematical Algorithms in Maple</td>
<td></td>
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<tr>
<td>Total Credits</td>
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<table>
<thead>
<tr>
<th>Junior</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>MATH 317</td>
<td>Advanced Calculus of One Variable</td>
<td>4B</td>
</tr>
<tr>
<td>MATH 450</td>
<td>Introduction to Numerical Analysis I</td>
<td></td>
</tr>
<tr>
<td>MATH 451</td>
<td>Introduction to Numerical Analysis II</td>
<td></td>
</tr>
</tbody>
</table>
Select two courses from the following:  

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 301</td>
<td>Introduction to Combinatorial Theory</td>
<td></td>
</tr>
<tr>
<td>MATH 331</td>
<td>Introduction to Mathematical Modeling</td>
<td></td>
</tr>
<tr>
<td>MATH 332</td>
<td>Partial Differential Equations</td>
<td></td>
</tr>
<tr>
<td>MATH 360</td>
<td>Mathematics of Information Security</td>
<td></td>
</tr>
</tbody>
</table>

Biological and Physical Sciences\(^1\)  
Mathematics Sciences\(^2\)  
Related Area\(^3\)  
Elective  

Total Credits: 30

Senior

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>JTC 300</td>
<td>Professional and Technical Communication (GT-CO3)</td>
<td></td>
</tr>
<tr>
<td>MATH 435</td>
<td>Projects in Applied Mathematics</td>
<td></td>
</tr>
</tbody>
</table>

Select one course from the following:  

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 417</td>
<td>Advanced Calculus I</td>
<td></td>
</tr>
<tr>
<td>MATH 419</td>
<td>Introduction to Complex Variables</td>
<td></td>
</tr>
<tr>
<td>MATH 430/ECE 430</td>
<td>Fourier and Wavelet Analysis with Apps</td>
<td></td>
</tr>
<tr>
<td>MATH 460</td>
<td>Information and Coding Theory</td>
<td></td>
</tr>
</tbody>
</table>

Mathematical Sciences\(^2\)  
Related Area\(^3\)  
Electives\(^4\)  

Total Credits: 30

Program Total Credits: 120

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**Major Completion Map**

**Distinctive Requirements for Degree Program:**

TO PREPARE FOR FIRST SEMESTER: The curriculum for the Major in Mathematics, Applied Mathematics Concentration assumes students enter college prepared to take calculus. Entering students who are not prepared to take calculus will need to fulfill pre-calculus requirements in the first semester: MATH 117, MATH 118, MATH 124, MATH 125, MATH 126. A minimum grade of C is required in all Mathematics, Statistics, and Computer Science courses that are required by the major.

### Freshman

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CO 150</td>
<td></td>
<td>1A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 160</td>
<td></td>
<td>X</td>
<td>1B</td>
<td>4</td>
</tr>
<tr>
<td>MATH 192</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Arts and Humanities</td>
<td></td>
<td>3B</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Historical Perspectives</td>
<td></td>
<td>3D</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
| Pre-Calculus Requirements must be completed by the end of Semester 1, if needed (MATH 117, MATH 118, MATH 124, MATH 125, MATH 126). | | | | | X

Total Credits: 14

<table>
<thead>
<tr>
<th>Semester 2</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 161</td>
<td></td>
<td>X</td>
<td>1B</td>
<td>4</td>
</tr>
<tr>
<td>Arts and Humanities</td>
<td></td>
<td>3B</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Global and Cultural Awareness</td>
<td></td>
<td>3E</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Social and Behavioral Sciences</td>
<td></td>
<td>3C</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td></td>
<td></td>
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</tbody>
</table>

Total Credits: 14

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\(^1\) Select from the list of courses (in a department other than Physics) in category 3A in the AUCC.\n
\(^2\) Select from upper-division MATH, CS, STAT courses, except those ending in –80 to –99.\n
\(^3\) A coherent set of courses outside the Mathematics Department in which mathematics is applied, approved by the concentration coordinator.\n
\(^4\) Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level).
CO 150, MATH 160 must be completed by the end of Semester 2.  

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 261</td>
<td></td>
<td></td>
<td>X</td>
<td>4</td>
</tr>
<tr>
<td>PH 141</td>
<td></td>
<td></td>
<td>X</td>
<td>3A</td>
</tr>
<tr>
<td>STAT 315</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Select one group from the following:

Group A:
- CS 163 or 164 Java (CS1) No Prior Programming
- Java (CS1) Prior Programming

Group B:
- CS 155 Introduction to Unix
- CS 156 Introduction to C Programming I

In addition, to complete Group B, select at least two of the following:
- CS 157 Introduction to C Programming II
- CS 158 Mathematical Algorithms in C
- MATH 151 Mathematical Algorithms in Matlab I
- MATH 152 Mathematical Algorithms in Maple

MATH 161 must be completed by the end of Semester 3.  

| Total Credits | 16 |

<table>
<thead>
<tr>
<th>Semester 4</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 235</td>
<td>Introduction to Mathematical Reasoning</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>MATH 369</td>
<td>Linear Algebra I</td>
<td>4A</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>PH 142</td>
<td>Physics for Scientists and Engineers II (GT-SC1)</td>
<td>3A</td>
<td></td>
<td>5</td>
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</table>

Select one course from the following:
- MATH 340 Introduction to Ordinary Differential Equations
- MATH 345 Differential Equations

MATH 261, PH 141 must be completed by the end of Semester 4.  

| Total Credits | 14 |

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 450</td>
<td>Introduction to Numerical Analysis I</td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Select two courses from the following:
- MATH 301 Introduction to Combinatorial Theory
- MATH 331 Introduction to Mathematical Modeling
- MATH 332 Partial Differential Equations
- MATH 360 Mathematics of Information Security

Related Area (See Concentration Coordinator) 3  
Elective 3  

MATH 369 must be completed by the end of Semester 5.  

| Total Credits | 15 |

<table>
<thead>
<tr>
<th>Semester 6</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 317</td>
<td>Advanced Calculus of One Variable</td>
<td>X</td>
<td>4B</td>
<td>3</td>
</tr>
<tr>
<td>MATH 451</td>
<td>Introduction to Numerical Analysis II</td>
<td>X</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Biological and Physical Sciences 3  
Mathematical Science Elective 3  
Related Area (See Concentration Coordinator) 3  

MATH 340 or MATH 345 must be completed by the end of Semester 6.  

| Total Credits | 15 |
### Senior

<table>
<thead>
<tr>
<th>Semester 7</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Science Elective</td>
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</tr>
<tr>
<td>Related Area (See Concentration Coordinator)</td>
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<td></td>
<td>3</td>
</tr>
<tr>
<td>Electives</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>MATH 450 must be completed by the end of Semester 7.</td>
<td>X</td>
<td></td>
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<tr>
<td>Total Credits</td>
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<table>
<thead>
<tr>
<th>Semester 8</th>
<th>Critical</th>
<th>Recommended</th>
<th>AUCC</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>JTC 300</td>
<td>X</td>
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<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 435</td>
<td>X</td>
<td></td>
<td>4C</td>
<td>3</td>
</tr>
<tr>
<td>Select one course from the following:</td>
<td>X</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MATH 417</td>
<td></td>
<td>Advanced Calculus I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 419</td>
<td></td>
<td>Introduction to Complex Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 430/ ECE 430</td>
<td></td>
<td>Fourier and Wavelet Analysis with Apps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Related Area (See Concentration Coordinator)</td>
<td>X</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td>X</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>The benchmark courses for the 8th semester are the remaining courses in the entire program of study.</td>
<td>X</td>
<td></td>
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<tr>
<td>Total Credits</td>
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<td>15</td>
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<tr>
<td>Program Total Credits:</td>
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