**B.S. in Data Science and Artificial Intelligence**

**Overview**

Data science (DS) is an interdisciplinary field focused on extracting knowledge from large data sets and applying that knowledge to solve problems. Artificial intelligence (AI) is the study of systems that perceive their environment and take actions that maximize their chance of achieving their goals. The two fields are interwoven, with DS systems using AI techniques for knowledge extraction and representation, and AI systems improving by examination of existing performance data. The proposed new major in Data Science and Artificial Intelligence gives students critical skills in both DS and AI, and teaches them about the interplay between the two fields. This knowledge is based on a foundational underpinning of computer science and mathematics, provides a range of electives to develop skills in subareas, and exposes the application of DS and AI in various domains.

**Curriculum Requirements for B.S. in Data Science and Artificial Intelligence**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>MAJOR REQUIREMENTS</strong></td>
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<tr>
<td><strong>Core Computer Science Courses</strong></td>
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<tr>
<td>CSC 113</td>
<td>Data Science for the World (New course: Data Science for Everyone) ¹</td>
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<tr>
<td>CSC 120</td>
<td>Computer Programming I</td>
<td>4</td>
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<tr>
<td>CSC 220</td>
<td>Computer Programming II</td>
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<tr>
<td>CSC 315</td>
<td>Introduction to Python for Scientists</td>
<td>3</td>
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<tr>
<td>CSC 317</td>
<td>Data Structures and Algorithm Analysis</td>
<td>3</td>
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<tr>
<td>CSC 545</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
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<tr>
<td>CSC 546</td>
<td>Introduction to Machine Learning with Applications</td>
<td>3</td>
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<tr>
<td><strong>Core Mathematics Courses</strong></td>
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<tr>
<td>MTH 161</td>
<td>Calculus I (Also fulfills Quantitative Proficiency Skills Requirement)</td>
<td>4</td>
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<tr>
<td>MTH 162</td>
<td>Calculus II</td>
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<tr>
<td>MTH 210</td>
<td>Introduction to Linear Algebra</td>
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<tr>
<td>MTH 224</td>
<td>Introduction to Probability and Statistics</td>
<td>3</td>
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<tr>
<td>MTH 309</td>
<td>Discrete Mathematics I</td>
<td>3</td>
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<tr>
<td><strong>Techniques</strong></td>
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<tr>
<td>CSC 115</td>
<td>Python Programming for Everyone (only if taken before CSC 120)</td>
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<td>CSC 322</td>
<td>System Programming</td>
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<td>CSC 423</td>
<td>Database Systems</td>
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<td>CSC 506</td>
<td>Logic and Automated Reasoning</td>
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<tr>
<td>CSC 542</td>
<td>Statistical Learning with Applications</td>
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<td>CIM 563</td>
<td>Design with AI</td>
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<tr>
<td>ECE 553</td>
<td>Neural Networks</td>
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<tr>
<td>ECE 574</td>
<td>Agent Technology</td>
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<tr>
<td>EPS 351</td>
<td>Introduction to Statistics and Research Design</td>
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<tr>
<td>EPS 401</td>
<td>Advanced statistics: Using regression for predictive modeling</td>
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<td>EPS 402</td>
<td>Statistical Programming in R and SAS</td>
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<tr>
<td>JMM 331</td>
<td>Introduction to Infographics and Data Visualization</td>
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<tr>
<td>JMM 429</td>
<td>Advanced Infographics and Data Visualization</td>
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<tr>
<td>MTH 524</td>
<td>Introduction to Probability</td>
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<tr>
<td>MTH 525</td>
<td>Introduction to Mathematical Statistics</td>
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<tr>
<td>MTH 542</td>
<td>Statistical Analysis</td>
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<tr>
<td>PHI 330</td>
<td>Ethics</td>
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<tr>
<td>PSY 292</td>
<td>Introduction to Biobehavioral Statistics Section B (not permitted with MTH 524, MTH 525, or MTH 542)</td>
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<tr>
<td><strong>Applications</strong></td>
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<tr>
<td>CSC 329</td>
<td>Introduction to Game Programming</td>
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<tr>
<td>CSC 410</td>
<td>Computer Science Project Planning ²</td>
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<tr>
<td>CSC 411</td>
<td>Computer Science Project Implementation</td>
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### Plan of Study

#### Freshman Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CSC 115 Python Programming for Everyone</td>
<td>3</td>
</tr>
<tr>
<td>CSC 113 Data Science for Everyone</td>
<td>4</td>
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<tr>
<td>MTH 161 Calculus I</td>
<td>4</td>
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<tr>
<td>WRS 105 First-Year Writing I</td>
<td>3</td>
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<tr>
<td>2nd Language</td>
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<td><strong>Credit Hours</strong></td>
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<table>
<thead>
<tr>
<th>Spring</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>CSC 120 Computer Programming I</td>
<td>4</td>
</tr>
<tr>
<td>MTH 162 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>WRS 106 First-Year Writing II</td>
<td>3</td>
</tr>
<tr>
<td>2nd Language</td>
<td>3</td>
</tr>
<tr>
<td><strong>Credit Hours</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
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1. EPS 402 may be accepted as an alternative to CSC 113. However, since EPS 402 is a 3 credit courses, students who take EPS 402 will be required to take additional elective credits to sum 120 for the B.S. degree.

2. To fulfill the Advanced Writing and Communication Skills requirement, students must complete 4 "W" courses including one of the following; CSC 405 Computer Science Seminars, CSC 410 Computer Science Project Planning, CSC 431 Introduction to Software Engineering or WRS 233 Advanced Writing for STEM.
### Sophomore Year

**Fall**
- CSC 220: Computer Programming II 4
- MTH 309: Discrete Mathematics I 3
- PHI 115: Social and Ethical Issues in Computing 3
- P&S Cognate 3
- 2nd Language 3

**Credit Hours** 16

**Spring**
- CSC 317: Data Structures and Algorithm Analysis 3
- MTH 224: Introduction to Probability and Statistics 3
- P&S Cognate 3
- Natural Science 3
- Elective 3

**Credit Hours** 15

### Junior Year

**Fall**
- CSC 315: Introduction to Python for Scientists 3
- MTH 210: Introduction to Linear Algebra 3
- P&S Cognate 3
- Elective 3
- Elective 3

**Credit Hours** 15

**Spring**
- CSC 546: Introduction to Machine Learning with Applications 3
- Application 3
- A&H Cognate 3
- Elective 3
- Elective 3

**Credit Hours** 15

### Senior Year

**Fall**
- CSC 545: Introduction to Artificial Intelligence 3
- Application 3
- A&H Cognate 3
- Elective 3
- Elective 3

**Credit Hours** 15

**Spring**
- Application 3
- A&H Cognate 3
- Elective 3
- Elective 3
- Elective 3

**Credit Hours** 15

**Total Credit Hours** 122

### Mission

The program aims to prepare students for professional and research careers in DS and AI, by giving them an understanding of both the principles and the practice of the two areas. The core courses will provide common knowledge that is necessary for all aspects of DS and AI; the elective courses will provide advanced knowledge in chosen subareas, and the application courses will illustrate how techniques in DS and AI can be applied in a range of domains. Additionally, the mathematics and statistics courses provide a formal basis for DS and AI techniques, and the ethics courses teach how
DS and AI should be used in modern society. Students with this major in DS and AI will find employment in a range of industries, or to continue into academic or industrial research.

**Learning Outcomes**

Students will be able to:

- Write efficient computer programs in several programming languages (minimally Python and Java), using appropriate data structures, to solve application problems.
- Use data analysis languages and libraries for the analysis of large data sets.
- Apply basic and advanced techniques of AI.
- Relate mathematical concepts and techniques to programming, data analysis, and AI algorithms.
- Use specialized tools and techniques from DS and AI, for data repositories, statistical analysis, data visualization, machine learning, etc.
- Translate their DS and AI skills to solve problems in application domains beyond computer science and mathematics.
- Use DS and AI in an ethical way.