DATA SCIENCE AND ENGINEERING MINOR

The Data Science and Engineering minor requires 8 courses: 4 core courses, 2 studio courses, and 2 elective courses. No more than 3 courses may be double counted within a student’s 16-unit major program. Courses with a grade lower than “C-” cannot be applied to the minor.

### Core courses (4 units):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>Statistics Foundations (1 course)</td>
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</tr>
<tr>
<td>BMD_ENG 220-0</td>
<td>Introduction to Biomedical Statistics</td>
</tr>
<tr>
<td>CHEM_ENG 312-0</td>
<td>Probability and Statistics for Chemical Engineering</td>
</tr>
<tr>
<td>CIV_ENV 306-0</td>
<td>Uncertainty Analysis</td>
</tr>
<tr>
<td>IEMS 201-0</td>
<td>Introduction to Statistics</td>
</tr>
<tr>
<td>IEMS 303-0</td>
<td>Statistics</td>
</tr>
<tr>
<td>Programming Foundations (1 course)</td>
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<tr>
<td>COMP_SCI 150-0</td>
<td>Fundamentals of Computer Programming 1.5</td>
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<tr>
<td>COMP_SCI 211-0</td>
<td>Fundamentals of Computer Programming II</td>
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<tr>
<td>COMP_SCI 230-0</td>
<td>Programming for Engineers</td>
</tr>
<tr>
<td>Intermediate Programming/Algorithmic Skills (1 course)</td>
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<tr>
<td>COMP_SCI 214-0</td>
<td>Data Structures &amp; Algorithms</td>
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<tr>
<td>COMP_SCI 217-0</td>
<td>Data Management &amp; Information Processing</td>
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<tr>
<td>Applied Machine Learning (1 course)</td>
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<tr>
<td>COMP_SCI 349-0</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>ELEC_ENG 375-0</td>
<td>Machine Learning: Foundations, Applications, and Algorithms</td>
</tr>
<tr>
<td>IEMS 304-0</td>
<td>Statistical Learning for Data Analysis</td>
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</tbody>
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### Data Science Studio Courses (2 units):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>DATA_ENG 200-0</td>
<td>Foundations of Data Science</td>
</tr>
<tr>
<td>DATA_ENG 300-0</td>
<td>Data Engineering Studio</td>
</tr>
</tbody>
</table>

### Elective Courses (2 units):

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>BMD_ENG 311-0</td>
<td>Computational Genomics</td>
</tr>
<tr>
<td>BMD_ENG 395-0</td>
<td>Topics in Biomedical Engineering (Biomedical Applications in Machine Learning)</td>
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<tr>
<td>CHEM_ENG 379-0</td>
<td>Computational Biology: Analysis and Design of Living Systems</td>
</tr>
<tr>
<td>CIV_ENV 304-0</td>
<td>Civil and Environmental Engineering Systems Analysis</td>
</tr>
<tr>
<td>CIV_ENV 473-0</td>
<td>Survey methods, data and analysis</td>
</tr>
<tr>
<td>CIV_ENV 480-1</td>
<td>Travel Demand Analysis &amp; Forecasting 1</td>
</tr>
<tr>
<td>CIV_ENV 480-2</td>
<td>Advances in Travel Demand Analysis and Forecasting</td>
</tr>
<tr>
<td>CIV_ENV 495-0</td>
<td>Selected Topics in Civil Engineering (Data Analytics for Transportation and Urban Infrastructure Applications)</td>
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<tr>
<td>COMP_SCI 348-0</td>
<td>Introduction to Artificial Intelligence</td>
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<tr>
<td>COMP_SCI 394-0</td>
<td>Agile Software Development</td>
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<tr>
<td>COMP_SCI 396-0</td>
<td>Special Topics in Computer Science (Deep Learning) or (Interactive Information Visualization) or (Computing, Ethics, and Society) or (Visualization for Scientific Communication)</td>
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<tr>
<td>COMP_SCI 397-0</td>
<td>Special Projects in Computer Science (Rapid Prototyping for Software Innovation)</td>
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<tr>
<td>ELEC_ENG 328-0</td>
<td>Information Theory &amp; Learning</td>
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<tr>
<td>ELEC_ENG 335-0</td>
<td>Deep Learning Foundations from Scratch</td>
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<tr>
<td>ELEC_ENG 373-0</td>
<td>Deep Reinforcement Learning</td>
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<tr>
<td>ELEC_ENG 395-0</td>
<td>Special Topics in Electrical Engineering (Optimization Techniques for Machine Learning and Deep Learning)</td>
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<tr>
<td>ELEC_ENG 424-0</td>
<td>Distributed Optimization</td>
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<tr>
<td>ELEC_ENG 433-0</td>
<td>Statistical Pattern Recognition</td>
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<tr>
<td>ES_APPM 345-0</td>
<td>Applied Linear Algebra</td>
</tr>
<tr>
<td>ES_APPM 375-1</td>
<td>Quantitative Biology I: Experiments, Data, Models, and Analysis</td>
</tr>
<tr>
<td>ES_APPM 375-2</td>
<td>Quantitative Biology II: Experiments, Data, Models, and Analysis</td>
</tr>
<tr>
<td>ES_APPM 472-0</td>
<td>Introduction to the Analysis of RNA Sequencing Data</td>
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<tr>
<td>ES_APPM 479-0</td>
<td>Data Driven Methods for Dynamical Systems</td>
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<tr>
<td>IEMS 307-0</td>
<td>Quality Improvement by Experimental Design</td>
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<tr>
<td>IEMS 308-0</td>
<td>Data Science and Analytics</td>
</tr>
<tr>
<td>IEMS 313-0</td>
<td>Foundations of Optimization</td>
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<tr>
<td>IEMS 340-0</td>
<td>Field Project Methods</td>
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<tr>
<td>IEMS 341-0</td>
<td>Social Networks Analysis</td>
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<tr>
<td>IEMS 351-0</td>
<td>Optimization Methods in Data Science</td>
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<tr>
<td>MAT_SCI 391-0</td>
<td>Process Design</td>
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<tr>
<td>MECH_ENG 301-0</td>
<td>Introduction to Robotics Laboratory</td>
</tr>
<tr>
<td>MECH_ENG 395-0</td>
<td>Special Topics in Mechanical Engineering (Mechanistic Data Science)</td>
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<tr>
<td>MECH_ENG 441-0</td>
<td>Engineering Optimization for Product Design and Manufacturing</td>
</tr>
<tr>
<td>MECH_ENG 469-0</td>
<td>Machine Learning and Artificial Intelligence for Robotics</td>
</tr>
<tr>
<td>MECH_ENG 495-0</td>
<td>Selected Topics in Mechanical Engg (Sensory Navigation and Machine Learning for Robotics)</td>
</tr>
</tbody>
</table>