# Management Science and Engineering Undergraduate Major

See the "Department of Management Science and Engineering (http://exploredegrees.stanford.edu/schoolofengineering/managementscienceandengineering)” section of this bulletin for additional information on the department, and its programs and faculty.

The department offers a B.S. as well as a minor in Management Science and Engineering.

## Management Science and Engineering (MS&E)

Completion of the undergraduate program in Management Science and Engineering leads to the conferral of the Bachelor of Science in Management Science and Engineering.

### Requirements

<table>
<thead>
<tr>
<th>Mathematics and Science</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to ten units of AP/IB Calculus, MATH 19, 20, 21, or 42.</td>
<td>10</td>
</tr>
<tr>
<td>All required; see SoE Basic Requirements 1 and 2</td>
<td>23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CME 100 or MATH 51</td>
<td>Vector Calculus for Engineers</td>
<td>Linear Algebra, Multivariable Calculus, and Modern Applications</td>
</tr>
<tr>
<td>CME 103</td>
<td>Introduction to Matrix Methods</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 120</td>
<td>Probabilistic Analysis</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 121</td>
<td>Introduction to Stochastic Modeling</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 125</td>
<td>Introduction to Applied Statistics</td>
<td></td>
</tr>
</tbody>
</table>

Select two of the following:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 31B</td>
<td>Chemical Principles II</td>
<td></td>
</tr>
<tr>
<td>CHEM 33</td>
<td>Structure and Reactivity of Organic Molecules</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 41 or PHYSICS 21</td>
<td>Mechanics</td>
<td>Mechanics, Fluids, and Heat</td>
</tr>
<tr>
<td>PHYSICS 43 or PHYSICS 23</td>
<td>Electricity and Magnetism</td>
<td>Electricity, Magnetism, and Optics</td>
</tr>
<tr>
<td>BIO 81</td>
<td>Introduction to Ecology</td>
<td></td>
</tr>
<tr>
<td>BIO 82</td>
<td>Genetics</td>
<td></td>
</tr>
<tr>
<td>BIO 83</td>
<td>Biochemistry &amp; Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>BIO 84</td>
<td>Physiology</td>
<td></td>
</tr>
<tr>
<td>BIO 85</td>
<td>Evolution</td>
<td></td>
</tr>
<tr>
<td>BIO 86</td>
<td>Cell Biology</td>
<td></td>
</tr>
</tbody>
</table>

Math, Science, or Statistics Elective from SoE approved lists. 3

### Engineering Depth

Core Courses (all six required) 6

<table>
<thead>
<tr>
<th>Unit</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 106B or CS 106X</td>
<td>Programming Abstractions</td>
<td></td>
</tr>
<tr>
<td>ECON 50</td>
<td>Economic Analysis I</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 108</td>
<td>Senior Project (WIM)</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 111 or MS&amp;E 111X</td>
<td>Introduction to Optimization</td>
<td>Introduction to Optimization (Accelerated)</td>
</tr>
<tr>
<td>MS&amp;E 140</td>
<td>Accounting for Managers and Entrepreneurs</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 180</td>
<td>Organizations: Theory and Management</td>
<td></td>
</tr>
</tbody>
</table>

Area Courses (see below) 24

Choose four courses from a primary area and two courses from each of the other two areas.

### Depth Areas

#### Finance and Decision Area

Students choosing F&D as their primary area must take at least two of ECON 51, MS&E 145 (or 245A), and MS&E 152 (or 252).

Introductory (no prerequisites)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 143</td>
<td>Finance and Society for non-MBAs</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 152</td>
<td>Introduction to Decision Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Intermediate (has prerequisites and/or appropriate for juniors and seniors)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS&amp;E 145</td>
<td>Introduction to Finance and Investment</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 146</td>
<td>Corporate Financial Management</td>
<td></td>
</tr>
<tr>
<td>MS&amp;E 252</td>
<td>Decision Analysis I: Foundations of Decision Analysis</td>
<td></td>
</tr>
</tbody>
</table>

Advanced (intended primarily for graduate students, but may be taken by advanced undergraduates)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS&amp;E 245A</td>
<td>Investment Science</td>
<td></td>
</tr>
</tbody>
</table>
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### Operations and Analytics Area

**Background requirements (two courses; letter-graded or CR/NC)**

- CME 100 or MATH 51: Linear Algebra, Multivariable Calculus, and Modern Applications
- CS 106A: Programming Methodology

**Minor requirements (seven courses; all letter-graded)**

- MS&E 111: Introduction to Optimization
- MS&E 120: Probabilistic Analysis
- MS&E 125: Introduction to Applied Statistics
- MS&E 180: Organizations: Theory and Management
- MS&E 111X: Introduction to Optimization (Accelerated)
- MS&E 121: Introduction to Stochastic Modeling
- MS&E 125: Introduction to Applied Statistics
- MS&E 180: Organizations: Theory and Management
- MS&E 111/ENGR 193: Principles of Engineering Risk Analysis

**Recommended courses**

- ENGR 145: Technology Entrepreneurship
- MS&E 175: Innovation, Creativity, and Change
- MS&E 182A: Leading Organizational Change
- MS&E 182B: Leading Organizational Change II
- MS&E 184: Future of Work: Issues in Organizational Learning and Design
- MS&E 185: Global Work
- MS&E 188: Organizing for Good
- MS&E 243: Energy and Environmental Policy Analysis
- MS&E 292: Health Policy Modeling
- MS&E 246: Financial Risk Analytics
- MS&E 250A: Engineering Risk Analysis
- MS&E 250B: Project Course in Engineering Risk Analysis
- MS&E 292: Methods and Models for Policy and Social Science
- MS&E 292: Introduction to Computational Social Science
- MS&E 267: Service Operations and the Design of Marketplaces
- MS&E 330: Law, Bias, & Algorithms
- MS&E 463: Healthcare Systems Design

**Organizations, Technology, and Policy Area**

**Background requirements (two courses; letter-graded or CR/NC)**

- CME 100 or MATH 51: Linear Algebra, Multivariable Calculus, and Modern Applications
- CS 106A: Programming Methodology

**Minor requirements (seven courses; all letter-graded)**

- MS&E 111: Introduction to Optimization
- MS&E 120: Probabilistic Analysis
- MS&E 125: Introduction to Applied Statistics
- MS&E 180: Organizations: Theory and Management
- MS&E 111/ENGR 193: Principles of Engineering Risk Analysis
- MS&E 121: Introduction to Stochastic Modeling
- MS&E 125: Introduction to Applied Statistics
- MS&E 180: Organizations: Theory and Management
- MS&E 111/ENGR 193: Principles of Engineering Risk Analysis

**Recommended courses**

- ENGR 145: Technology Entrepreneurship
- MS&E 175: Innovation, Creativity, and Change
- MS&E 182A: Leading Organizational Change
- MS&E 182B: Leading Organizational Change II
- MS&E 184: Future of Work: Issues in Organizational Learning and Design
- MS&E 185: Global Work
- MS&E 188: Organizing for Good
- MS&E 243: Energy and Environmental Policy Analysis
- MS&E 292: Health Policy Modeling

**Electives**

- Students must come from the School of Engineering approved list or PSYCH 50 Introduction to Cognitive Neuroscience, and may not repeat material from any other requirement. AP/IB credit for Chemistry and Physics may be used if not used above.

### Management Science and Engineering (MS&E) Minor

The following courses are required to fulfill the minor requirements:

**Background requirements (two courses; letter-graded or CR/NC)**

- CME 100 or MATH 51: Linear Algebra, Multivariable Calculus, and Modern Applications
- CS 106A: Programming Methodology

**Minor requirements (seven courses; all letter-graded)**

- MS&E 111: Introduction to Optimization
- MS&E 120: Probabilistic Analysis
- MS&E 125: Introduction to Applied Statistics
- MS&E 180: Organizations: Theory and Management
- MS&E 111/ENGR 193: Principles of Engineering Risk Analysis
- MS&E 121: Introduction to Stochastic Modeling
- MS&E 125: Introduction to Applied Statistics
- MS&E 180: Organizations: Theory and Management
- MS&E 111/ENGR 193: Principles of Engineering Risk Analysis

**Recommended courses**

- ENGR 145: Technology Entrepreneurship
- MS&E 175: Innovation, Creativity, and Change
- MS&E 182A: Leading Organizational Change
- MS&E 182B: Leading Organizational Change II
- MS&E 184: Future of Work: Issues in Organizational Learning and Design
- MS&E 185: Global Work
- MS&E 188: Organizing for Good
- MS&E 243: Energy and Environmental Policy Analysis
- MS&E 292: Health Policy Modeling

1. Students completing a calculus-based probability course such as CS 109 or STATS 116 for their major, may substitute another MS&E course for MS&E 120.