# Management Science and Engineering Undergraduate Major

## COVID-19-Related Degree Requirement Changes

For information on how Management Science and Engineering degree requirements have been affected by the pandemic, see the "COVID-19 Policies tab" ([http://exploredegrees.stanford.edu/schoolofengineering/managementscienceandengineering/#covid19policies](http://exploredegrees.stanford.edu/schoolofengineering/managementscienceandengineering/#covid19policies)) in the "Management Science and Engineering" of this bulletin. For University-wide policy changes related to the pandemic, see the "COVID-19 and Academic Continuity" ([http://exploredegrees.stanford.edu/covid-19-policy-changes/](http://exploredegrees.stanford.edu/covid-19-policy-changes/)) section of this bulletin.

See the "Department of Management Science and Engineering" ([http://exploredegrees.stanford.edu/schoolofengineering/managementscienceandengineering/](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, and/or 21.</td>
<td>10</td>
</tr>
<tr>
<td>All required; see SoE Basic Requirements 1 and 2</td>
<td>22</td>
</tr>
</tbody>
</table>

| CME 100 or MATH 51 | Vector Calculus for Engineers Linear Algebra, Multivariable Calculus, and Modern Applications |
| ENGR 108 | Introduction to Matrix Methods (formerly CME 103) |
| MS&E 120 | Introduction to Probability |
| MS&E 121 | Introduction to Stochastic Modeling |
| MS&E 125 | Introduction to Applied Statistics |

Select two of the following:  
- CHEM 31B: Chemical Principles II  
- CHEM 33: Structure and Reactivity of Organic Molecules  
- PHYSICS 41 or PHYSICS 21: Mechanics, Fluids, and Heat  
- PHYSICS 43 or PHYSICS 23: Electricity and Magnetism, and Optics  
- BIO 81: Introduction to Ecology  
- BIO 82: Genetics  
- BIO 83: Biochemistry & Molecular Biology  
- BIO 84: Physiology  
- BIO 85: Evolution  
- BIO 86: Cell Biology  

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

<table>
<thead>
<tr>
<th>Technology in Society</th>
<th>3</th>
</tr>
</thead>
</table>
| Select one of the following; see SoE Basic Requirement 4  
  - AA 252: Techniques of Failure Analysis  
  - BIOE 131: Ethics in Bioengineering  
  - COMM 120W: The Rise of Digital Culture  
  - CS 181: Computers, Ethics, and Public Policy  
  - CS 182: Ethics, Public Policy, and Technological Change  
  - ENGR 117: Expanding Engineering Limits: Culture, Diversity, and Equity  
  - ENGR 148: Principled Entrepreneurial Decisions  
  - ME 267: Ethics and Equity in Transportation Systems  
  - MS&E 193: Technology and National Security: Past, Present, and Future  
  - STS 1: The Public Life of Science and Technology |

<table>
<thead>
<tr>
<th>Engineering Fundamentals</th>
<th>12</th>
</tr>
</thead>
</table>
| Three required; see SoE Basic Requirement 3  
  - CS 106A: Programming Methodology  
  - MS&E 111: Introduction to Optimization or MS&E 111X: Introduction to Optimization (Accelerated) |

Select one of the following:  
- ENGR 10: Introduction to Engineering Analysis  
- ENGR 14: Intro to Solid Mechanics  
- ENGR 15: Dynamics  
- ENGR 20: Introduction to Chemical Engineering  
- ENGR 21: Engineering of Systems  
- ENGR 40A: Introductory Electronics  
- ENGR 40M: An Intro to Making: What is EE  
- ENGR 42: Introduction to Electromagnetics and Its Applications  
- ENGR 50: Introduction to Materials Science, Nanotechnology Emphasis  
- ENGR 50E: Introduction to Materials Science, Energy Emphasis  
- ENGR 50M: Introduction to Materials Science, Biomaterials Emphasis  
- ENGR 80: Introduction to Bioengineering (Engineering Living Matter)  
- ENGR 90: Environmental Science and Technology |

### Engineering Depth  

Core Courses (all six required)  
- CS 106B: Programming Abstractions  
- ECON 1: Principles of Economics  
- ECON 50: Economic Analysis I  
- MS&E 108: Senior Project (WIM)  
- MS&E 140: Accounting for Managers and Entrepreneurs  
- MS&E 180: Organizations: Theory and Management  

Area Courses (eight required; see below)  

### Depth Areas

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

### Finance and Decision Area

Students choosing F&D as their primary area must take at least two of ECON 51 (or MS&E 241), MS&E 145 (or 245A), and MS&E 152 (or 252).
Management Science and Engineering Undergraduate Major

I. Minor requirements (seven courses; all letter-graded)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS&amp;E 111</td>
<td>Introduction to Optimization</td>
<td>3-4</td>
</tr>
<tr>
<td>MS&amp;E 111X</td>
<td>Introduction to Optimization (Accelerated)</td>
<td>3-4</td>
</tr>
<tr>
<td>MS&amp;E 120</td>
<td>Introduction to Probability</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 121</td>
<td>Introduction to Stochastic Modeling</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 125</td>
<td>Introduction to Applied Statistics</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 180</td>
<td>Organizations: Theory and Management</td>
<td>4</td>
</tr>
<tr>
<td>Electives</td>
<td>(select any two 100- or 200-level MS&amp;E courses)</td>
<td>6</td>
</tr>
</tbody>
</table>

II. Recommended courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 50</td>
<td>Economic Analysis I</td>
<td>5</td>
</tr>
<tr>
<td>MS&amp;E 140</td>
<td>Accounting for Managers and Entrepreneurs</td>
<td>3-4</td>
</tr>
</tbody>
</table>

* Students without AP/IB mathematics credit, who skip MATH 19, 20, and/or 21, may petition to waive up to 10 units of math.
* AP/IB credit for Chemistry and Physics may be used.
* Electives must come from the School of Engineering approved list or PSYCH 50 Introduction to Cognitive Neuroscience, may not repeat material from any other requirement, and may not be used to also satisfy an engineering fundamentals or depth requirement. AP/IB credit for Chemistry and Physics may be used if not used above.
* A course may only be counted towards one requirement; courses used to satisfy the TiS requirement may not be used to also satisfy a depth area requirement.
* Engineering fundamentals plus engineering depth must total a minimum of 60 units. Recommended engineering fundamentals are E25B, E25E, E40A, E40M, and E80. MS&E majors may not use E60, or E70B as engineering fundamentals.
* Students may petition to waive CS 106A Programming Methodology after completion of CS 106B Programming Abstraction, and/or ECON 1 Principles of Economics after completion of ECON 50 Economic Analysis I.
* All courses taken for the major must be taken for a letter grade. Minimum combined GPA for all courses in Engineering Topics (Engineering Fundamentals and Depth courses) is 2.0.

For additional information and sample programs see the Handbook for Undergraduate Engineering Programs (UGHB) (http://ughb.stanford.edu).