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)" in this section 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)" section of this bulletin.

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.

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
Mathematics and Science
- Up to ten units of AP/IB Calculus, MATH 19, 20, 21, 41, or 42.
- All required; see SoE Basic Requirements 1 and 2

Mathematics and Science Elective from SoE approved lists.

Technology in Society
Math, Science, or Statistics Elective from SoE approved lists.

Select one of the following; see SoE Basic Requirement 4
- AA 252 Techniques of Failure Analysis
- COMM 120W The Rise of Digital Culture
- BIOE 131 Ethics in Bioengineering
- CS 181 Computers, Ethics, and Public Policy
- 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
- POLSCI 114S International Security in a Changing World
- STS 1 The Public Life of Science and Technology

Engineering Fundamentals
- Two courses; see SoE Basic Requirement 3
- CS 106A Programming Methodology
- 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 25B Biotechnology
  - ENGR 25E Energy: Chemical Transformations for Production, Storage, and Use
  - ENGR 40A Introductory Electronics
  - ENGR 40M An Intro to Making: What is EE
  - 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
- or CS 106X Programming Abstractions
- ECON 50 Economic Analysis I
- MS&E 108 Senior Project (WIM)
- MS&E 111 Introduction to Optimization
- or MS&E 111X Introduction to Optimization (Accelerated)
- MS&E 140 Accounting for Managers and Entrepreneurs
- MS&E 180 Organizations: Theory and Management

Area Courses (see below)
- 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)
- ECON 143 Finance and Society for non-MBAs
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS&amp;E 185</td>
<td>Global Work</td>
<td>6</td>
</tr>
<tr>
<td>MS&amp;E 188</td>
<td>Organizing for Good</td>
<td>6</td>
</tr>
<tr>
<td>MS&amp;E 243</td>
<td>Energy and Environmental Policy Analysis</td>
<td>6</td>
</tr>
<tr>
<td>MS&amp;E 292</td>
<td>Health Policy Modeling</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Students without AP/IB mathematics credit, who skip MATH 19, 20, 21, 41, and/or 42, may petition to waive up to 10 units of math.
2. AP/IB credit for Chemistry and Physics may be used.
3. Electives 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.
5. Students may petition to waive CS 106A Programming Methodology.
6. A course may only be counted towards one requirement; it may not be double-counted. For example, MS&E 193 may not count towards both TiS and towards the OTP depth area, and MS&E 111/ENGR 145 may not count towards both an engineering fundamental and towards the MS&E core depth.
7. 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).

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**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)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CME 100</td>
<td>Linear Algebra, Multivariable Calculus, and Modern Applications</td>
<td>5</td>
</tr>
<tr>
<td>or MATH 51</td>
<td>Programming Methodology</td>
<td>5</td>
</tr>
</tbody>
</table>

**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>or MS&amp;E 111X</td>
<td>Introduction to Optimization (Accelerated)</td>
<td>3-4</td>
</tr>
<tr>
<td>MS&amp;E 120</td>
<td>Probabilistic Analysis</td>
<td>5</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 (select any two 100- or 200-level MS&amp;E courses)</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Recommended courses**

In addition to the required background and minor courses, it is recommended that students also take the following courses.
<table>
<thead>
<tr>
<th>Course</th>
<th>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 (may be used as one of the required electives above)</td>
<td>3-4</td>
</tr>
</tbody>
</table>

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.