BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING - QUANTITATIVE REASONING CATEGORY III/IV AND STRETCH ENGLISH

129 Total Units Required
Minimum Number of Units in Major: 93

Course | Title | Units
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**First Semester**

ENG 104 | Writing the First Year: Finding Your Voice Stretch I | 3

ENGR 100 | Introduction to Engineering (Major Core) | 1

ENGR 101 | Engineering Graphics (Major Core) | 1

MATH 197 | Prelude to Calculus I (Prerequisite for MATH 226) | 3

**GE Area A: Oral Communication (A1)** | | 3

**GE Area C** | | 3

Units | 14

**Second Semester**

Select One (Major Core): 3-5

- CHEM 115 | General Chemistry I: Essential Concepts of Chemistry |
- CHEM 180 | Chemistry for the Energy and the Environment (B1, B3, ES) |

ENG 105 | Writing the First Year: Finding Your Voice Stretch II (A2) | 3

MATH 198 | Prelude to Calculus II (Prerequisite for MATH 226, B4) | 3

**GE Area C** | | 3

**GE Area D** | | 3

Units | 15-17

**Third Semester**

ENGR 200 | Materials of Engineering (Major Core) | 3

MATH 226 | Calculus I (Major Core, B4) | 4

**GE Area B: Life Science (B2)** | | 3

**GE Area D** | | 3

**Fourth Semester**

ENGR 103 | Introduction to Computers (Major Core) | 1

MATH 227 | Calculus II (Major Core) | 4

PHYS 220 & PHYS 222 | General Physics with Calculus I and General Physics with Calculus I Laboratory (Major Core, B1, B3) | 4

Modular Elective - Take Three | | 3

**GE Area E** | | 3

Units | 16

**Fifth Semester**

ENGR 102 | Statics (Major Core) | 3

MATH 228 | Calculus III (Major Core) | 4

PHYS 230 & PHYS 232 | General Physics with Calculus II and General Physics with Calculus II Laboratory (Major Core) | 4

**GE Area D** | | 3

GE Area UD-C: Upper-Division Arts and/or Humanities (Consider SF State Studies Course) | | 3

Units | 17

**Sixth Semester**

ENGR 201 | Dynamics (Major Core) | 5

ENGR 205 & ENGR 206 | Electric Circuits and Circuits and Instrumentation Laboratory (Major Core) | 4

MATH 245 | Elementary Differential Equations and Linear Algebra (Major Core) | 3

PHYS 240 & PHYS 242 | General Physics with Calculus III and General Physics with Calculus III Laboratory (Major Core) | 4

GE Area UD-D: Upper-Division Social Sciences (Consider SF State Studies Course) | | 3

Units | 17

**Seventh Semester**

ENGR 300 | Engineering Experimentation (Major Core) | 7

Units | 3
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGR 303</td>
<td>Engineering Thermodynamics (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 304</td>
<td>Mechanics of Fluids (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 305</td>
<td>Linear Systems Analysis (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 309</td>
<td>Mechanics of Solids (Major Core)</td>
<td>3</td>
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<td><strong>Units</strong></td>
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**Eighth Semester**

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<tbody>
<tr>
<td>ENGR 302</td>
<td>Experimental Analysis (Major Core)</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 364</td>
<td>Materials and Manufacturing Processes (Major Core)</td>
<td>3</td>
</tr>
</tbody>
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**Select One Set of Courses (Major Emphasis Elective):**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ENGR 410</td>
<td>Process Instrumentation and Control and Instrumentation and Process Control Laboratory</td>
<td>7</td>
</tr>
<tr>
<td>ENGR 447</td>
<td>Control Systems and Control Systems Laboratory</td>
<td>3</td>
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<tr>
<td>ENGR 447</td>
<td>Control Systems and Control Systems Laboratory</td>
<td>3</td>
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<tr>
<td>ENGR 467</td>
<td>Heat Transfer (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 696</td>
<td>Engineering Design Project I (Major Core)</td>
<td>1</td>
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<td></td>
<td><strong>Major Upper-Division Electives - Take One</strong></td>
<td><strong>3</strong></td>
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**Ninth Semester**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENGR 463</td>
<td>Thermal Power Systems (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 464</td>
<td>Mechanical Design (Major Core)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 697GW</td>
<td>Engineering Design Project II - GWAR (Major Core)</td>
<td>2</td>
</tr>
</tbody>
</table>

**Major Upper-Division Electives - Take Two**

**Total Units** 138-140

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1. ENG 114 can only be taken if you complete Directed Self-Placement (DSP) and select ENG 114; if you choose ENG 104/ENG 105 through DSP you will satisfy A2 upon successful completion of ENG 105 in the second semester; multilingual students may be advised into alternative English courses.

2. Depending on courses completed through Early Start, students in Pathway/Category III or IV may be required to enroll in a support course to complement their Quantitative Reasoning/B4 requirement. There are multiple course options for this pathway. Before enrolling in a B4 course, students should verify their MATH Pathway/Category in their Student Center. Information regarding the courses that correspond with your MATH Pathway/Category can be found on the Developmental Studies Office Website.

3. QR Category III students with a grade of B or higher in high school pre-calculus in the past year may be able to enroll in MATH 226. Please see a department advisor.

4. It is recommended that you meet the SF State Studies requirements (AERM, GP, ES, SJ) within your GE or major to avoid taking additional units.

5. GE Area A: Critical Thinking (A3) is satisfied upon completion of ENGR 205 and ENGR 201 or ENGR 213.

6. **Lower-Division Modular Electives (3 units)**
   - ENGR 271 Introduction to MATLAB (1 units)
   - ENGR 272 Engineering Project Management (1 units)
   - ENGR 291 Introduction to Creo Parametric (1 units)
   - ENGR 292 Introduction to Solid Works - Level I (1 units)
   - ENGR 294 Introduction to Microcontrollers (1 units)
   - ENGR 295 Design Methodology (1 units)

   Upper-Division General Education, Physical and Life Sciences (UD-B) is satisfied upon completion of ENGR 300 and one of ENGR 301 or ENGR 302.

7. Students must complete 21 units of upper-division Engineering units before registering for ENGR 696.
Upper-Division Major Electives (9 units)
Choice of upper-division electives must present a clearly identifiable educational objective and ensure that the program requirements in engineering science and design are met by all students. Distribution of credit units among engineering science and design is given in the Advising Guide. A study plan of intended upper-division electives must be approved by the student’s advisor and the program coordinator prior to the seventh semester of the Engineering program.
A total of nine units from the following list of courses is required, subject to the minimum number of units specified for each group. Courses selected for the controls (emphasis) elective may not be double-counted as upper-division electives.
ENGR 306 Electromechanical Systems (3 units)
ENGR 410 Process Instrumentation and Control (3 units) (Hidden Prerequisite for ENGR 411)
ENGR 411 Instrumentation and Process Control Laboratory (1 units)
ENGR 415 Mechatronics (4 units)
ENGR 432 Finite Element Methods in Structural and Continuum Mechanics (3 units)
ENGR 441 Fundamentals of Composite Materials (3 units)
ENGR 446 Control Systems Laboratory (1 units) (Hidden Prerequisite for ENGR 447)
ENGR 447 Control Systems (3 units)
ENGR 461 Mechanical and Structural Vibrations (3 units)
ENGR 465 Principles of HVAC (3 units)
ENGR 466 Gas Dynamics and Boundary Layer Flow (3 units)
ENGR 468 Applied Fluid Mechanics and Hydraulics (3 units)
ENGR 469 Alternative and Renewable Energy Systems (3 units)
ENGR 470 Biomechanics (3 units)
ENGR 610 Engineering Cost Analysis (3 units)
ENGR 699 Independent Study (1-3 units)
ENGR 820 Energy Resources and Sustainability (3 units)
ENGR 863 Advanced Thermal-Fluids (3 units)
ENGR 865 Energy-Efficient Buildings (3 units)
ENGR 866 Air Quality Engineering (3 units)
ENGR 867 Energy Auditing and Measurement and Verification (3 units)
ENGR 871 Advanced Electrical Power Systems (3 units)