Materials science and engineering is the basis for all engineering. Improvements in the quality of life require knowledge of the processing and properties of current materials and the design, development and application of new materials. The Materials Science and Engineering (MatSE) curriculum provides an understanding of the underlying principles of synthesis and processing of materials and of the interrelationships between structure, properties, and processing. Students learn how to create advanced materials and systems required, e.g., for flexible electronic displays and photonics that will change communications technologies, for site specific drug delivery, for self-healing materials, for enabling the transition to a hydrogen-based economy, and for more efficient photovoltaics and nuclear systems for energy production. The curriculum uses concepts from both basic physics and chemistry and provides a detailed knowledge of what makes the materials we use every day behave as they do.

Students in the first two years take courses in general areas of science and engineering as well as courses introducing the concepts in MatSE. In the third year, students study the common, central issues related to MatSE. In the senior year, students focus on an area of MatSE of their greatest interest, providing them with the detailed knowledge to be immediately useful to corporations, become entrepreneurs, or to provide the underpinning knowledge for graduate study. Note: students interested in biomaterials take a specific set of courses to provide them with a background in biology and chemistry while maintaining a strong engineering focus.

A combined B.S.-M.S. Materials Science and Engineering (http://catalog.illinois.edu/undergraduate/engineering/materials-engineering-bsms) degree program is available. Its admission and course requirements are described on The Grainger College of Engineering Advising website (https://wiki.illinois.edu/wiki/display/ugadvise/Majors%2CMinors+and+Certificates/#Majors,MinorsandCertificates-ComboBSMS) and the department’s website (https://matse.illinois.edu/academics/undergraduate-programs/combined-degree-program).

Overview of Curricular Requirements
The curriculum requires 128 hours for graduation and is organized as follows.

Orientation and Professional Development
These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Foundational Mathematics and Science
These courses stress the basic mathematical and scientific principles upon which this engineering discipline is based.

Materials Science and Engineering Technical Core
These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of materials science and engineering.

For All Students

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>CS 101</td>
<td>Intro Computing: Engrg &amp; Sci</td>
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<tr>
<td>ECE 205</td>
<td>Electrical and Electronic Circuits</td>
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Technical grade point average (TGPA) requirements for graduation and advanced-level course registration (https://wiki.illinois.edu/wiki/display/ugadvise/DegreeRequirements/#DegreeRequirements-TechnicalGPARequirement)

1 External transfer students take ENG 300 instead.
2 This optional course is highly recommended for freshmen and may be used to help meet free elective requirements.

Information listed in this catalog is current as of 07/2019
**For the Biomaterials Area**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>IE 300</td>
<td>Analysis of Data or STAT 400 Statistics and Probability I</td>
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<td>Thermodynamics of Materials</td>
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<td>MSE 402</td>
<td>Kinetic Processes in Materials</td>
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<td><strong>Total Hours</strong></td>
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1. The replacement of IE 300 with STAT 400 is not allowed for students in the Biomaterials Area unless one of their biomaterials area topical lectures and one of their topical lectures outside the biomaterials area are deemed by the Accreditation Board for Engineering and Technology (ABET) to be an engineering course. The extra hour of credit for STAT 400 may be used to help meet free elective requirements.

**For All Other Areas**

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<tr>
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<th>Title</th>
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<tr>
<td>MSE 404</td>
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<td><strong>Total Hours</strong></td>
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**Technical Electives**

These courses stress the rigorous analysis and design principles practiced in the major subdisciplines of materials science and engineering embodied in the MatSE focus areas.

**For the Biomaterials Area**

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<th>Title</th>
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<tr>
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<td>AE 410</td>
<td>Computational Aerodynamics</td>
<td>3 or 4</td>
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<td>AE 412</td>
<td>Viscous Flow &amp; Heat Transfer</td>
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<td>AE 416</td>
<td>Applied Aerodynamics</td>
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<td>AE 419</td>
<td>Aircraft Flight Mechanics</td>
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<td>AE 420</td>
<td>Finite Element Analysis</td>
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<td>Aerospace Systems Design II</td>
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**For All Other Areas**

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**For All Other Areas**

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**Total for all non-Biomaterials Students**

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<td>Polymer Science &amp; Engineering</td>
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<td>Intro to Combinatorics</td>
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<td>MATH 414</td>
<td>Mathematical Logic</td>
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<td>MATH 416</td>
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<td>Biochem &amp; Phys Basis of Life</td>
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<td>MCB 406</td>
<td>Gene Expression &amp; Regulation</td>
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<td>Immunology</td>
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<td>Developmental Biology, Stem Cells and Regenerative Medicine</td>
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<td>Molecular Microbiology</td>
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<td>Microbial Physiology</td>
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<td>MCB 432</td>
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<td>MCB 433</td>
<td>Virology &amp; Viral Pathogenesis</td>
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<td>MCB 435</td>
<td>Evolution of Infectious Disease</td>
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<td>MCB 442</td>
<td>Comparative Immunobiology</td>
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<td>Physical Biochemistry</td>
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<td>MCB 461</td>
<td>Cell &amp; Molecular Neuroscience</td>
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<td>Cell Structure and Dynamics</td>
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<tr>
<td>NPRE 241</td>
<td>Intro to Radiation Protection</td>
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</tbody>
</table>

*Information listed in this catalog is current as of 07/2019*
Information listed in this catalog is current as of 07/2019
Information listed in this catalog is current as of 07/2019.

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course in which courses would be taken by a student with no college course.
credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken. The first two years of the Suggested Sequence is the same for all MatSE students. The third and fourth years vary with the Focus Area chosen. Refer to the appropriate third and fourth year sequence.

### First Year

#### First Semester

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<thead>
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<tr>
<td>CHEM 102</td>
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<td>CHEM 103</td>
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<td>ENG 100</td>
<td>Engineering Orientation</td>
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**Semester Hours**: 14

#### Second Semester

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<td>General Chemistry Lab II</td>
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<td>MATH 225</td>
<td>Introductory Matrix Theory</td>
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<td>MATH 231</td>
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<td>MSE 183</td>
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<td>PHYS 211</td>
<td>University Physics: Mechanics</td>
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<td>RHET 105</td>
<td>Writing and Research (or Liberal education elective)</td>
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**Semester Hours**: 17

### Second Year

#### First Semester

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**Semester Hours**: 17

#### Second Semester

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<td>MATH 285</td>
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<td>MSE 206</td>
<td>Mechanics for MatSE</td>
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<td>PHYS 214</td>
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**Semester Hours**: 15

**Total Hours**: 63

### All students except Biomaterials Area

#### Third Year

#### First Semester

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<td>or STAT 400</td>
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<td>MSE 307</td>
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**Semester Hours**: 15

### Fourth Year

#### First Semester

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<td>MCB 450</td>
<td>Introductory Biochemistry</td>
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**Semester Hours**: 15

### Biomaterials Area

#### Third Year

#### First Semester

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<td>MSE 307</td>
<td>Materials Laboratory I</td>
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<td>MSE 401</td>
<td>Thermodynamics of Materials</td>
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<td>MSE 406</td>
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**Semester Hours**: 15

#### Second Semester

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**Semester Hours**: 15

### Fourth Year

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**Semester Hours**: 15

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*Information listed in this catalog is current as of 07/2019*
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<tr>
<td>Topical lecture outside of biomaterials area</td>
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**Second Semester**

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<tr>
<td>MSE 404 Laboratory Studies in Materials Science and Engineering</td>
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1. MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

2. RHET 105 may be taken in the first or second semester as authorized. The alternative is a social sciences or humanities elective.

3. Liberal education electives (https://wiki.illinois.edu/wiki/display/ugadvise/DegreeRequirements#DegreeRequirements-LiberalEducationElectives) must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course, (ii) one non-western culture(s) course, and (iii) one U.S. Minority Culture(s) course from the General Education cultural studies lists. Most students select liberal education courses that simultaneously satisfy two or more cultural studies requirements. Courses from the western and non-western lists that fall into free electives or other categories may also be used satisfy the cultural studies requirements.

4. This course is highly recommended for freshmen, who may use it to help meet free elective requirements.

5. The replacement of IE 300 with STAT 400 is not allowed for students in the Biomaterials Area unless one of their biomaterials area topical lectures and one of their topical lectures outside the biomaterials area are deemed by the Accreditation Board for Engineering and Technology (ABET) to be an engineering course. The extra hour of credit for STAT 400 may be used to help meet free elective requirements.

6. Satisfies the General Education Advanced Composition requirement.

7. To be selected from list of topical lecture courses (https://matse.illinois.edu/academics/undergraduate-programs/undergraduate-curriculum/topical-lectures) established by the department to provide an acceptable level of study in the student's chosen focus area.

8. During fourth year, strongly recommended is incorporation of one or more of an internship, co-op position, and a research project during summers or an academic semester, or both. For students who intend to continue in graduate school, recommended additionally is the undertaking of a research project (Senior Thesis) in the senior year. The project may take the place of 4-6 hours of free or technical electives.

9. Each section of MSE 404 is 1.5 hours. Students take 2 unique sections of MSE 404 for 3 hours.

10. Selected from the departmental list of approved technical electives (http://www.matse.illinois.edu/academics/undergraduate/curriculum/technical.html).

Information listed in this catalog is current as of 07/2019