BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING - MICRO- AND NANOENGINEERING

The undergraduate curriculum in mechanical engineering (ME) is very broad and flexible. The curriculum comprises a ME core of fundamental concepts, plus a design/professional-practice stem, plus 15 credit hours of free electives. The program prepares students to be problem solvers and to contribute to a wide range of industries and businesses, or to go on for further study in graduate school. There is a strong emphasis in the ME program on design, creativity, and hands-on learning. Due to the wide range of career choices open to MEs, the program incorporates courses in electronics, materials science, computer programming, and manufacturing. The large number of free elective hours allows students to pursue minors and certificates throughout the Institute, or to specialize in areas within ME. The flexibility also helps students to pursue a variety of special programs including co-op, internships, study abroad, and undergraduate research.

Program Educational Objectives

The faculty of the Woodruff School strives to continuously improve our undergraduate programs in mechanical engineering. The educational objectives reflect the needs, and have been reviewed by, among others, the Advisory Board of the Woodruff School, the faculty, and the students.

- Our graduates will be recognized leaders in ME-related fields or other career paths, including industry, academe, government, and non-governmental organizations.
- Our graduates will be global collaborators, leading and participating in culturally diverse teams, who fearlessly discover and apply new knowledge and engineering practices that have a world-wide impact.
- Our graduates will be adaptive learners who continue to grow professionally by obtaining professional registration or certification, or by earning post-graduate degrees.
- Our graduates will be entrepreneurially minded innovators who have a positive economic and social impact on their communities, the nation, and society as a whole.

Wellness

APPH 1040 Scientific Foundations of Health 2
or APPH 10 The Science of Physical Activity and Health

Core A - Essential Skills

ENGL 1101 English Composition I 3
ENGL 1102 English Composition II 3
MATH 1552 Integral Calculus 2 4

Core B - Institutional Options

CS 1371 Computing for Engineers 3

Core C - Humanities

Any HUM (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-c) 6

Core D - Science, Math, & Technology

PHYS 2211 Introductory Physics I 2 4
PHYS 2212 Introductory Physics II 4

MATH 1551 Differential Calculus 2 2
MATH 1553 Introduction to Linear Algebra 2 2

Core E - Social Sciences

Select one of the following:

HIST 2111 The United States to 1877 3
HIST 2112 The United States since 1877
INTA 1200 American Government in Comparative Perspective
POL 1101 Government of the United States
PUBP 3000 American Constitutional Issues

Select one of the following:

ECON 2100 Economic Analysis and Policy Problems 3
ECON 2101 The Global Economy
ECON 2105 Principles of Macroeconomics
ECON 2106 Principles of Microeconomics

Any SS (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/core-area-ss)

Core F - Courses Related to Major

CHEM 1130 General Chemistry 4
ME 1770 Introduction to Engineering Graphics and Visualization 3
MATH 2551 Multivariable Calculus 2 4
MATH 2552 Differential Equations 2 4
MSE 2001 Principles and Applications of Engineering Materials 3

Ethics Requirement (http://www.catalog.gatech.edu/academics/undergraduate/core-curriculum/ethics)

Major Requirements

COE 2001 Statics 2 2
ME 2016 Computer Applications 3
ME 2110 Creative Decisions and Design 3
ME 2202 Dynamics of Rigid Bodies 3
ME 3017 System Dynamics 3
ME 3057 Experimental Methodology and Technical Writing 3
ME 3322 Thermodynamics, Thermodynamics I 3
ME 3340 Fluid Mechanics, Fluid Mechanics I 3
ME 3345 Conduction and Radiation Heat Transfer 3
COE 3001 Mechanics of Deformable Bodies 3
ME 3210 Design, Materials, and Manufacture 3
ME 4056 Mechanical Engineering Systems Laboratory 3
ME 4182 Mechanical Design Engineering 3

Other Engineering Requirements

ECE 3710 Circuits and Electronics 2
ECE 3741 Instrumentation and Electronics Lab 1
ISYE 3025 Essentials of Engineering Economy 1
MATH 3670 Probability and Statistics with Applications 3

Micro- and Nanoengineering Concentration

ME 4315 Energy Systems Analysis and Design 3

Select four of the following: 3

CHBE 4020 Chemical Engineering in Nanoscale Systems 12
CHBE 4050 The Science and Engineering of Microelectronic Fabrication

Bachelor of Science in Mechanical Engineering - Micro- and Nanoengineering

### Cooperative Plan

Since 1912, Georgia Tech has offered a five-year Undergraduate Cooperative Program to those students who wish to combine career-related work experience with classroom studies. The program is the fourth oldest of its kind in the world.

Students typically alternate between industrial assignments and classroom studies until they complete at least three terms of work (two of which must be fall or spring). Co-op students complete the same coursework on campus that is completed by non-co-op students. Most co-op students begin the program as freshman or sophomores and are classified as full-time students regardless whether they are attending classes on campus or are full-time at an employer's location.

Participants have the opportunity to develop career interests, gain hands-on work experience, develop human relation skills and earn a paycheck. Graduates of the program receive a bachelor's degree with the Cooperative Plan Designation.

Students can also complete work assignments in a foreign country as part of the International Cooperative Program. This program is a great opportunity to utilize foreign language skills, gain a global perspective, and experience a diverse culture. Proficiency in a foreign language is necessary to earn the International Cooperative Plan degree designation. For more information on the Cooperative Program, visit: [www.coop.gatech.edu](http://www.coop.gatech.edu).

### Internships

The Undergraduate Professional Internship Program is for students who do not participate in the Cooperative Program, but want some career-related work experience before graduation. Students generally work for one semester, usually in the summer, with an option for more work. Students must have completed at least thirty hours of coursework at Georgia Tech before they can participate in the program. For more details, visit: [www.uci.gatech.edu](http://www.uci.gatech.edu).

In addition, there is a Work Abroad Program ([www.workabroad.gatech.edu](http://www.workabroad.gatech.edu)), which complements a student's formal education with paid international work experience directly related to Materials Science and Engineering. Participating students typically include juniors and seniors. The international work assignments are designed to include practical training, cross-cultural exposure and learning, and the acquisition of professional skills.

For more information about all of the programs in the Center for Career Discovery and Development, visit [www.careerdiscovery.gatech.edu](http://www.careerdiscovery.gatech.edu).

### Research Option

The Materials Science and Engineering undergraduate program offers a Research Option that allows students to participate in undergraduate research in faculty laboratories. The words "Research Option in Materials Science and Engineering" will appear on the transcript of each student completing the requirements to indicate that the student has had a substantial, in-depth, research experience.

The requirements for the "Research Option" in Materials Science and Engineering are:

1. Selection of a faculty advisor and research topic in conjunction with the faculty advisor. The topic and expected scope of the project must be approved in advance by the MSE Undergraduate Curriculum Committee. A key criterion will be whether the research may lead to a publishable paper.
2. Completion of nine units (see item 3 below) of supervised research, over a period of at least two, but preferably three, terms. Research may be either for pay or credit. At least six credit hours must involve work on a single research project.
3. Registration in nine hours of undergraduate research courses MSE 2698 and MSE 4698 (for pay), or MSE 2699 and MSE 4699 (for credit). MSE 2699 or MSE 4699 can be used to satisfy the free elective requirements of the BS degree in MSE.
4. Completion of LMC 4701 Undergraduate Research Proposal Writing (one hr. credit typically taken during the first or second semester of research). The student should write a Research Proposal while taking this class.

### Cooperative Plan Designation Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>CHEM 3412</td>
<td>Physical Chemistry II</td>
<td>1</td>
</tr>
<tr>
<td>ME 4766</td>
<td>Fabrication and Properties of Nanoscale Devices</td>
<td>3</td>
</tr>
<tr>
<td>ME 4803</td>
<td>Multiscale Thermal Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MSE 4325</td>
<td>Thin Film Materials Science</td>
<td>2</td>
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<tr>
<td>MSE 4330</td>
<td>Fundamentals of Nanomaterials and Nanostructures</td>
<td>3</td>
</tr>
<tr>
<td>MSE 4335</td>
<td>Soft Nano and Bio Materials</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 4262</td>
<td>Solid-state Physics</td>
<td>1</td>
</tr>
</tbody>
</table>

**Free Electives**

- **Electives 1**: 3 credit hours of 3000-level or higher ME course.
- **Electives 2**: 3 credit hours of 4000-level or higher ME course.
- **Electives 3**: 1 credit hour of 3000-level or higher course.
- **Electives 4**: 1 credit hour of 4000-level or higher course.
- **Electives 5**: 1 credit hour of non-ME course.

Total Credit Hours 36

No pass-fail courses allowed.

Student must earn a 2.0 GPA within Major Requirements and the following:

- **MSE 2001**: Principles and Applications of Engineering Materials
- **ECE 3710**: Circuits and Electronics
- **ECE 3741**: Instrumentation and Electronics Lab
- **ISYE 3025**: Essentials of Engineering Economy

If a course is repeated, only the latest grade is included in the calculation of the Major Requirements GPA.

1. Students must complete one Ethics course during their program.
2. Minimum grade of C required.
3. At least 3 credit hours in either the Concentration Electives or Free Electives must be a 3000-level or higher ME course. ME 3141, ME 3700, ME 3720, ME 3743, ME 3744, ME 4699, ME 4741, ME 4742, ME 4753, and ME 4903 are not allowed.
4. Excludes CEE 2040, PHYS 2802, PHYS 2XXX (AP Credit) and MGT 2250.
5. Students can use a maximum of 6 credit hours of VIP courses (ECE 2811, ECE 38X1, ECE 48X1) or a maximum of 6 credit hours of undergraduate research and special problems courses (2699, 4699, 4903 from any department) not to exceed 9 credit hours from both course groups towards the degree requirements for the BSME degree.

For more information about all of the programs in the Center for Career Discovery and Development, visit [www.careerdiscovery.gatech.edu](http://www.careerdiscovery.gatech.edu).
5. Obtain approval of the Research Proposal from the MSE Undergraduate Curriculum Committee. This is required before taking LMC 4702.

6. Completion of LMC 4702 (one hr. credit). This course is taken during the term in which the thesis is written.

7. Have research thesis approved by the faculty advisor and one other MSE faculty member approved by the MSE Undergraduate Curriculum Committee. The thesis will be evaluated on the basis of publishability, originality, creativity, and clarity. The MSE Undergraduate Curriculum Committee must approve each "Research Option" awarded under the BS MSE program.