This handbook is intended to support you as an entering and continuing undergraduate in the College of Engineering at Cornell University. (Some curriculum requirements may not be relevant to continuing students.) It has been prepared as a handy reference guide to the requirements, programs, policies, and procedures of the college. We hope that you will find the information you need for both planning and understanding your engineering education.

The College of Engineering would also like to emphasize the importance of the social and ethical implications of the work of engineers as a contribution to the improvement of society. You are fortunate to be a part of an educational community composed of people from many different parts of the world and from diverse ethnic groups in the United States. This diversity gives Cornell a rich multicultural character, and living in the Cornell community can be an opportunity to learn respect for the customs of others and to experience cultural pluralism in today’s world. We encourage you to seek out and explore courses and activities that address issues of race, gender, and ethnic diversity to gain a more valuable educational experience and to prepare for the practice of engineering.

Although this handbook embraces the development of an undergraduate engineering education, it does not constitute a complete or definitive statement of the policies of Cornell University and the College of Engineering. The university announcement *Courses of Study* is the official document of the university for defining academic programs and requirements. In addition, the final authority for academic degree requirements of the College of Engineering is jointly administered by the faculty of the College of Engineering, the College Curriculum Governing Board, and the faculty of the individual Majors within Engineering. For more complete information, consult the sources mentioned in this handbook, *Courses of Study*, and Engineering Advising in 167 Olin Hall.

We hope you find this handbook a useful resource as you progress through your years at Cornell. We wish you much success and welcome your suggestions for improvement of the handbook.

**Rich Robbins**
Director, Engineering Advising

**Fran Shumway**
Associate Director, Engineering Advising

**Melissa Hutson**
Assistant Director, Engineering Advising
Responsibility for Meeting Degree Requirements

Ultimately, students are responsible for understanding the degree requirements for their Majors and for planning their courses of study accordingly. They should consult the appropriate undergraduate office (listed on pages 10–12) for more specific information. The Major will provide a consultant who can answer specific questions and make binding decisions relating to the fulfillment of degree requirements. Faculty advisors will assist in course selection, but they are not responsible for ensuring that the courses selected meet degree requirements. That is the responsibility of the student.
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University and College Mission, Vision, and Values

Cornell University’s Mission and Values

“I would found an institution where any person can find instruction in any study.” Ezra Cornell, 1868

Cornell is a learning community that seeks to serve society by educating the leaders of tomorrow and extending the frontiers of knowledge.

In keeping with the founding vision of Ezra Cornell, our community fosters personal discovery and growth, nurtures scholarship and creativity across a broad range of common knowledge, and engages men and women from every segment of society in this quest. We pursue understanding beyond the limitations of existing knowledge, ideology, and disciplinary structure. We affirm the value to individuals and society of cultivation and enrichment of the human mind and spirit.

Our faculty, students, alumni, and staff strive toward these objectives in a context of freedom with responsibility. We foster initiative, integrity, and excellence, in an environment of collegiality, civility, and responsible stewardship. As the land-grant university for the state of New York, we apply the results of our endeavors in service to our alumni, the community, the state, the nation, and the world.

College of Engineering Undergraduate Programs Mission

The College of Engineering is dedicated to the transformation of its excellence in research and design to a correspondingly outstanding educational experience in engineering and applied science for a diverse group of baccalaureate students.

Specific missions are to:

• enroll and graduate a highly qualified and diverse undergraduate student body and enable their success.

• continuously improve the quality of the undergraduate education by ongoing evaluation of the common curriculum, assessment of teaching and learning, and implementation of improvements to the program based on those results.

• infuse the results of ongoing research, the capabilities of technology, the excitement of hands-on learning, and the experience of design projects into the undergraduate curricula.

• provide high-quality information and guidance to undergraduate students about the college, about curricula, and about future employment possibilities.

• oversee the educational progress of all students and encourage and enhance their success, both prior to affiliation with a Major and within the Major.

• collaborate with the faculty and administration of other Cornell colleges and organizations external to Cornell to efficiently provide the best possible undergraduate education.
Vision
Cornell Engineering will utilize the world-class intellectual resources and interdisciplinary opportunities of the college and university to prepare its undergraduate students for lifelong creation of knowledge and solutions to complex real-world problems.

Values
We believe that all students who enroll in the engineering college undergraduate program are capable of successfully graduating with a B.S. degree. We understand that young people in the typical undergraduate age range are maturing rapidly and therefore may change their professional and personal aspirations and may struggle with adjustments to campus life and academic expectations. It is our responsibility to maintain a curricular schedule that allows students to change directions and services to assist them in making informed decisions. We respect the variability of learning styles spanned by our students and faculty. We embrace the responsibilities of Cornell faculty members for preeminent research as well as for excellent undergraduate education. Furthermore, we highly value the need of everyone in our college community to balance workload and personal life. We prize an inclusive, respectful college environment in which community bonds and community responsibility exceed competitiveness.

Educational Objectives
College of Engineering graduates will demonstrate early in their careers an ability to:

• apply their general educational experience and specific knowledge of mathematics, science, and engineering to a wide variety of careers including industry, advanced engineering study, nontraditional engineering-related career paths, and graduate study.

• perform in a modern diverse working environment in which they will work in multidisciplinary teams and communicate effectively with both professional colleagues and the public.

• lead design processes that include consideration of the impact designs have on people, societies, and nature.

• model, analyze, and solve complex problems from a systems perspective.

• recognize contemporary global issues and their professional and ethical responsibility to contribute to solutions for the social, economic, and environmental challenges faced by humanity.

• engage in self-directed learning, including the pursuit of graduate study and professional development activities.
Guide to Important Resources

College of Engineering
Office of the Dean, 242 Carpenter Hall, 255.9679
Associate Dean for Undergraduate Programs, 167 Olin Hall, 255.8240
Assistant Dean for Student Services, 167 Olin Hall, 255.8240
Career Services, 201 Carpenter Hall, 255.5006
Cooperative Education Program, 201 Carpenter Hall, 255.5006
Diversity Programs in Engineering, 146 Olin Hall, 255.6403
Engineering Advising, 167 Olin Hall, 255.7414
Engineering Communications Program, 425 Hollister Hall, 255.8558
Engineering Library, Carpenter Hall, 255.5933
Engineering Learning Initiatives, 167 Olin Hall, 255.9622
Engineering Registrar, 158 Olin Hall, 255.7140

Personal Counseling Services
Campus Life Central Office, 2336 South Balch Hall, 255.5511
Cornell United Religious Work, Anabel Taylor Hall, 255.4214
Counseling and Psychological Services, ground floor, Gannett Health Center, 255.5208
Diversity Programs in Engineering, 146 Olin Hall, 255.6403
EARS (Empathy, Assistance, and Referral Service), 211 Willard Straight Hall, 255.EARS
Engineering Advising, 167 Olin Hall, 255.7414
International Students and Scholars Office, B50 Caldwell Hall, 255.5243
Office of Equal Opportunity, 234 Day Hall, 255.3976
Student Life Union, 401 Willard Straight Hall, 255.6839
Suicide Prevention and Crisis Service, Ithaca, NY 14850, 272.1616 (24 hrs.)

Tutorial and Academic Support Services
Behrman Biology Center, 216 Stimson Hall, 255.7429
Center for Learning and Teaching, 420 Computing and Communications Center, 255.6310
Department of Computer Science, 303 Upson Hall, 255.0982
Diversity Programs in Engineering, 146 Olin Hall, 255.6403
Engineering Advising, 167 Olin Hall, 255.7414
Engineering Learning Initiatives, 167 Olin Hall, 255.9622
Mathematics Support Center, 256–258 Malott Hall, 255.4658
Writing Workshop, 174 Rockefeller Hall, 255.6349
Career and Professional Development Services

Engineering Career Services, 201 Carpenter Hall, 255.5006
Engineering Cooperative Education Program, 201 Carpenter Hall, 255.5006
Master of Engineering Program, 222 Carpenter Hall, 255.7413
University Career Center, 103 Barnes Hall, 255.5221

Other Resources

Bursar's Office, 260 Day Hall, 255.6413
Campus Life, 2336 Balch Hall, 255.5511
Continuing Education and Summer Sessions, B20 Day Hall, 255.4987
Dean of Students Office, 401 Willard Straight Hall, 255.6839
Financial Aid and Student Employment, 203 Day Hall, 255.5145
Gannett Health Center, Gannett Health Services, 255.5155
Housing and Dining Office, 206 Robert Purcell Community Center, 255.5368
Internal Transfer Division, 220 Day Hall, 255.4386
International Students and Scholars Office, B50 Caldwell Hall, 255.5243
Judicial Administrator, 500 Day Hall, 255.4680
Office of Minority Educational Affairs (COSEP), 100 Barnes Hall, 255.3841
Ombudsman, 118 Stimson Hall, 255.4321
Student Disability Services, 4th floor, Computing and Communications Center, 255.4545
University Registrar, B7 Day Hall, 255.4232, univreg@cornell.edu
Undergraduate Major Consultants and Coordinators

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Brenda Marchewka
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Carol Casler
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Civil Engineering (CE)
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Nadine Porter
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Kelli Hulslander
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Environmental Engineering (EnvE)
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Brenda Marchewka
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Independent Major (IM)
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Information Science, Systems, and Technology (ISST)
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Undergraduate Office
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Materials Science and Engineering (MS&E)
  
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  Joseph Sweet  
  jcs9@cornell.edu  
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  289 Grumman Hall, 255.8309  

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  Cindy Jay  
  cjh6@cornell.edu  
  203 Rhodes Hall, 255.5088  

Science of Earth Systems (SES)
  
  Bryan Isacks  
  bli1@cornell.edu  
  3110 Snee Hall, 255.2307  

  Undergraduate Coordinator  
  2124 Snee Hall, 255.5466
## Requirements for the Bachelor of Science Degree

<table>
<thead>
<tr>
<th>Category</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mathematics</td>
<td>15–16</td>
</tr>
<tr>
<td>MATH 191, 192, 293 or 294, and a mathematics course chosen by the Major.</td>
<td></td>
</tr>
<tr>
<td>2. Physics</td>
<td>8–12</td>
</tr>
<tr>
<td>PHYS 112 and 213, and, depending on the Major, either PHYS 214 or a designated mathematics or science course. Majors in ChemE, CS, SES, and the Environmental Engineering Option in BE may substitute CHEM 208 for PHYS 214. Majors in CE may substitute CHEM 208 or CHEM 257/357 for PHYS 214. Majors in ORE may substitute CHEM 208, CS 280, or MATH 293, 304, 311, or 336 for PHYS 214. Majors in BE and EnvE, and students in the Environmental Engineering Concentration of CE must take CHEM 257/357 instead of PHYS 214.</td>
<td></td>
</tr>
<tr>
<td>3. Chemistry</td>
<td>4–8</td>
</tr>
<tr>
<td>CHEM 209. Majors in ChemE, ORE, SES, or those planning on a health-related career should take CHEM 209 and then 208. Students in EnvE, the Environmental Engineering Option in BE, or the Environmental Engineering Concentration of CE should take CHEM 209 and CHEM 257/357.</td>
<td></td>
</tr>
<tr>
<td>4. First-year writing seminars (two courses)</td>
<td>6</td>
</tr>
<tr>
<td>5. Technical writing requirement (see page 15)</td>
<td>3</td>
</tr>
<tr>
<td>6. Computing (usually CS 100J or CS 100M followed by CS 101M or CS 101J)</td>
<td>5</td>
</tr>
<tr>
<td>7. Engineering distribution</td>
<td></td>
</tr>
<tr>
<td>a. one introduction to engineering (ENGRI) course</td>
<td>3</td>
</tr>
<tr>
<td>b. two distribution courses (ENGRD), one of which may be required by the Major</td>
<td>6</td>
</tr>
<tr>
<td>8. Liberal studies distribution (six courses)</td>
<td>18</td>
</tr>
<tr>
<td>9. Approved electives (two courses)</td>
<td>6</td>
</tr>
<tr>
<td>10. Major program</td>
<td></td>
</tr>
<tr>
<td>a. Major-required courses</td>
<td>≥30</td>
</tr>
<tr>
<td>b. Major-approved electives</td>
<td>9</td>
</tr>
<tr>
<td>c. Courses outside the Major</td>
<td>9</td>
</tr>
</tbody>
</table>

From 124 to 134 credits are required for graduation. The exact number depends on the Major; the specific requirements for each Major are given on the following pages. In addition, all students must complete two terms of physical education and pass the swim test, preferably in the first year.
College of Engineering Majors

In the first two years, students in the College of Engineering take a set of courses designed to provide a firm foundation for later specialization. This set of courses conforms to the Common Curriculum, which is established by the College Curriculum Governing Board (CCGB) and administered through Engineering Advising. During the second year, students choose and affiliate with an undergraduate Major (see list below); thereafter, they take courses to satisfy the Bachelor of Science degree in that Major.

Biological Engineering (BE)
Chemical Engineering (ChemE)
Civil Engineering (CE)
Computer Science (CS)
Electrical and Computer Engineering (ECE)
Engineering Physics (EP)
Environmental Engineering (EnvE)
Independent Major (IM)
Information Science, Systems, and Technology (ISST)
Materials Science and Engineering (MS&E)
Mechanical Engineering (ME)
Operations Research and Engineering (ORE)
Science of Earth Systems (SES)

Requirements for Graduation

The detailed requirements of the Common Curriculum appear in the university announcement *Courses of Study*, which is revised annually. Students should become familiar with this material, because they are ultimately responsible for meeting all graduation requirements.

The Common Curriculum and the Bachelor of Science degree require a certain number of credits in courses belonging to 10 categories.

Category 1. Mathematics

Students must earn at least a grade of C– in MATH 191, 192, 293, or 294, and an approved Major-specific mathematics course. Students who do not meet this requirement the first time they take a course must immediately repeat the course and earn a satisfactory grade. Students may not enroll in the next course in the sequence until they have done so. (A grade lower than C– the second time will result in dismissal from the engineering program.) Courses taken a second time to meet this requirement do not yield additional credit toward a degree.
Category 2. Physics
Students must earn at least a grade of C– in MATH 191 or have substantial previous contact with introductory calculus combined with co-registration in MATH 191 before taking PHYS 112. Similarly, at least a grade of C– is required in each subsequent mathematics course before taking the physics course for which it is a prerequisite (MATH 293 is a co- or prerequisite for PHYS 213; MATH 294 is a co- or prerequisite for PHYS 214).

Category 3. Chemistry
Students who do not intend further study in chemistry should enroll in CHEM 211 during either semester of the first year. Students are required to receive credit for CHEM 209 either through AP credit or by successful completion of the course. Students choosing the CHEM 209 and then 208 sequence must enroll in CHEM 209 during the fall semester of the first year so that they may enroll in CHEM 208 during the spring term. Students must earn at least a grade of C–.

Category 4. Computing
CS 100: Introduction to Computer Programming is taken in the first year, followed by CS 101, to fulfill the computing requirement. If the first course is Java-based, the CS 101 course must be MatLab-based, and vice versa. The CS 101 course should be completed by the end of the second year.

Before taking CS 100, some students take CS 099: Fundamental Programming Concepts, which is offered in the summer only. CS 099 may not be used as credit toward graduation.

Category 5. First-Year Writing Seminars
During each semester of the first year, students must choose a first-year writing seminar from among more than 100 courses offered by more than 30 different departments in the humanities, social sciences, and expressive arts.

These courses, which offer the benefits of small class size, provide an opportunity to practice writing English prose.

Category 6. Technical Writing
Students can fulfill the upper-level technical-writing requirement in one of the six ways shown below. For more information, see www.engineering.cornell.edu/ECP/.

1. ENGRC 335 or ENGRC 350, taught by the Engineering Communications Program.

2. The Writing-Intensive Co-op, an opportunity to combine work and academics. Some co-op students do a significant amount of writing on the job, and, under certain circumstances, this writing may satisfy the college’s technical-writing requirement.
3. An officially designated writing-intensive (W-I) engineering course:

- ENGRD/A&EP 264: Computer-Instrumentation Design
- CHEME 432: Chemical Engineering Laboratory
- MS&E 403/404 (both): Senior Materials Laboratory I and II
- MS&E 405/406 (both): Senior Thesis I and II
- M&AE 427: Fluids/Heat Transfer Laboratory
- BEE 450: Bioinstrumentation with co-registration in BEE 493: Technical Writing for Engineers
- BEE 473: Watershed Engineering with co-registration in BEE 493: Technical Writing for Engineers
- BEE 489: Engineering Entrepreneurship, Management, and Ethics

4. ENGRC 302, a one-credit attachment to an engineering course that is not one of the officially designated W-I courses (see #3 above). An instructor may wish to extend the writing done in their course for a given semester so that it will fulfill the technical-writing requirement. With the approval of the CCGB’s Subcommittee on Technical Writing, the instructor may have students co-register in ENGRC 302. (May be taken more than once, with different courses, by permission of engineering instructor.)

5. COMM 260: Scientific Writing for Public Information, COMM 263: Organizational Writing, or COMM 352: Science Writing for the Mass Media, taught by the Department of Communication (in the College of Agriculture and Life Sciences)

6. Petition. Occasionally, students will be doing a significant amount and variety of technical writing elsewhere in the engineering college. It may be appropriate to submit a petition to the CCGB’s Subcommittee on Technical Writing for permission to use their upcoming writing (not past writing) to meet the technical-writing requirement.

Category 7. Engineering Distribution

The Common Curriculum requires three distribution courses (9 credits). One intro-to-engineering course (with the course acronym ENGRI), is to be completed during the first year. The remaining two distribution courses (with the course acronym ENGRD) should be completed by the end of the third semester. Some Majors may require additional distribution courses, taken after a student affiliates with a Major. All Common Curriculum distribution requirements must be fulfilled by the end of the second year.

The intro-to-engineering course introduces students to the engineering process and provides a substantive experience in open-ended problem-solving. The following courses fulfill this requirement:

- ENGRI 101: Intro to Biomedical Engineering Analysis. Requires concurrent registration in BIO G 110: Biological Principles. (spring)
- ENGRI 102: Introduction to Nanoscience and Nanoengineering (fall, spring)
Two engineering distribution (ENGRD) courses (6–8 credits) must be selected from two different categories listed below. A student may use any one of the possible substitutions described.

1. **Scientific Computing**
   - ENGRD 211: Computers and Programming
   - ENGRD 241: Engineering Computation
   - ENGRD 321: Numerical Methods in Computational Molecular Biology
   - ENGRD 322: Introduction to Scientific Computation

2. **Materials Science**
   - ENGRD 261: Mechanical Properties of Materials; From Nanodevices to Superstructures
   - ENGRD 262: Electronic Materials for the Information Age

3. **Mechanics**
   - ENGRD 202: Mechanics of Solids
   - ENGRD 203: Dynamics

4. Probability and Statistics

ENGRD 270: Basic Engineering Probability and Statistics

Majors in Electrical and Computer Engineering may substitute ECE 310: Introduction to Probability and Random Signals for ENGRD 270. Majors in Engineering Physics may substitute ECE 310 or MATH 471: Basic Probability for ENGRD 270. Majors in Civil, Biological, or Environmental Engineering may substitute CEE 304: Uncertainty Analysis in Engineering for ENGRD 270.

5. Electrical Sciences

ENGRD 210: Introduction to Circuits for Electrical and Computer Engineers
ENGRD 230: Introduction to Digital Logic Design
ENGRD 264: Computer-Instrumentation Design

6. Thermodynamics and Energy Balances

ENGRD 219: Mass and Energy Balances
ENGRD 221: Thermodynamics

7. Earth and Life Sciences

ENGRD 201: Introduction to the Physics and Chemistry of the Earth
ENGRD 251: Engineering for a Sustainable Society
ENGRD 260: Principles of Biological Engineering

8. Biology and Chemistry

BIO G 101 and 103: Biological Sciences, Lectures and Laboratory
BIO G 105: Introductory Biology
BIO G 107: General Biology
CHEM 389: Honors Physical Chemistry I
ENGRD 252: The Physics of Life

Category 8. Liberal Studies Distribution

Global and diverse societies require that engineers have an awareness of historical patterns, an appreciation for different cultures, professional ethics, the ability to work in multifaceted groups, and superior communication skills. Cornell has a rich curriculum in the humanities, arts, and social sciences, enabling every engineering student to obtain a truly liberal education. A minimum of six courses (totaling at least 18 credits) is required, and these should be chosen with as much care and foresight as courses from technical areas.

• The six courses must be chosen from at least three of the following six groups.
• At least two courses must be at the 200 level or higher.
Refer to the web page of Cornell Engineering Advising (www.engineering.cornell.edu/programs/undergraduate-education/degree-requirements/liberal-studies.cfm) or visit Engineering Advising, 167 Olin Hall, for a complete list of acceptable courses in those groups.

**Group 1. Cultural Analysis (CA)**

Courses in this area study human life in particular cultural contexts through interpretive analysis of individual behavior, discourse, and social practice. Topics include belief systems (science, medicine, and religion); expressive arts and symbolic behavior (visual arts, performance, poetry, myth, narrative, and ritual); identity (nationality, race, ethnicity, gender, and sexuality); social groups and institutions (family, market, and community); and power and politics (states, colonialism, and inequality).

**Group 2. Historical Analysis (HA)**

Courses in this area interpret continuities and changes—political, social, economic, diplomatic, religious, intellectual, artistic, and scientific—through time. The focus may be on groups of people, a specific country or region, an event, a process, or a time period.

**Group 3. Literature and the Arts (LA)**

Offerings in this area explore literature and the arts in two different but related ways. Some courses focus on the critical study of art works and on their history, aesthetics, and theory. These courses develop skills of reading, observing, and hearing and encourage reflection on such experiences; many investigate the interplay among individual achievement, artistic tradition, and historical context. Other courses are devoted to the production and performance of art works (in creative writing, performing arts, and media such as film and video). These courses emphasize the interaction among technical mastery, cognitive knowledge, and creative imagination.


Offerings in this area investigate the bases of human knowledge in its broadest sense, ranging from cognitive faculties (such as perception) shared by humans and animals, to abstract reasoning, to the ability to form and justify moral judgments. Courses investigating the sources, structure, and limits of cognition may use the methodologies of science, cognitive psychology, linguistics, or philosophy. Courses focusing on moral reasoning explore ways of reflecting on ethical questions that concern the nature of justice, the good life, or human values in general.

**Group 5. Social and Behavioral Analysis (SBA)**

Courses in this area examine human life in its social context through the use of social-scientific methods, often including hypothesis testing, scientific sampling techniques, and statistical analysis. Topics studied range from the thoughts, feelings, beliefs, and attitudes of individuals to interpersonal relations between individuals (e.g., in friendship, love, conflict), to larger social organizations (e.g., the family, society, religious or educational or civic institutions, the economy, government), to
the relationships and conflicts among groups or individuals (e.g., discrimination, inequality, prejudice, stigmas, conflict resolution).

**Group 6. Foreign Languages (not literature courses)**

Courses in this area teach language skills, including reading, writing, listening, and spoken non-English languages, at beginning to advanced levels.

**Category 9. Electives**

Six credits of approved electives are required and are approved by the student’s faculty advisor. Because these courses should help develop and broaden the skills of the engineer, advisors will generally accept the following as approved electives: one introduction to engineering course, engineering distribution courses, courses stressing oral or written communication, upper-level engineering courses, advanced courses in mathematics, and rigorous courses in the biological and physical sciences. Advisors are likely to approve courses in business, economics, and language that serve the student’s educational and academic objectives. In other cases, a student’s interests might be better served by approved electives that expand the Major or other parts of the curriculum, including the liberal studies requirement. (Note: up to 6 credits of advisor-approved electives will be allowed for ROTC courses at or above the 300-level.)

Students are free to take as many courses offered at the university in addition to the minimum engineering curriculum requirement as they wish before meeting graduation requirements.

No course with a number <100 can be applied toward graduation requirements.

**Category 10. Major requirements**

The requirements of the Majors are discussed on pages 37–98. They include:

1. Major-required courses, i.e., courses in the Major itself.
2. Major-approved electives (9 credits).
3. Major-complementary courses (9 credits). These courses, taken outside the Major, ensure breadth of engineering studies.

**Residence Requirements**

Candidates for an undergraduate degree in Engineering must spend at least four semesters or an equivalent period of instruction as full-time students at Cornell, including at least three semesters affiliated with an Engineering Major.

Engineering students who are on leave may not take Cornell extramural courses. Exceptions are granted in extraordinary circumstances with permission from Engineering Advising. At most 18 credits earned through extramural study or acquired as transfer credit (or any combination thereof) following matriculation may be used to satisfy the requirements for the bachelor’s degree in Engineering. Students cannot complete their last semester extramurally.
Degree candidates may spend periods of time studying away from the Cornell campus with appropriate authorization. Information on programs sponsored by other universities and on procedures for direct enrollment in international universities is available at the Cornell Abroad office, 300 Caldwell Hall. Programs should be planned in consultation with the staff of Engineering Advising, who can provide information on credit evaluation policies and assist in the petitioning process.

First-Year Requirements

By the end of the first year, engineering students are expected to have completed (or received credit for) the following core requirements:

- MATH 191 and MATH 192;
- Two of the following: CHEM 209, CHEM 208 (if required for Major), PHYS 112, 213, 214 (depending on Major);
- CS 100;
- Two (2) first-year writing seminars;
- One (1) intro-to-engineering course (ENGRI designation);
- Two (2) physical education courses

Preparing for a Major

Some Majors begin with courses that cannot be taken without prior completion of certain prerequisites. Students planning to affiliate with such a Major must decide to do so early enough to take the prerequisite courses, even though they will not formally affiliate until after the prerequisites have been completed. Information on prerequisites of each Major is available on pages 34–36 in this handbook and in Courses of Study.

Learning About Majors/Careers in Engineering

ENGRG 150: Engineering Seminar

All first-year students are pre-enrolled in a section of ENGRG 150: Engineering Seminar. This 1-credit fall course gives first-year students an opportunity to get to know their faculty advisors on a more personal level. Meeting regularly with their advisees gives advisors an opportunity to learn about each student, to assist in resolving problems as they arise, and to help new students adjust to the demands of the engineering curriculum.

Activities in ENGRG 150 may include discussion of engineering careers, active research in the college and engineering in general, ethics, and workshops on study and exam skills useful to engineering students. Practicing engineers, advising staff, and faculty members from different disciplines may join the group from time to time.
Faculty Advisors

Every student in the College of Engineering is assigned a faculty advisor. The advisors can help students learn about engineering through the ENGRG 150 seminar, through one-on-one meetings, and through informal activities sponsored by the college, departments/schools, and student organizations. For more information on faculty advisors, see page 26.

Peer Advisors

Each ENGRG 150 section has one or two peer advisors—second-, third-, and fourth-year students who have volunteered to help new students understand the course selection process, meet other engineering students, and adjust to life at Cornell. They can offer useful information about courses, tips on studying, student activities, organizations, and other need-to-know facts about campus life from a student’s point of view.

National Engineers Week

The Engineering Student Council (ESC) initiated the celebration of National Engineers Week at Cornell University in 1998. During February, the ESC coordinates seven days of events organized by the council and other engineering-affiliated groups, including the following:

Engineering Day at the Mall

Cornell engineering organizations staff booths to help children in the Ithaca community learn about science and engineering concepts.

Diversity Dinner

In cooperation with the National Society of Black Engineers (NSBE), The Society of Hispanic Professional Engineers (SHPE), and the Society of Women Engineers (SWE), the ESC coordinates a dinner to celebrate cultural diversity in the college. The event includes faculty, administration, and corporate speakers, as well as student entertainers.

Major Information Fair

In October, students may attend the information fair sponsored by Engineering Advising. The fair gives unaffiliated students an opportunity to explore a variety of Engineering Majors by learning about each Major’s curriculum, curricular requirements, research, and career opportunities.

Alumni

The Cornell Engineering Alumni Association (CEAA) is the alumni association for the College of Engineering. Founded in 1903, the CEAA has grown into a major support organization for the college. Nearly two thousand alumni maintain their connection to the college through membership in the CEAA.
The CEAA serves as a link between the college and its alumni by:

- introducing first-year students to young engineering professionals during Alumni Speakers Week in their ENGRG 150 sections.
- providing ongoing opportunities for networking through regional alumni programs and the annual Engineering Conference.
- sponsoring an innovative project to assist engineering alumni with career development.
- sponsoring the Enterprise Engineering Seminar, which brings alumni back to campus as speakers.
- supporting prestigious awards for excellence in teaching and outstanding student groups.

Engineering Student Project Teams

Students can get involved in many projects that exist within the college, usually for credit. These include:

- the AIChE Chemical Powered Car Competition (Chemical Engineering)
- ASCE Concrete Canoe Competition (Civil Engineering)
- the ASCE Steel Bridge Competition (Civil Engineering)
- Autonomous Systems (multidisciplinary)
- BOOM—Bits On Our Mind (Computer Science)
- the Robocup Project (Mechanical Engineering/Computer Science)
- the SAE Formula Race Car (Mechanical Engineering)

Undergraduate-Major Consultants and Associate Directors

A faculty member serves as associate director or undergraduate-Major consultant of each Engineering Major. This faculty member is responsible for managing the Major. Major consultants can be valuable sources of information for students who want to learn more about their respective undergraduate Majors.

Engineering Student Organizations

Each Engineering Major has at least one student organization. In addition, there are student chapters of the American Indian Science and Engineering Society (AISES), the National Society of Black Engineers (NSBE), the Society of Hispanic Professional Engineers (SHPE), and the Society of Women Engineers (SWE), which are open to all students. A list of engineering student organizations begins on page 182.

The Sundial

The *Sundial* is e-mailed to students every week during the regular semester. This electronic publication provides important information that students should be aware of and includes events in the college that can help students learn about engineering.
Such events include speakers on engineering topics, company information sessions, student organization activities, and career services offerings.

Printed Material from Majors
Majors produce undergraduate handbooks for use by their students. In addition to required course work and options specific to the Major, many Major handbooks include information on the corresponding engineering discipline(s). Handbooks can be obtained from the undergraduate Major offices.

Web Pages—Majors, Faculty, Students
The College of Engineering web site, www.engineering.cornell.edu, has links to the web sites for the individual departments and/or schools of engineering at Cornell. These web sites provide information on the undergraduate and graduate programs as well as links to faculty, graduate student, and research pages.

Career Services Library
A collection of books, directories, hard copy and electronic job bulletins, and audio/videotapes is available to help students investigate career options and prospective employers. The main library is located at the Cornell Career Services office, 103 Barnes Hall. Engineering Cooperative Education and Career Services (201 Carpenter Hall) also maintains a small collection of supplementary guides and directories.

Networking
Talking to friends and acquaintances who are engineers is a good way to learn about the personal experiences of people in the profession. Students are encouraged to visit with practicing engineers and to ask questions that can help them learn about both the positive and more challenging aspects of being an engineer.

Engineering Career Fairs
Cornell Career Services coordinates a two-day career fair in mid-September. One of these days is designated as an engineering/technical career event.

In cooperation with Engineering Cooperative Education and Career Services, the Engineering Student Council (ESC) also coordinates a spring career fair for full-time, internship, and co-op recruitment in February.

Summer Internships
Engineering Cooperative Education and Career Services (201 Carpenter Hall), in conjunction with Cornell Career Services (103 Barnes Hall), receives listings for summer jobs during the academic year. Job listings for students are placed on the CornellTRAK link of the Cornell Career Services web site at www.career.cornell.edu/students.
Externships

Students can obtain an insider's view of a career Major by shadowing Cornell alumni at their workplaces during January break. The FRESH Externship program is offered exclusively for first-year students during the March spring break. Through externships, students can observe the day-to-day activities of their Cornell sponsor, discuss specific careers with alumni and their colleagues, and obtain limited hands-on experience.

Externships are available in various industries and geographic locations. Externships, determined by the sponsor, are generally from one to several days long.

For more information on externships, visit www.career.cornell.edu/careerConnections/default.html and select either “Extern Program” or “FRESH.”
Academic Advising and Student Services

Academic Advising

From the time students enter the college until they become affiliated with a Major, they are under the administration of Engineering Advising, which implements the academic policies of the College Curriculum Governing Board (CCGB). Engineering Advising provides a variety of advising services to help first- and second-year students with academic, career, and personal matters. Students can make an appointment by calling 255.7414 or may stop in to see an advisor on a walk-in basis.

Engineering Advising is responsible for a variety of programs and services that assist in the development of successful engineering students. These include publishing The Sundial, a weekly e-mail newsletter for students that provides information about upcoming deadlines and special programs; organizing the Major Information Fair and other events to help first- and second-semester students choose a Major; coordinating the Peer Advisor Program; sending early-intervention communications to students who may need additional support in specific courses; and providing information on tutoring and academic support services available on campus.

Faculty Advising

All students are assigned a faculty advisor when they begin their course of study in the College of Engineering. They usually keep that advisor until they affiliate with a Major, even though the advisor may not be in the Major in which they intend to specialize. Once students choose a Major, they are assigned a faculty advisor from that Major.

Faculty advisors help students translate their interests into an appropriate course of study, evaluate their curriculum and workload, monitor their progress toward a degree, and take advantage of the diverse opportunities available at Cornell. Students should consult their faculty advisor when they have questions about the academic requirements of the university, the college, or the schools and departments. Faculty advisors evaluate each semester’s program, approve course changes, and approve any course to be used as an approved elective. Students must see their faculty advisor whenever they consider adding or dropping a course. Students who wish to petition for an exception to college rules should discuss the matter first with their advisor, who must sign any petition before it can be considered.

To be effective, a faculty advisor must be aware of a student’s academic and personal goals. Students should make appointments to see their advisors as soon as they return to campus after intersession or summer vacation. This is an opportunity for the student and advisor to discuss the student’s goals, reevaluate academic plans, and make changes in course enrollment, if necessary. Students must also consult with their faculty advisors during the pre-registration period to receive approval of their course selections for the following semester.

Students are responsible for staying in contact with their faculty advisor and ensuring that the advisor is aware of the their goals and progress. Academic difficulties may be avoided if the advisor is able to recognize problems early. Students often form strong
intellectual bonds with their faculty advisors, and this is more apt to happen if the student takes the initiative. Another benefit of developing a relationship with the faculty advisor (and faculty members in general) is that students may wish to ask the advisor for a letter of recommendation at some point in their career. Such letters are not particularly useful unless they come from people who know the student well enough to accurately assess their capabilities.

What Students Should Expect from Their Advisor

- **Advice.** Students should use their advisors as resources for planning their academic program and identifying academic and career goals. The advisor will be able to explain college degree requirements, scheduling/registration procedures, and other academic regulations. While it is not the function of advisors to help students find employment, they should be able to give broad advice on careers in engineering and science and the academic background necessary for such careers. Advisors can also provide information on postgraduate education and general requirements for admission to graduate programs. A faculty advisor may refer a student to other faculty members or offices that are better able to serve the student’s needs.

- **Assistance.** Advisors can help students explore special programs, such as cooperative education, international study, dual-degree, and double-Major programs. They may also be helpful in obtaining tutorial assistance or transfer/advanced placement credit, as appropriate. Students often ask their advisors to provide letters of recommendation for scholarships, employment, or graduate school.

- **Availability.** Students should expect to have ready access to their advisors. Most advisors set aside several hours each week for advising and will usually make appointments outside those hours if necessary. Advisors who are out of town for more than a week will usually designate an alternative advisor to handle urgent problems.

- **Personal Contact.** Students should expect to have personal relationships with their advisors, through which the advisors will become familiar with the students’ backgrounds, academic records, and career plans.

What Students Should Not Expect from Their Advisor

- **Assessment of Effort Required for Specific Courses.** Advisors can determine the appropriateness of a given course in a student’s program, but they cannot predict how difficult the course will be or how much effort it will require.

- **Help with Personal Problems.** Students should make their advisors aware of problems that interfere with academic progress, but advisors are not trained to provide counseling for personal problems, nor should they be expected to resolve housing or financial issues. They will, however, refer students to the appropriate university office or program.

- **Job Placement.** While students should be able to discuss career options with their advisors, it is not the advisor’s responsibility to provide assistance
in a job search. Students should contact the University Career Center or the Engineering Cooperative Education and Career Services office for help in finding employment.

• **Tutoring/Study Skills.** Advisors are often able to identify the need for tutoring, remedial course work, or improved study skills, but should not be expected to provide the necessary assistance. Students in need of such assistance are generally referred to other resources, such as the Learning Strategies Center.

**Student Responsibilities in the Student–Advisor Relationship**

• **Accept Referrals.** Students should be willing to accept referrals from their advisors and should review the results of such referrals with their advisors after the fact.

• **Initiate Contact.** Students are expected to initiate contact with their advisors for scheduling, course changes, and other matters in a timely fashion. Because of teaching commitments, research, and travel obligations, advisors may not be available on short notice. Students are urged to plan ahead and initiate contact with their advisors well in advance of specific deadlines.

• **Keep Advisors Informed.** Advisors can provide better advice if they are kept informed of their advisees’ academic progress and career goals. Students should feel free to share this information with their advisors and can expect that their advisors will ask questions and provide appropriate guidance based on the dialogue.

• **Work to Develop Rapport.** The rapport necessary for good advising can occur only if both the advisor and the student make an active effort to develop it. Recognizing that individual advisors have their own styles and personalities, students should respond to the efforts of their advisors to get to know them and their academic interests.

**ENGRG 150: The Engineering Seminar**

ENGRG 150: The Engineering Seminar, a 1-credit fall course, provides an opportunity for first-year students to get to know their faculty advisors on a more personal and meaningful level. Students meet regularly (as a group) with their faculty advisor to discuss a range of engineering topics. Discussions may include the engineering curriculum, aspects of engineering careers, active research in the college and engineering in general, and study and examination skills useful to engineering students. Groups may also visit campus academic, engineering, and research facilities. All first-year students are preregistered in a section of ENGRG 150.

**Peer Advising**

Each ENGRG 150 section has one or two peer advisors—second-, third-, and fourth-year students who have volunteered to help new students understand the course selection process, meet other engineering students, and adjust to life at Cornell. Incoming first-year students meet their peer advisors during orientation week and as
part of ENGRG 150. Subsequent meetings are arranged as needed. Students should feel free to call their peer advisors at home during reasonable hours whenever they have questions.

**Preprofessional Advising**

Advising networks have been established at the university level for students who intend to go on to graduate study in law, medicine, or business. The principal function of these networks is to disseminate information and coordinate visits by admissions personnel. Students considering any of these graduate fields should visit Engineering Advising for general guidance and more detailed information.

**Premedical**

Students interested in medicine or other health-related careers must plan their courses early to meet both the requirements of the Engineering Common Curriculum and the prerequisites of the intended professional course of study. Advice for first- and second-year premed students is provided by Engineering Advising, 167 Olin Hall, and by Judy Jensvold, the university pre-med advisor, in her annual pre-med meetings for engineers.

For third- and fourth-year students, pre-med advising is handled exclusively through the Office of Health Careers Programs. Students must declare their intentions through that office in the fall of their third year.

Important meetings and deadlines are advertised in *The Sundial*, the *Cornell Daily Sun*, and special bulletins published by the Office of Health Careers Programs in 103 Barnes Hall.

**Prelaw**

Preparation for law school does not require a special structured curriculum, but students are encouraged to take electives in history, economics, government, and other courses that emphasize reading, writing, and oral communication. Prelaw advising is provided by Cornell Career Services in Barnes Hall. During the academic year, this office conducts information sessions for students who want to learn more about the legal profession and admission to law school.

**Prebusiness**

Students who want to prepare for business school should take electives in economics, personnel management, business management, law, behavioral science, investments, or accounting. Special programs offered by the Johnson Graduate School of Management make it possible to work toward degrees in both engineering and management at the same time (see page 138 for more information). Students interested in these options should visit the Office of Research and Graduate Studies (201 Carpenter Hall) or the admissions office of the Johnson Graduate School of Management.
Diversity Programs in Engineering

The Diversity Programs in Engineering (DPE) office operates programs at the undergraduate, graduate, and faculty levels to facilitate the outreach, recruitment, retention, and overall success of underrepresented minorities, women, and other underrepresented groups in Engineering. DPE is responsible for fostering a vision of diversity appreciation reflective of the College of Engineering’s strategic plan, which enables students from all backgrounds and cultures to thrive and succeed at Cornell. DPE provides an institutionalized approach to meeting the needs of students by coordinating and planning educational, professional development, and networking opportunities that enhance interaction and learning across groups. Through intentional programming and training, DPE assists the college in understanding, appreciating, and celebrating Cornell’s rich cultural diversity. For further information, please contact DPE at 255.6403 or stop by 146 Olin Hall. Some of the current programs are listed below.

Prefreshman Summer Program

The College of Engineering participates in a university-wide effort to promote academic achievement and involve students in the life of the university through this six-week residential program. The program is designed to acquaint students with the challenges associated with the Cornell Engineering curriculum that will begin in the fall.

Courses are provided in subjects such as mathematics, computer science, and English composition. Students may take regular or accelerated courses.

Trips and recreational activities provide opportunities for getting a better understanding of how to navigate and adapt to the college. Seminars and workshops cover a wide range of topics that are relevant to academic and extracurricular life in the university setting.

Professional Networking Events

Each year the Diversity Programs in Engineering office sponsors networking events that allow company representatives from all over the United States to meet with students historically underrepresented in the field of engineering. Summer internships and permanent jobs frequently result from these annual events.

CURIE Program

The CURIE Academy is a one-week summer residential program for high school girls who excel in mathematics and science. It offers classes, labs, and research experiences designed and taught by Cornell’s world-class faculty. Social events, panel discussions, and informal networking allow students to experience life on a university campus and to make new friends from all over the country.

CATALYST Program

The Cornell Association for the Technological Advancement of Learned Youth in Science and Technology (CATALYST) program is a one-week summer residential
program for rising high school sophomores, juniors, and seniors from underrepresented backgrounds. Participants will be exposed to hands-on projects in engineering research fields and lab sessions led by world-renowned engineering faculty members. Academic and leadership skill development, panel discussions, social events, and other out-of-classroom activities will provide participants with opportunities to informally network with Cornell faculty and staff members and students.

Engineering Learning Initiatives

Engineering Learning Initiatives, 167 Olin Hall, facilitates academic opportunities for engineering students that enhance the learning environment, support teaching excellence, and cultivate professional development. The following programs are offered through Engineering Learning Initiatives: Academic Excellence Workshops (AEWs), Tutors-On-Call, Undergraduate Research, the Cornell LeaderShape® Institute, and Engineering TA Training.

For more information on these programs, call 607.255.9622, e-mail eng-learning@cornell.edu, or visit www.engineering.cornell.edu/student-services/learning.

Academic Excellence Workshop (AEW)

Academic Excellence Workshops (AEWs) are 1-credit, small-group, cooperative-learning sessions that complement the core engineering courses, including MATH 191, 192, 293, and 294; CHEM 209 and 211; and CS 100 and 211. The weekly two-hour workshops are led by trained peer facilitators and offer a cooperative environment where students work together on concepts, problems, and projects to enhance understanding of course material. AEWs are based on research showing that cooperative methods promote higher grades, greater persistence, deeper comprehension, more enjoyment in learning, and more positive attitudes toward academic work. To register for an AEW, access the online add/drop instructions through Just The Facts under the ENGRG courses. For more information on AEW, visit www.engineering.cornell.edu/student-services/learning/academic-excellence-workshops/.

Tutors-on-Call

The goal of the Tutors-on-Call program is to promote students’ development of critical-thinking and problem-solving skills through peer guidance and support. Peer tutors are available free of charge for many first- and second-year core courses for engineering students, including mathematics, chemistry, physics, computer science, and distribution courses. Peer tutors earn an hourly wage and are trained to help their peers master course content and improve learning skills. Tutors must have a 3.0 grade point average and have earned an A or a B in the course(s) they tutor. Tutors can help students better understand key concepts, apply concepts to problems and projects, and review and prepare for examinations. One-on-one tutoring is intensive and gives each student individualized assistance. To schedule a tutoring appointment, e-mail a tutor listed under the appropriate course on the Available Tutor List. Find the list on the web at www.engineering.cornell.edu/student-services/learning/peer-tutoring/ or visit the Engineering Learning Initiatives office in 167 Olin Hall to pick up a paper copy.
Cornell LeaderShape® Institute

The Cornell LeaderShape® Institute is a dynamic, interactive, six-day residential retreat, emphasizing vision planning and leadership development. The curriculum is provided by LeaderShape®, Inc., a not-for-profit organization that has been helping young adults learn to “lead with integrity” since 1988. It begins with participants engaging in self-reflection and learning about the power of visions and goals, and results in participants creating powerful visions for themselves and for their student organizations. Overall, student participants will explore personal characteristics; expand their understanding about leadership; meet and work with peers; and talk to current leaders of the college, university, and surrounding community. For more information, visit www.engineering.cornell.edu/student-services/learning/leadershape/.

Engineering TA Training

New teaching assistants (TAs) in the College of Engineering become certified by completing the TA Development Program, which includes training in classroom management, diversity, grading, cooperative learning, and presentation skills. While the majority of TAs are graduate students, some undergraduates have the opportunity to be trained and serve as teaching assistants in their fourth year. By giving TAs a sophisticated understanding of how human learning occurs, as well as rigorous training in course management responsibilities, we are creating a pool of talent that enriches the pedagogical life of the college. In addition, TAs may also receive credit for their successful participation in the 1-credit course, ENGRG 678: Teaching Seminar. This course, offered by Engineering Learning Initiatives as an enhancement to the TA Development Program, aims to upgrade teachers’ skills, increase teaching standards, and improve student-learning outcomes through formative discussion and reflective writing.

Engineering Registrar

The Engineering Registrar’s office, located in 158 Olin Hall, is the main repository of all engineering student records. This office is distinct from the University Registrar’s office located in B7 Day Hall.

The Engineering Registrar’s office oversees course enrollment, grading, course scheduling, room assignments, and examination scheduling for the College of Engineering. It is responsible for maintaining the Student Information System, and processes all grade and course updates. Any official documents relating to academic matters are filed as part of each student’s permanent record and held there. It also produces reports regarding course, enrollment, and student data. Students who need an official transcript or certification of enrollment should go through the University Registrar’s office.
University Student Records Policy

The university regards a student’s enrollment status (e.g., registered, on leave, withdrawn, etc.) as directory information that may be released unless a student submits a “no-release” request to the University Registrar. Additionally, where the university believes that it is in a dependent student’s best interest, information from the student’s educational records may, at the university’s discretion, be released to the parents or legal guardians of such a dependent student. Such disclosure will generally be limited to information about a student’s official status at the university, but parents or legal guardians of a dependent student may also be notified when a student has voluntarily withdrawn from the university or has been required by the university to withdraw; when a student has been placed on academic warning; when the student’s academic good standing or promotion is at issue; when a student has been placed on disciplinary probation or restriction; or when a student otherwise engages in behavior calling into question the appropriateness of the student’s continued enrollment in the university. Unless otherwise indicated in writing by the student at the time of registration, or thereafter, the university will presume that a full-time undergraduate student is a dependent as that term is defined in the Internal Revenue Code.
Applying for Major Affiliation

Students must apply for affiliation with a Major during the first semester of their second year, although earlier affiliation may be granted at the discretion of the Major. To apply for affiliation, students visit the office of the undergraduate Major consultant in the Major of their choice and complete an Application for Major Affiliation. To affiliate, students must: (1) have a cumulative grade point average (GPA) > 2.0; and (2) have satisfied the Major’s course and grade requirements (see pages 34–36).

Occasionally, a student falls just short of meeting standard affiliation requirements but demonstrates potential in the Major. In such cases, a Major may offer “conditional affiliation.” Conditional affiliation involves a written agreement signed by both the Major and the student. Students must meet the requirements specified in the conditional affiliation agreement to continue in the Major.

Students who are not affiliated or conditionally affiliated with a Major by the end of the fourth semester will be withdrawn from the College of Engineering. Future enrollment in the College of Engineering is dependent on affiliation or participation in a terminal semester.

Major Descriptions, Flow Charts, and Checklists

Each Major program is described in detail in Courses of Study. Flow charts on pages 39, 44, 50, 56, 61, 65, 70, 78, 83, 88, 92, and 96 in this handbook present the courses that make up these Majors. Because it is difficult to depict the flexibility that makes it possible to take some courses in semesters other than those indicated, these charts are meant only to suggest the structure of the program. The sequence of courses may also be influenced by advanced placement or transfer credit.

Requirements for graduation differ from Major to Major. In addition to completing the requirements of the Common Curriculum, students must take a range of courses that constitutes the Major; they must earn grades that are adequate to remain in good standing (see page 154 for specific Major requirements for good standing); and they must accumulate sufficient credits for graduation. Each of these three parameters differs by Major, and students are responsible for knowing and meeting the requirements of the Major with which they affiliate. Specific Major requirements are set forth later in this publication and in Courses of Study. Students who have questions regarding the interpretation of these requirements should consult the undergraduate Major consultants (listed on pages 10–12) and their faculty advisors.

Requirements for Major Affiliation

Biological Engineering (BE)

At most one grade below C– in mathematics and science courses and CS 100 or its equivalent.
Chemical Engineering (ChemE)
At most one grade below C– in chemistry, mathematics, physics, and chemical engineering courses and a GPA \( \geq 2.2 \) in mathematics, science, and chemical engineering courses.

Civil Engineering (CE)
GPA \( \geq 2.0 \) for all engineering and science courses. At least a grade of C– in ENGRD 202 (or ENGRD 251 for students who do not take ENGRD 202 before affiliation).

Computer Science (CS)
At least a grade of C in all completed CS and mathematics courses. GPA \( \geq 2.5 \) in CS 211, 212, and 280. GPA \( \geq 2.5 \) in MATH 192 and CS 280. Visit the CS undergraduate office web site to learn about alternative criteria for affiliation.

Electrical and Computer Engineering (ECE)
At least a grade of C+ in MATH 293, PHYS 213, and one of ECE/ENGRD 210, ECE 220, and ECE/ENGRD 230. GPA \( \geq 2.5 \) in the following courses if completed: MATH 192, 293, 294; PHYS 213; ECE/ENGRD 210; ECE 220; ENGRD 211, ECE/ENGRD 230.

Engineering Physics (EP)
At least a grade of B– in all required mathematics and physics courses.

Environmental Engineering (EnvE)
GPA \( \geq 2.0 \) for all engineering and science courses. At least a grade of C– in ENGRD 251.

Independent Major (IM)
Cumulative GPA \( \geq 2.0 \).

Information Science, Systems, Technology (ISST)
At least a grade of C in two of MATH 294, CS 211, and OR&IE 270. GPA \( \geq 2.3 \) in all completed mathematics, ENGRD, and ISST Major courses. Qualifying courses must be taken at Cornell; all courses must be taken for a letter grade. For a repeated course, the most recent grade will be used.

Materials Science and Engineering (MS&E)
At least a grade of C– in mathematics, physics and chemistry courses and at least a grade of C in ENGRD 261 or 262.
Mechanical Engineering (ME)
At least a grade of C– in ENGRD 202, ENGRD 221 (if taken), and in all completed required mathematics, science and computer science courses. GPA ≥2.5 in these courses: MATH 293, PHYS 213, ENGRD 202, and ENGRD 221 (if taken).

Operations Research and Engineering (ORE)
At least a grade of C– in ENGRD 270. GPA ≥2.0 in mathematics, science, and engineering courses (both overall and in the term immediately before affiliation). GPA ≥2.0 in ENGRD 270 and all required college mathematics courses at the 200 level or above that have been taken thus far.

Science of Earth Systems (SES)
Good academic standing in the College of Engineering.
**Major Programs**

**Major: Biological Engineering (BE)**

Accredited by ABET (see inside front cover).

Offered by: Department of Biological and Environmental Engineering

207 Riley-Robb Hall, 255.2173, www.bee.cornell.edu

**Our Commitment**

The educational objectives of the Biological Engineering program are consistent with those of the College of Engineering and Cornell University. We are committed to providing an excellent undergraduate engineering program in a nurturing learning environment where our graduates acquire knowledge and develop skills for professional success. Graduates of our program include a diverse group of leaders and problem-solvers who contribute technically, professionally, and personally to our society.

**Program Objectives**

- Produce graduates who pursue careers related to Biological Engineering based on a solid educational background in appropriate mathematics, physical and life sciences, liberal studies, and engineering.
- Produce graduates who pursue advanced degrees in engineering and related professional fields.

**Engineering Distributions**

ENGRD 202: Mechanics of Solids (required)

ENGRD 2XX: ENGRD 260: Principles of Biological Engineering (recommended)

**Required Major Courses**

BIO G 101–104: Biological Sciences

BIOBM 330 or 333: Principles of Biochemistry

or

BIOMI 290: General Microbiology Lectures

or

CEE 451: Microbiology for Environmental Engineering

BIO XXX: Biological Science course(s) at ≥200 level

CHEM 257: Introduction to Organic and Biological Chemistry

or

CHEM 357: Organic Chemistry for the Life Sciences

BEE 151 or CS 100M: Introduction to Computer Programming

CS 101J: Introduction to Computer Programming Java

ENGRG 150: Engineering Seminar

or

BEE 200: The BEE Experience
BEE 260/ENGRD 260: Principles of Biological Engineering
or
BEE 251/ENGRD 251: Engineering for a Sustainable Society
BEE 350: Biological and Environmental Transport Processes
BEE 222: Bioengineering Thermodynamics and Kinetics
or
ENGRD 221: Thermodynamics
CEE 304: Uncertainty Analysis in Engineering
or
ENGRD 270: Basic Engineering Probability and Statistics
BEE 331: Bio-Fluid Mechanics
or
CEE 331: Fluid Mechanics

Concentration electives: Three courses from approved list.
Major-approved electives to complete remaining credits.

Major-Approved Engineering Electives and Concentration Courses
Must include a minimum of 12 credits of BEE courses. One course must be a BEE Capstone course and one must be a Laboratory Experience course (see department for a list of approved courses). BE Concentrations: Biomedical Engineering, Bioprocess Engineering, or Bioenvironmental Engineering (see department for a list of approved concentration courses).

The requirements for premedical study can be met with an additional 6–9 credits if courses are carefully selected.
Biological Engineering Major (BE)

a. Engineering electives must include Capstone design and lab experience.
b. ENGRD 270 (fall, spring) or CEE 304 (fall)
c. Students may substitute BIO G 105–106 or BIO 109–100.
d. Upper-level BIO S. need to take either Biochemistry or Microbiology—BIO BM 330, or BIO BM 333, or BIO BM 331 and BIO BM 332, or BIO MI 290, or CEE 451.
e. Required of CALS matriculants only. Engineering matriculants complete ENGRG 150.
# Biological Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
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<tr>
<td>MATH 293</td>
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<tr>
<td>MATH 294</td>
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<tr>
<td>CHEM 209</td>
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<td>CHEM 257 (or 357)</td>
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<td>PHYS 112</td>
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<tr>
<td>PHYS 213</td>
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<tr>
<td>BEE 151 (or CS 100M and 101J)</td>
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<td>Introduction to Engineering (not required of CALS–matriculating BE students)</td>
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<tr>
<td>Engineering Distribution 1: ENGRD 202</td>
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<td>Engineering Distribution 2:</td>
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</tr>
<tr>
<td>(ENGRD 260 or ENGRD 251)</td>
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</tr>
<tr>
<td>First-Year Writing Seminar 1</td>
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</tr>
<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liberal Studies 1</td>
<td></td>
<td></td>
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<tr>
<td>Liberal Studies 2</td>
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<td>Liberal Studies 4</td>
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<tr>
<td>Liberal Studies 6</td>
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</tr>
<tr>
<td>Approved Elective (two courses; 6-credit minimum)</td>
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<tr>
<td>Approved Elective</td>
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<tr>
<td>Physical Education (two semesters) and swim test</td>
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</tr>
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</table>

**Required Major Courses (54-credit minimum)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>√ When Done</th>
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</thead>
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<tr>
<td>BIO G 101/103 (or 109)</td>
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<td>BIO G 102/104 (or 110)</td>
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<td>BIOBM 330 or 333 or BIOMI 290 or CEE 451</td>
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<td>BEE/ENGRD 260 or BEE/ENGRD 251</td>
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<td>BEE 350</td>
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<td>BEE 222 or ENGRD 221</td>
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<td>CEE 304 or ENGRD 270</td>
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<td>BEE 331 or CEE 331</td>
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<tr>
<td>Major-approved Engineering Electives</td>
<td>13</td>
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</tr>
<tr>
<td>Total Required Credits</td>
<td>127 minimum</td>
<td></td>
</tr>
</tbody>
</table>

- Capstone Design Requirement
- Laboratory Experience Requirement
- Technical Writing Requirement
Notes


b. BE satisfies the intro-to-engineering course and credit requirement through a sequence of courses in the Major. An ENGRI course is not required of CALS matriculating students.

c. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective, or Major course.

d. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA); (2) Historical Analysis (HA); (3) Literature and the Arts (LA); (4) Knowledge, Cognition, and Moral Reasoning (KCM); (5) Social and Behavioral Analysis (SBA); and (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

e. The 9 credits of Major-complementary courses are ENGRD 202, CEE 304, or ENGRD 270, and a non–BEE engineering elective.

f. BE students matriculating in CALS take BEE 200. Engineering students take ENGRG 150 prior to affiliating with BE.

g. A total of 12 credits from BEE must be included in concentration and major-approved electives.

h. Major courses must include a BEE Capstone Design course and a Laboratory Experience course. See department for a list of approved courses.
Major: Chemical Engineering (ChemE)

Accredited by ABET (see inside front cover).
Offered by: School of Chemical and Biomolecular Engineering
120 Olin Hall, 255.8656, www.cheme.cornell.edu

Program Objectives

Our objectives are designed to meet the needs of our constituents: our students, our graduates, the employers of our graduates, the graduate study programs that our graduates enter, the chemical engineering professional community, and society in general.

Objective 1. To teach our students to analyze and design chemical processes that span molecular to macroscopic scales.

Objective 2. To teach our students interpersonal skills necessary in a professional environment.

Objective 3. To provide a liberal education in humanities and history.

Objective 4. To create scholars and professionals.

Engineering Distributions

ENGRD 219: Mass and Energy Balances (required)
CHEM 389: Honors Physical Chemistry I (recommended)a

Required Major Courses

CHEM 251: Introduction to Experimental Organic Chemistry
CHEM 290: Introductory Physical Chemistry Laboratory
CHEM 357: Organic Chemistry for the Life Sciences b
CHEM 390: Honors Physical Chemistry II
CHEME 301: Nonresident Lectures
CHEME 313: Chemical Engineering Thermodynamics
CHEME 323: Fluid Mechanics
CHEME 324: Heat and Mass Transfer
CHEME 332: Analysis of Separation Processes
CHEME 372: Introduction to Process Dynamics and Control
CHEME 390: Reaction Kinetics and Reactor Design
CHEME 432: Chemical Engineering Laboratory
CHEME 462: Chemical Process Design
Electives


Four Major-approved electives (includes the advanced science elective\(^c\) and the biology elective\(^d\))
Chemical Engineering Major (ChemE)

a. This is a major-approved elective.
b. May be taken in semester 7 or 8.
c. The biology requirement can be taken in semester 4 or later.

Note: This chart does not include Liberal Studies and Physical Education requirements.
### Chemical Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credit Hours</th>
<th>√ When Done</th>
</tr>
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<tbody>
<tr>
<td>MATH 191</td>
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<tr>
<td>MATH 192</td>
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<td>MATH 293</td>
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<td>CHEM 209 (or 215)</td>
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<td>PHYS 112 (or 116)</td>
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<td>PHYS 213 (or 217)</td>
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<td>CS 100</td>
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<td>Introduction to Engineering (ENGRI 1XX)</td>
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<td>Engineering Distribution 1: ENGRD 219</td>
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<td>Engineering Distribution 2: CHEM 389</td>
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<td>First-Year Writing Seminar 1</td>
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<tr>
<td>First-Year Writing Seminar 2</td>
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<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)</td>
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<td>Liberal Studies 1</td>
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<td>Physical Education (two semesters and swim test)</td>
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### Required Major Courses (52-credit minimum)

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<tr>
<td>CHEME 313</td>
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<td>CHEME 323</td>
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<td>CHEME 332</td>
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<td>CHEME 372</td>
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<td>CHEME 390</td>
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<td>CHEME 432f</td>
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<td>CHEME 462</td>
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<td>Advanced CHEME Elective 1</td>
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<tr>
<td>Advanced CHEME Elective 2</td>
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<tr>
<td>Courses outside the Major:</td>
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</tr>
<tr>
<td>CHEM 251</td>
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<tr>
<td>CHEM 290</td>
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</tr>
<tr>
<td>CHEM 357</td>
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<tr>
<td>CHEM 390</td>
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<tr>
<td>Major-approved Elective 1: Biology Elective</td>
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</tr>
<tr>
<td>Major-approved Elective 2: Advanced Science Elective</td>
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<tr>
<td>Major-approved Elective 3</td>
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<tr>
<td>Major-approved Elective 4</td>
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<td></td>
</tr>
<tr>
<td>Total Required Credits</td>
<td>128 minimum</td>
<td></td>
</tr>
</tbody>
</table>

Major Programs: Chemical Engineering
Notes

a. CHEM 389 is required by the Major, and it is recommended that this course be counted as an engineering distribution course.

b. Premed students need 8 credits of organic chemistry.


d. Every student must complete one of the six following options for the biology elective:
   • Advanced Placement—a score of 5 on the CEEB AP exam or a score of 7 on the IB Higher Level exam.
   • CHEME 288: Biomolecular Engineering: Fundamentals and Applications (spring, 3 credits)
   • four credits of a pre-med biology sequence; BIO G 101: Biological Sciences, Lectures (fall, 2 credits) and BIO G 103: Biological Sciences, Laboratory (fall, 2 credits); BIO G 102: Biological Sciences, Lectures (spring, 2 credits) and BIO G 104: Biological Sciences, Laboratory (spring, 2 credits); BIO G 105: Introductory Biology (fall, 4 credits); BIO G 106: Introductory Biology (spring, 4 credits); BIO G 107: General Biology (first half of the eight-week summer session, 4 credits); or BIO G 108: General Biology (second half of the eight-week summer session, 4 credits).
   • three credits of microbiology—BIOMI 290: General Microbiology Lectures (fall, spring, or six-week summer session, 3 credits).
   • four credits of biochemistry—BIOBM 330: Principles of Biochemistry, Individual Instruction (fall or spring, 4 credits) or BIOBM 333: Principles of Biochemistry: Proteins, Metabolism, and Molecular Biology (six-week summer session, 4 credits).
   • five credits of biochemistry—BIOBM 331: Principles of Biochemistry: Proteins and Metabolism (fall, 3 credits) and BIOBM 332: Principles of Biochemistry: Molecular Biology (spring, 2 credits).

e. If CHEM 389 is taken as an engineering distribution, the fourth credit may apply as an approved elective credit.

f. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective, or Major course (CHEME 432: Chemical Engineering Laboratory satisfies this requirement).
g. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

h. The required 9 credits of Major program courses outside the Major consist of courses in chemistry.

i. Students who want a biomolecular focus should use the following courses as electives: BIOBM 330 as an applied science elective, CHEME 401 and CHEME 402 as advanced chemical engineering electives, and CHEME 543 or CHEME 481 as a Major-approved elective.

This engineering checklist is formatted to conform to the general specifications of the College of Engineering. We strongly recommend that you visit 120 Olin Hall for an official Chemical and Biomolecular Engineering curriculum sheet and checklist or go to www.cheme.cornell.edu/undergraduate.curriculum/.
Major: Civil Engineering (CE)

Accredited by ABET (see inside front cover).

Offered by: School of Civil and Environmental Engineering
221 Hollister Hall, 607.255.3412, www.cee.cornell.edu

Program Objectives

We are dedicated to providing the highest-quality broad-based technical, scientific, and liberal education. We create and maintain an outstanding educational program in a climate that fosters diverse skills designed for professional success. Our objectives are to prepare our students for:

• excellence in engineering decision-making and design,
• leadership careers in engineering practice,
• graduate professional engineering education,
• advanced study and research in engineering, and
• diverse, alternative career choices.


Engineering Distributions

ENGRD 202: Mechanics of Solids (required)

Recommended Distributions

ENGRD 211: Computers and Programming (recommended for students interested in transportation systems engineering)

ENGRD 221: Thermodynamics (recommended for students interested in fluid mechanics and hydraulics/hydrology)

ENGRD 251: Engineering for a Sustainable Society (recommended for students interested in environmental engineering)

ENGRD 261: Mechanical Properties of Materials: From Nanodevices to Superstructures (recommended for students interested in structural and geotechnical engineering)

ENGRD 320\(^a\) (formerly ENGRD 241): Engineering Computation (recommended for all students)
Required Major Courses

ENGRD 203: Dynamics
or
CEE 478: Structural Dynamics and Earthquake Engineering
ENGRD 320: Engineering Computation (formerly ENGRD 241)
CEE 304: Uncertainty Analysis in Engineering
CEE 323: Engineering Economics and Management
CEE 331: Fluid Mechanics
CEE 341: Introduction to Geotechnical Engineering
CEE 351: Environmental Quality Engineering
CEE 361: Introduction to Transportation Engineering
CEE 371: Structural Modeling and Behavior

Electives

Technical writing course (see listing of approved courses in Courses of Study)
Three CEE design courses
Two Major-approved electives
Two approved electives
Civil Engineering Major (CE)

a. Students taking ENGRD 203, 320 (formerly ENGRD 241), or CEE 304 as a second engineering distribution must take an additional major-approved elective.

b. ENGRD 270 may be accepted (by petition) to substitute for CEE 304 if taken prior to affiliation in the major or if necessary because of scheduling conflicts caused by co-op or other study abroad programs.

c. May substitute CHEM 208 or CHEM 257 for PHYS 214.

d. ENGRD 203 may be taken in the second year; CEE 478 should not be taken until the third or fourth year.

e. Students may take CEE 351, 361, or 371 in semester 4, depending on their interests.

f. Students may substitute either CEE 372 or CEE 471 for either CEE 351 or CEE 361, if they also complete CEE 473. However, CEE 372 or CEE 471 then counts as a Core Course only and not as a CE Design Course or Major-Approved Elective.

g. Students may substitute CEE 461 for CEE 351 if they also take two of the three courses: CEE 463, CEE 464, CEE 465. However, then CEE 461 counts as a Core Course only and cannot be counted as a Major-Approved Elective.

h. CS 100M and CS 101J are recommended.

i. Recommended: ENGRD 261 for Infrastructure; ENGRD 221 for Hydraulics; ENGRD 211 for Transportation; ENGRD 251 for Environmental.

j. ENGRD 320 (formerly ENGRD 241) may be taken in semester 4 or 5.

k. If the technical communication requirements are met with a course that fulfills another requirement, then an additional approved elective is required.

Note: This chart does not include Liberal Studies and Physical Education requirements.

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Semester 1  | Semester 2  | Semester 3  | Semester 4  | Semester 5  | Semester 6  | Semester 7  | Semester 8
---|---|---|---|---|---|---|---
MATH 191  | MATH 192  | MATH 293  | MATH 294  | CEE 304\(^a,b\)  | CEE 323  | Appr Elect  | Appr Elect
CHEM 209  | PHYS 112  | PHYS 213  | PHYS 214\(^c\)  | ENGRD 202  | CEE 371\(^e\)  | CEE 331  | CEE 341
Intro to Engr  |  |  |  |  |  |  |  |
CS 100M\(^d\) and CS 101J  | First-Year Writing Seminar  | First-Year Writing Seminar  | ENGRD\(^d\)  | CEE 320\(^a,j\)  | CEE 361\(^e\)  | CEE Design Elect  | CEE Design Elect
First-Year Writing Seminar  |  |  |  |  |  |  |  |

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**KEY**

- **Major Program**
- **Common Curriculum**
- **Elective**
- **prerequisite**
- **prerequisite or corequisite**
- **usually taken concurrently**

---

\(^a\) Students taking ENGRD 203, 320 (formerly ENGRD 241), or CEE 304 as a second engineering distribution must take an additional major-approved elective.

\(^b\) ENGRD 270 may be accepted (by petition) to substitute for CEE 304 if taken prior to affiliation in the major or if necessary because of scheduling conflicts caused by co-op or other study abroad programs.

\(^c\) May substitute CHEM 208 or CHEM 257 for PHYS 214.

\(^d\) ENGRD 203 may be taken in the second year; CEE 478 should not be taken until the third or fourth year.

\(^e\) Students may take CEE 351, 361, or 371 in semester 4, depending on their interests.

\(^f\) Students may substitute either CEE 372 or CEE 471 for either CEE 351 or CEE 361, if they also complete CEE 473. However, CEE 372 or CEE 471 then counts as a Core Course only and not as a CE Design Course or Major-Approved Elective.

\(^g\) Students may substitute CEE 461 for CEE 351 if they also take two of the three courses: CEE 463, CEE 464, CEE 465. However, then CEE 461 counts as a Core Course only and cannot be counted as a Major-Approved Elective.

\(^h\) CS 100M and CS 101J are recommended.

\(^i\) Recommended: ENGRD 261 for Infrastructure; ENGRD 221 for Hydraulics; ENGRD 211 for Transportation; ENGRD 251 for Environmental.

\(^j\) ENGRD 320 (formerly ENGRD 241) may be taken in semester 4 or 5.
Civil Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
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<tr>
<td>MATH 192</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 293</td>
<td>4</td>
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<tr>
<td>MATH 294</td>
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<td>PHYS 112 (or 116)</td>
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<tr>
<td>PHYS 213 (or 217)</td>
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<tr>
<td>PHYS 214 (or 218 or CHEM 208 or 257)</td>
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</tr>
<tr>
<td>CS 100M</td>
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<tr>
<td>CS 101J</td>
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<tr>
<td>Introduction to Engineering (ENGRI 1XX)</td>
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<tr>
<td>Engineering Distribution 1: ENGRD 202 (required)</td>
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<tr>
<td>Engineering Distribution 2(^g)</td>
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<td>First-Year Writing Seminar 1(^h)</td>
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<tr>
<td>First-Year Writing Seminar 2(^h)</td>
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<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)(^i)</td>
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<td>Liberal Studies 1</td>
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<tr>
<td>Liberal Studies 6</td>
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<tr>
<td>Approved Elective 1</td>
<td></td>
<td></td>
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<tr>
<td>Approved Elective 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Education (two semesters) and swim test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required Major Courses (49-credit minimum)(^j)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGRD 203 or CEE 478(^k)</td>
<td>3</td>
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</tr>
<tr>
<td>ENGRD 320(^l)</td>
<td>3</td>
<td></td>
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<tr>
<td>CEE 304(^l)</td>
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<tr>
<td>CEE 323</td>
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<td>CEE 341</td>
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<tr>
<td>CEE 351(^d)</td>
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<tr>
<td>CEE 361(^d)</td>
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<td></td>
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<tr>
<td>CEE 371</td>
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<tr>
<td>Technical Writing Course(^h)</td>
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<td></td>
</tr>
<tr>
<td>CEE Design Elective 1</td>
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<td>CEE Design Elective 2</td>
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<tr>
<td>CEE Design Elective 3</td>
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<tr>
<td>Major-approved Elective 1</td>
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<td></td>
</tr>
<tr>
<td>Major-approved Elective 2</td>
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<td></td>
</tr>
<tr>
<td>Total Required Credits</td>
<td>125 minimum</td>
<td></td>
</tr>
<tr>
<td>Additional Elective Courses (0 credits minimum, no maximum)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Major Programs: Civil Engineering
a. Students using this course as a second engineering distribution must take an additional Major-approved elective.

b. ENGRD 203 may be taken in the second year, but CEE 478 should not be taken until the third or fourth year.

c. ENGRD 270: Basic Engineering Probability and Statistics may be accepted (by petition) as a substitute for CEE 304 in the Major, but only if taken before affiliation, or in some special cases where co-op or study abroad programs necessitate such a substitution.

d. Students interested in pursuing a concentration in civil infrastructure (geotechnical and structural engineering) may substitute either CEE 372: Intermediate Solid Mechanics or CEE 471: Fundamentals of Structural Mechanics for either CEE 351 or CEE 361, if they also complete either CEE 473: Design of Concrete Structures or CEE 474: Design of Steel Structures. However, CEE 372 or CEE 471 then counts as a Core Course only and not as a CEE Design Course or Major-approved elective. Students interested in pursuing a concentration in transportation systems may substitute CEE 461: Urban Transportation Planning and Modeling for CEE 351 if they also take two of these three courses: CEE 463: Transportation and Information Technology, CEE 464: Transportation Systems Design, and CEE 465: Transportation, Energy, and the Environment. However, CEE 461 then counts as a Core Course only and cannot be counted as a Major-approved Elective.

e. If the technical communications requirement is met with a course that fulfills another requirement (liberal studies, Major-approved elective, etc.), then the student must take an additional approved elective.

f. To be chosen from lists available in the CE Major office, 221 Hollister Hall. Lists of suggested courses are available for students interested in structural engineering, transportation engineering, fluid mechanics/hydrology, geotechnical engineering, water resources and environmental systems engineering, and environmental engineering.

g. Recommended: ENGRD 261 for civil infrastructure; ENGRD 221 for hydraulics; ENGRD 211 for transportation; ENGRD 251 for environment; ENGRD 320 for all students.

h. In addition to the first-year writing seminars, a technical writing course must be taken. An approved COMM course, any ENGRC course or BEE 489: Engineering Entrepreneurship, Management, and Ethics will satisfy this requirement. If the course fulfilling the technical elective requirement also fulfills another requirement (liberal studies, Major-approved elective), an additional approved elective must be taken.
i. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

j. Nine credits of electives are determined by Major approval. To ensure breadth of engineering studies, Major programs also will include 9 credits of courses outside the Major. This group of courses may be comprised of ENGRD 202, ENGRD 203, one engineering distribution or elective, and/or a CE Major course outside the Major disciplinary area.

k. ENGRD 203 may be taken during the second year, but CEE 478 should not be taken until the third or fourth year.

l. Students electing to use this course as a second engineering distribution must take an additional Major-approved elective.
Major: Computer Science (CS)
Offered by: Department of Computer Science
303 Upson Hall, 255.0982, www.cs.cornell.edu/degreeprogs/ugrad/

Program Objectives
Emphasizing the underlying principles of the computing process and its applications in systems; computer vision; artificial intelligence; database design and management; information retrieval, language, and text processing; financial analysis; multimedia systems; supercomputing; computer graphics and scientific visualization, including advanced analysis and design.

Engineering Distributions
ENGRD 211: Object-Oriented Programming and Data Structures (required)
ENGRD 230: Introduction to Digital Logic Design (recommended for students interested in computer engineering)

Required Major Courses
CS 212: Programming Practicum
CS 280: Discrete Structures
CS 312: Data Structures and Functional Programming
CS/ECE 314: Computer Organization
or
CS 316: Systems Programming
ENGRD 322: Introduction to Scientific Computation
or
CS 321: Numerical Methods in Computational Molecular Biology
or
CS 421: Numerical Analysis
or
CS 422: Numerical Analysis: Linear and Nonlinear Problems
or
CS 428: Introduction to Computational Biophysics
CS 381: Introduction to Theory of Computing
CS 414: Operating Systems
CS 482: Introduction to Analysis of Algorithms

Electives
Two CS electives numbered ≥400; 3-credit minimum per course; CS 490 not allowed
One CS project course; 2-credit minimum
One mathematics-related elective course (≥300 level) or a mathematically oriented course from a related technical area (e.g., OR&IE, ECE, PHYS, T&AM); 3-credit minimum
Two Major-approved technical electives numbered ≥300; 3-credit minimum per course

Two advisor-approved, free electives

Three related, upper-level elective courses numbered ≥300 (specialization); 3-credit minimum per course; CS courses not allowed
Computer Science Major (CS)

a. May substitute PHYS 214 for CHEM 208. MATH 293 is a prerequisite for PHYS 214.

Note: This schedule represents the latest possible entry into the Computer Science Major. Typically, CS 100, 211, 212, 280, 312, and 314 are completed by the end of the second year.

See accompanying description for explanation of upper-class course requirements.

Note: This chart does not include Liberal Studies and Physical Education requirements.
## Computer Science Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
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</tr>
<tr>
<td>CS 280</td>
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<td>MATH 294</td>
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<td>CHEM 209</td>
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<tr>
<td>PHYS 112 (or 116)</td>
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<td></td>
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<tr>
<td>PHYS 213 (or 217)</td>
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<tr>
<td>CHEM 208 (or PHYS 214 or 218)</td>
<td>4</td>
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</tr>
<tr>
<td>CS 100</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 101</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Introduction to Engineering (ENGRI 1XX)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 1: ENGRD 211</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 2</td>
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<tr>
<td>First-Year Writing Seminar 1(^a)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)(^b)</td>
<td></td>
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<tr>
<td>Liberal Studies 1</td>
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<td>Liberal Studies 5</td>
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<tr>
<td>Liberal Studies 6</td>
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</tr>
<tr>
<td>Approved Elective (two courses; 6-credit minimum)</td>
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<tr>
<td>Approved Elective</td>
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<td></td>
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<tr>
<td>Physical Education (two semesters) and swim test</td>
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</tr>
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</table>

### Required Major Courses (48-credit minimum)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>√ When Done</th>
</tr>
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<tbody>
<tr>
<td>CS 212</td>
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<td></td>
</tr>
<tr>
<td>CS 312</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 316 or CS 314</td>
<td>4</td>
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<tr>
<td>ENGRD 322 or CS 321 or CS 421 or CS 422 or CS 428</td>
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<td></td>
</tr>
<tr>
<td>CS 381</td>
<td>3</td>
<td></td>
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<tr>
<td>CS 414</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CS 482</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS Elective 400 or above</td>
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<td></td>
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<tr>
<td>CS Elective 400 or above</td>
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<td></td>
</tr>
<tr>
<td>CS Project Course</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Specialization Elective 1(^c)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Specialization Elective 2(^c)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Specialization Elective 3(^c)</td>
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<td></td>
</tr>
<tr>
<td>Mathematics-Related Electives(^d)</td>
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<tr>
<td>Major-approved Technical Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Technical Elective</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Total Required Credits**: 123 minimum

**Additional Elective Courses (0 credits minimum, no maximum)** | | |
Notes

a. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective, or Major course. (ENGRD 264: Computer-Instrumentation Design satisfies this requirement.)

b. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

c. The outside specialization consists of 9 or more credits at the ≥300 level. No CS courses are allowed. The three courses must be related to each other (3-credit minimum per course).

d. The mathematics elective involves taking a ≥300-level course that has rigorous mathematical content. (ENGRD 270: Basic Engineering Probability and Statistics and MATH 293: Differential Equations for Engineers are the only courses below the 300 level that satisfy this requirement.)

This engineering checklist is formatted to conform to the general specifications of the College of Engineering. We strongly recommend that you visit 303 Upson Hall for an official Computer Science Major checklist. This information can also be obtained by visiting the Computer Science web site (www.cs.cornell.edu/degreeprogs/ugrad/).
Major: Electrical and Computer Engineering (ECE)

Accredited by ABET (see inside front cover).

Offered by: School of Electrical and Computer Engineering
223 Phillips Hall, 255.4309, www.ece.cornell.edu

Program Objectives

Our objectives are designed to serve the needs of our constituents: our graduates, the employers of our graduates, the graduate study programs that our graduates enter, our faculty, and our society.

• To create leading scholars and professionals who are committed to excellence, integrity, lifelong learning, and professional citizenship.

• To enable our students to achieve engineering goals through problem solving, design, experimentation, teamwork, and effective communication.

• To endow our students with an appreciation of the impact of electrical and computer engineering on society and to encourage creative responses to the needs of society by our graduates.

• To provide our students with a broad education in the fundamentals of Electrical and Computer Engineering as well as advanced knowledge in one or more technical areas that lead to and sustain a productive engineering career.

Areas of Concentration

Computer architecture and organization, digital systems, and computer vision; power systems, control, optimization, numerical, and state-space methods; communications, networks, information theory, and coding, signal processing; electronic circuits, VLSI, solid state physics and devices, MEMs, nanotechnology, lasers and optoelectronics; electromagnetics, radiophysics, space sciences, and plasmas.

Engineering Distributions

ENGRD/ECE 210: Introduction to Circuits for Electrical and Computer Engineers
or
ENGRD/ECE 230: Introduction to Digital Logic Design

ENGRD 211: Computers and Programming (recommended for those interested in the Computer Engineering specialty area)

Required Major Courses

ECE/ENGRD 210: Introduction to Circuits for Electrical and Computer Engineers
ECE 220: Signals and Information
ECE 303: Electromagnetic Fields and Waves
ECE 314: Computer Organization
ECE 315: Introduction to Microelectronics
ECE 320: Networks and Systems
Major-approved Electives

Advanced ECE Electives: six lecture courses

Major-complementary electives (outside the Major): 9 credits minimum

The minimum number of Major credits is currently 52. Details are available on the ECE graduation check list available in 223 Phillips Hall.

Culminating Design Experience (CDE)

We are committed to providing our students with the most useful and relevant educational experience possible. The Culminating Design Experience (CDE) courses, of which two are required for graduation, include a significant and open-ended engineering design assignment with realistic constraints. Consideration of most of the following issues will be an integral part of a CDE course: an ability to design a component, system, or process to meet desired needs that includes most of the following: economics, the environment, sustainability, manufacturability, ethics, health and safety, society, and politics. An updated list of courses that meet the CDE requirement will be posted each semester on the bulletin board outside of 223 Phillips Hall. The CDE courses for the academic year 2007–2008 are ECE 415: GPS: Theory and Design, ECE 426: Applications of Signal Processing, ECE 437: Fiber and Integrated Optics, ECE 453: Analog Integrated Circuit Design, ECE 467: Digital Communication Receiver Design, ECE 475: Computer Architecture, and ECE 476: Digital Systems Design Using Microcontrollers.

Independent projects such as ECE 391, 392, 491, or 492 count only in the outside ECE Technical Electives category.
Electrical and Computer Engineering Major (ECE)

a. Can be taken in semester 5.
b. Can be taken in semester 6.
c. Approved list.

Note: This chart does not include Liberal Studies and Physical Education requirements.
### Electrical and Computer Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
<td></td>
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<tr>
<td>MATH 293</td>
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<tr>
<td>MATH 294</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 209 or 215</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 112 or 116</td>
<td>4</td>
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<tr>
<td>PHYS 213 or 217</td>
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<td>PHYS 214 or 218</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 100</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 101</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Applications of Probability and Statistics[^a]</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Intro to Engineering (ENGRI 1XX)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 1: ECE/ENGRD 230 (required)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 2[^b]: ENGRD 211</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>(recommended for Computer Engineering)</td>
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<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 1[^c]</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)[^d]</td>
<td></td>
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<tr>
<td>Liberal Studies 1</td>
<td></td>
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<td>Liberal Studies 2</td>
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<td>Liberal Studies 5</td>
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<tr>
<td>Liberal Studies 6</td>
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</tr>
<tr>
<td>College/Advisor–Approved Elective (two courses, 6-credit minimum)</td>
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<td></td>
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<tr>
<td>Physical Education (two semesters) and swim test</td>
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</tbody>
</table>

### Required Major Courses[^e] (53 credits)

- Additional Engineering Requirements
- Technical Writing Course[^c]

Total Required Credits: 130 minimum
Notes


b. Must include one course numbered ≥300, and all courses must have a college-level prerequisite. Students must also meet a college requirement of technical communications.

c. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, or approved elective.

d. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200 level or higher.

e. This engineering check list is formatted to conform to the general specifications of the College of Engineering and accurately reflects the first- and second-year requirements. We strongly recommend that you visit 223 Phillips Hall or the Electrical and Computer Engineering web site (www.ece.cornell.edu) for an official Electrical and Computer Engineering Major check list appropriate for the class of 2007 and later.
Major: Engineering Physics
 Offered by: School of Applied and Engineering Physics
 212 Clark Hall, 255.5198, www.aep.cornell.edu

Program Objectives
The objectives for the Major in Engineering Physics are to:

• Give our students an adequate education in mathematics and physics so that they have a basis for a complete understanding of current and future scientific and technological developments.

• Ensure, through a set of several elective courses, the necessary flexibility for various career objectives, i.e., (1) immediate employment with the B.S. degree; (2) background for entering professional graduate schools like law or medicine; or, (3) the appropriate background for Ph.D. graduate work in science and/or engineering.

• Include throughout the undergraduate program hands-on experience in laboratory as well as design, computational, and research problems.

• Provide an environment characterized by the highest academic and ethical standards that instills pride in these standards and the program in general.

Introduction to Engineering Course (recommended)
ENGRI 102: Introduction to Nanoscience and Nanoengineering
or ENGRI 110: Lasers and Photonics

Engineering Distributions (suggested)
ENGRD 252: The Physics of Life
ENGRD 264: Computer-Instrumentation Design
ENGRD XXX: Choose from the list of engineering distribution courses;

Required Major Courses
A&EP 333: Mechanics of Particles and Solid Bodies (counts as an engineering distribution course)
A&EP 361: Introductory Quantum Mechanics
A&EP 363: Electronic Circuits (Laboratory)
A&EP 423: Statistical Thermodynamics
A&EP 434: Continuum Physics (Laboratory)
PHYS 410³: Advanced Experimental Physics (Laboratory)
**Engineering Physics Major (EP)**

a. May simultaneously satisfy Major and distribution requirements.
b. May be taken in either semester 1 or 2.
c. Recommended but not required; satisfies college technical writing requirement. May also be taken in semester 5.
d. ECE 210 and ECE 230 could possibly be substituted for A&EP 363.
e. Two of the 4 credits of PHYS 410 can be satisfied by successfully completing A&EP/PHYS 330 or ASTRO 410. The remaining 2 credits can be satisfied by taking PHYS 400 for 2 credits provided that the experiments in PHYS 400 do not overlap with those in A&EP/PHYS 330 or ASTRO 410 (see previous page for details).

Note: This chart does not include Liberal Studies and Physical Education requirements, and Advisor-Approved Electives.
## Engineering Physics Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 293</td>
<td>4</td>
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<tr>
<td>MATH 294</td>
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<tr>
<td>CHEM 209 (or 207 or 215)</td>
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<td>PHYS 112 (or 116)</td>
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<td>PHYS 214 (or 218)</td>
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<td>CS 100</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 101</td>
<td>1</td>
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</tr>
<tr>
<td>Introduction to Engineering: ENGRI 102 or ENGRI 110 (recommended)</td>
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<td></td>
</tr>
<tr>
<td>Engineering Distribution 1: ENGRD 264 (recommended)</td>
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<tr>
<td>Engineering Distribution 2: A&amp;EP 333 (recommended)</td>
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<tr>
<td>First-Year Writing Seminar 1</td>
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<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
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<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies 1</td>
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<td>Liberal Studies 2</td>
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<td>Liberal Studies 6</td>
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<tr>
<td>Approved Elective (two courses; 6-credit minimum)</td>
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</tr>
<tr>
<td>Physical Education (two semesters) and swim test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Required Major Courses (58-credit minimum)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;EP 321</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>A&amp;EP 322</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>A&amp;EP 333\textsuperscript{e}</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>A&amp;EP 355</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>A&amp;EP 356</td>
<td>4</td>
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<tr>
<td>A&amp;EP 361</td>
<td>2</td>
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<td>A&amp;EP 362</td>
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<tr>
<td>A&amp;EP 363</td>
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<td></td>
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<tr>
<td>A&amp;EP 423</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>A&amp;EP 434</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 410\textsuperscript{a}</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>(Six (6) Major-approved electives, five (5) of which must be technical)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300-level or above and no S/U grades</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Required Credits</td>
<td>128 minimum</td>
<td></td>
</tr>
<tr>
<td>Additional Elective Courses (0 credits minimum, no maximum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Writing Course\textsuperscript{c}: ENGRD 264 (recommended)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Notes

a. Two of the 4 credits of PHYS 410 can be satisfied by successfully completing A&EP/PHYS 330. The remaining 2 credits can be satisfied by taking PHYS 400 for 2 credits provided that the experiments in PHYS 400 do not overlap with those in A&EP/PHYS 330. (A list of experiments that are not appropriate will be prepared by A&EP faculty and made available in the A&EP office.) If a student chooses this option, A&EP/PHYS 330 may also count as a technical elective, provided the remaining three technical electives are 4 credits each.

b. A&EP 333 may simultaneously satisfy Major and distribution requirements. In this case, the total number of credits required for the degree is 130.

c. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective or Major course. (ENGRD 264 satisfies this requirement.)

d. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

e. Nine credits of Major-complementary courses must be outside the Major.
Major: Environmental Engineering (EnvE)

Offered jointly by:
Department of Biological and Environmental Engineering
207 Riley-Robb Hall, 607.255.2173, www.bee.cornell.edu
and
School of Civil and Environmental Engineering
221 Hollister Hall, 607.255.3412, www.cee.cornell.edu

Program Objectives

We are committed to providing an excellent undergraduate engineering program in a nurturing learning environment so that our graduates acquire knowledge and develop the needed skills for successful professional careers. The educational program objectives are to:

• Produce graduates who pursue careers in Environmental Engineering based on a background in mathematics, physical and life sciences, liberal studies, and engineering.
• Produce graduates who pursue advanced degrees in engineering and related professional fields.
• Produce graduates who assume leadership positions and contribute to solution of societal problems involving environmental systems.

Students majoring in Environmental Engineering may double Major in “Civil Engineering” or “Biological Engineering” to ensure that they receive an ABET–accredited engineering degree. Civil Engineering offers a concentration in Environmental Engineering. Biological Engineering offers a concentration in Bioenvironmental Engineering. With appropriate course selection, students completing these concentrations can double Major in Environmental Engineering with minimal additional course requirements as defined in the BE and CE undergraduate handbooks.

Introduction to Engineering

BEE 200: The BEE Experience (required for students matriculating in CALS)\textsuperscript{a} or ENGRI 1XX ENGRI 113: Sustainability Design for Appledore Island (recommended)

Engineering Distributions

ENGRD 251: Engineering for a Sustainable Society (required)
Required Major Courses

BIO G 101/103: Biological Sciences
or
BIO G 105: Introductory Biology
or
BIO G 107: General Biology
or
BIO G 109: Biological Principles

ENGRD 202: Mechanics of Solids

ENGRD 320: Engineering Computation (formerly ENGRD 241)
or
ENGRD 221: Thermodynamics

CEE 304: Uncertainty Analysis in Engineering
CEE 323: Engineering Economics and Management
or
BEE 489: Engineering Entrepreneurship, Management and Ethics

CEE 331: Fluid Mechanics

CEE 351: Environmental Quality Engineering


CEE 451: Microbiology for Environmental Engineering

Lab Course: CEE 453: Laboratory Research in Environmental Engineering (spring), BEE 427: Water Sampling and Measurement (fall), BEE 473: Watershed Engineering (fall), or CEE 437: Experimental Methods in Fluid Dynamics (every other spring)

BEE 475: Environmental Systems Analysis

Electives

Technical communications course (Approved Technical communication courses are listed in Courses of Study, College of Engineering section. BEE 473 with BEE 493: Technical Writing for Engineers: or BEE 450: Bioinstrumentation with BEE 493 or BEE 489 are on the approved list)

Three design electives, 9 credit minimum (chosen from list of allowed courses)

Two Major-approved Engineering electives

Two approved electives
Environmental Engineering Major (EnvE)

a. CS 100M and CS 101J are recommended.
b. ENGRI 113 is recommended or BEE 200 together with BEE 151 satisfies the Intro to Engineering requirement.
c. ENGRD 202, ENGRD 221, or 320 (formerly ENGRD 241), and CEE 304 are required courses that may be used as a second distribution course. Students electing to count any of these as a second distribution course must take an additional Major-Approved Elective.
d. ENGRD 270 may be accepted (by petition) to substitute for CEE 304 if taken prior to affiliation in the Major or if necessary because of scheduling conflicts caused by co-op or study abroad programs.
e. Students choose from BIO G 101/103 (fall), 105 (fall), 107 (spring), or 109 (fall).
f. Students may choose from CEE 453 (spring), BEE 427 (fall), BEE 473 (fall), or CEE 437 (every other spring).
g. Students may choose from CEE 411 (spring), EAS 201 (fall), EAS 303, CSS 365 (spring), or BEE 371 (spring).

Note: Students must also take a course that meets the technical communications requirement. Students meeting the technical communications requirement with a course that fulfills another requirement will have met both requirements.

This chart does not include Physical Education requirements.
## Environmental Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Minimum Credit Hours</th>
<th>When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 293</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 294</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 209 (or 215)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 257 or 357</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>PHYS 112</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 213 (or 217)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 100M or BEE 151</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 101J</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Introduction to Engineering (ENGRI 1XX) or BEE 200</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 1: ENGRD 251 (required)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 2: ENGRD 2XH</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies 1</td>
<td></td>
<td></td>
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<tr>
<td>Liberal Studies 2</td>
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<tr>
<td>Liberal Studies 3</td>
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<td>Liberal Studies 4</td>
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<td>Liberal Studies 5</td>
<td></td>
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<tr>
<td>Liberal Studies 6</td>
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</tr>
<tr>
<td>Approved Elective (two courses; 6-credit minimum)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Approved Elective 1</td>
<td></td>
<td></td>
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<tr>
<td>Approved Elective 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Education (two semesters) and swim test</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Required Major Courses (54-credit minimum)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO G 10X (BIO G 101/103, or BIO G 105; or BIO G 107 or BIO G 109)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ENGRD 202</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>ENGRD 320 (formerly ENGRD 241) or 221</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CEE 304</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CEE 323 or BEE 489</td>
<td>3–4</td>
<td></td>
</tr>
<tr>
<td>CEE 331</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CEE 341, EAS 201, EAS 303, CSS 365, or BEE 371</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CEE 351</td>
<td>3</td>
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</tr>
<tr>
<td>CEE 451</td>
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<tr>
<td>Laboratory Course</td>
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<tr>
<td>BEE 475</td>
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</tr>
<tr>
<td>Design Elective 1</td>
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<td>Design Elective 2</td>
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<tr>
<td>Design Elective 3</td>
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<td></td>
</tr>
<tr>
<td>Major-approved Elective 1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Major-approved Elective 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Technical Writing Course</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Required Credits</strong></td>
<td>126 minimum</td>
<td></td>
</tr>
<tr>
<td>Additional Elective Courses (0 credits minimum, no maximum)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Major Programs: Environmental Engineering**
Notes

a. BEE 151: Introduction to Computer Engineering combined with BEE 200 (5 credits) satisfy the ENGRI requirement for CALS matriculated students. Students using BEE 200 and BEE 151 to satisfy the ENGRI requirement must make up the 2-credit difference with engineering course work.

b. Students electing to use this course as a second engineering distribution must take an additional Major-approved elective. Note: BIO G 109 is not an engineering distribution course.

c. ENGRD 270: Basic Engineering Probability and Statistics may be accepted (by petition) to substitute for CEE 304 if taken prior to affiliation with the Environmental Engineering Major or if necessary because of scheduling conflicts caused by co-op or study abroad programs.

d. Students planning graduate-level study in EnvE should take BIOMI 290, General Microbiology Lectures, in place of CEE 451.

e. If the course fulfilling the technical writing requirement also fulfills another requirement (e.g. liberal studies, Major-approved elective) then it may be used to satisfy both requirements.

f. The lists of suggested courses are given in the Undergraduate Handbook for Environmental Engineering and cover the areas of environmental engineering, hydraulics/hydrology, environmental systems engineering, geotechnical engineering, remote sensing, air pollution, and renewable energy systems. The handbook is available in the department offices.

g. ENGRI 113 is recommended.

h. ENGRD 202, 221, or 320 (formerly 241), ENGRD 201: Introduction to the Physics and Chemistry of the Earth, ENGRD 219: Mass and Energy Balances, or BIO G 101/103, 105, or 107 (introductory biology courses)

i. In addition to the first-year writing seminars, a technical writing course must be taken. An approved COMM or ENGRC course, or BEE 493 taken with BEE 473, or BEE 493 taken with BEE 450 or BEE 489 will satisfy this requirement.) Students meeting technical communications requirement with a course that fulfills another requirement (e.g. Liberal Studies, Lab, Design) can use that course to satisfy both requirements.

j. Six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.
k. Nine credits of electives are determined by Major approval. To ensure breadth of engineering studies, Major programs also will include 9 credits outside the Major. This group of courses may be comprised of ENGRD 202, one engineering distribution or elective, and/or a CEE or BEE Major course outside the Major disciplinary area.

l. Students electing to use this course as a second engineering distribution must take an additional Major-approved elective. Note: BIO G 109 is not an engineering distribution course.

m. Students planning graduate-level study in EnvE may take BIOMI 290, Introduction to Microbiology, in place of CEE 451.

n. CEE 453 (spring), BEE 427 (fall), BEE 473 (fall), or CEE 437 (every other spring).
Major: Information Science, Systems, and Technology

Offered by:
Department of Computer Science
(Information Science Option)
303 Upson Hall, 255.9837, www.infosci.cornell.edu/ugrad

and

School of Operations Research and Information Engineering
(Management Science Option)
202 Rhodes Hall, 255.5088, www.infosci.cornell.edu/ugrad

The ISST Major studies the design and management of complex information systems. Rather than focusing on the computing and communication technologies that underlie digital information systems, the ISST Major emphasizes information systems engineering in broad application contexts, where issues at the confluence of information science, technology, and management are the primary concerns. The core courses in the field provide students with grounding in operations research modeling techniques of probability, statistics, and optimization; computer science; economics; and the social and organizational contexts in which transformative information systems exist. Students then choose one of two options: Management Science (MS) or Information Science (IS).

The Management Science option educates students in methods for quantitative decision-making and their application to information technology, as well as the broader role that information technology plays in making these methods effective. Management Science students take advanced courses in mathematical models in management science, information systems, mathematical modeling in IT, and information technology management solutions.

The Information Science option educates students in methods for the creation, representation, organization, access, and analysis of information in digital form. Students who choose the Information Science option take classes in information systems, mathematical modeling in IT, human-centered systems, and social systems.

Note: All courses used toward the ISST Major must be taken for a letter grade.

The Major requires ENGRD 270: Basic Engineering Probability and Statistics as an Engineering Distribution course. CS 211 is required by the Major and it is recommended that it be taken as an engineering distribution course.

The Major has seven (7) additional required courses in three areas:

- probability, statistics, optimization (two courses);
- information systems (three courses);
- economic, organizational, and social context (two courses)

Students then complete the Major by specializing in either the Management Science option or the Information Science option (seven advanced courses); and by taking two Major-approved courses (The set of Major-approved elective courses is the same for both specialization options, and contains all the courses listed in the six areas below. In addition, students may choose to take INFO 490: Independent Reading and Research, as one of their Major-approved elective courses.)
**Engineering Distributions**

ENGRD 211: Object-Oriented Programming and Data Structures (required by the Major; recommended as a distribution course)

ENGRD 270: Basic Engineering Probability and Statistics (required)

**Required Major Courses**

OR&IE 320: Optimization I

OR&IE 360: Engineering Probability and Statistics II

INFO 230: Intermediate Design and Programming for the Web

OR&IE 311: Information Systems and Analysis

INFO 330: Data-Driven Web Applications

ECON 301: Microeconomics

or

ECON 313: Intermediate Microeconomic Theory

ILROB 175: Behaviors, Values, and Performance

or

INFO 245: Psychology of Social Computing

or

ENGRC 335: Communications for Engineering Managers

**Information Science Option**

Three courses from Information Systems (Area II below)

One course from Mathematical Modeling in Information Technology (Area III below)

Three elective courses: Students must choose either Human-Centered Systems (Area V) or Social Systems (Area VI) and take all elective courses from that area.

**Management Science Option**

The four courses in Mathematical Models in Management Science (Area I)

Three elective courses, one from each of

- Information Systems (Area II)
- Mathematical Modeling in Information Technology (Area III)
- Information Technology Management Solutions (Area IV)

**Area I. Mathematical Models in Management Science**

OR&IE 350: Financial and Managerial Accounting

OR&IE 361: Introductory Engineering Stochastic Processes I

OR&IE 480: Information Technology

OR&IE 580: Simulation Modeling and Analysis
Area II. Information Systems

CS 419: Computer Networks
INFO 430: Information Retrieval
INFO 431: Web Information Systems
CS 432: Introduction to Database Systems
CS 465: Introduction to Computer Graphics
CS 472: Foundations of Artificial Intelligence
CS 474: Introduction to Natural Language Processing
CS 501: Software Engineering
CS 513: System Security
INFO 530: The Architecture of Large-Scale Information Systems
CS 578: Empirical Methods in Machine Learning and Data Mining

Area III. Mathematical Modeling in Information Technology

INFO 372: Explorations in Artificial Intelligence
OR&IE 431: Discrete Models
OR&IE 474: Statistical Data Mining I
CS 478: Machine Learning
OR&IE 483: Applications of Operations Research and Game Theory to Information Technology
ECE 562: Fundamental Information Theory

Area IV. Information Technology Management Solutions

OR&IE 481: Delivering OR Solutions with Information Technology
OR&IE 518: Supply Chain Management

Area V. Human-Centered Systems

INFO 345: Human–Computer Interaction Design
PSYCH 347: Psychology of Visual Communications
PSYCH 380a: Social Cognition
PSYCH 413: Information Processing: Conscious and Nonconscious
PSYCH 416a: Modeling Perception and Cognition
INFO 440: Advanced Human–Computer Interaction Design
INFO 445: Seminar in Computer-Mediated Communication
INFO 450: Language and Technology
DEA 470: Applied Ergonomic Methods
Area VI. Social Systems
SOC 304: Social Networks and Social Processes
AEM 322\textsuperscript{b}: Information Technology Strategy
INFO 320: New Media and Society
INFO 349: Media Technologies
INFO 366: History and Theory of Digital Art
INFO 355: Computers: From the 17th Century to the Dot.com Boom
INFO 356: Computing Cultures
ECON 368\textsuperscript{b}: Game Theory
INFO 387: The Automatic Lifestyle: Consumer Culture and Technology
S&TS 411: Knowledge, Technology, and Property
INFO 415: Environmental Interventions
ECON 419: Economic Decisions Under Uncertainty
INFO 429: Copyright in the Digital Age
INFO 435: Seminar on Applications of Information Science
OR&IE 435\textsuperscript{b}: Introduction to Game Theory
INFO 444: Responsive Environments
INFO 447: Social and Economic Data
H ADM 474\textsuperscript{b}: Strategic Information Systems
H ADM 489: The Law of the Internet and e-Commerce
INFO 515: Culture, Law, and Politics of the Internet
Information Science, Systems, and Technology Major (ISST)

a. PHYS 214 may be taken instead of CHEM 208. Students who prefer to take PHYS 214 must take MATH 293 in semester 3 as the prerequisite to PHYS 214.

b. ENGRC 335 fulfills the technical writing requirement.

Note: This chart does not include Liberal Studies and Physical Education requirements.
## Information Science, Systems, and Technology Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 294</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 293 or 304 or CS 280</td>
<td>3 or 4</td>
<td></td>
</tr>
<tr>
<td>CHEM 209 or 215</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 112 (or 116)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 213 (or 217)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 214 (or 218 or CHEM 208 or 216)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CS 100 and 101</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Introduction to Engineering: (ENGRI 1XX)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 1: ENGRD 270</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Engineering Distribution 2: CS 211c</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 1d</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Liberal Studies Distribution**—six courses (18-credit minimum)

- Liberal Studies 1
- Liberal Studies 2
- Liberal Studies 3
- Liberal Studies 4
- Liberal Studies 5
- Liberal Studies 6

**Advisor Approved Elective** (two courses; 6-credit minimum)

**Physical Education** (two semesters) and swim test

### Required Major Courses (52-credit minimum)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Hours</th>
<th>When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR&amp;IE 320</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OR&amp;IE 360</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>INFO 230</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>OR&amp;IE 311</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>INFO 330</td>
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<td></td>
</tr>
<tr>
<td>ECON 301 or ECON 313</td>
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<td></td>
</tr>
<tr>
<td>INFO 245 or ILROB 175 or ENGRC 335</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### Information Science/Management Science

**Option** (nine course, 27-credit minimum)

- Specialization Elective 3/4
- Specialization Elective 3/4
- Specialization Elective 3/4
- Specialization Elective 3/4
- Specialization Elective 3/4
- Specialization Elective 3/4
- Specialization Elective 3/4
- Major-approved Elective 3/4
- Major-approved Elective 3/4

**Total Required Credits** 128 minimum
a. Students who take PSYCH 342 or 416 may also count their prerequisite, PSYCH 205: Perception or PSYCH 214: Cognitive Psychology, toward the Human-Centered Systems requirement. Students who take PSYCH 380 may also count PSYCH 280: Introduction to Social Psychology toward the Human-Centered Systems requirement. At most one of these 200-level prerequisites can be counted.

b. Only one of OR&IE 435 and ECON 368 can be taken for ISST credit. Only one of AEM 322 and H ADM 574 can be taken for ISST credit.

c. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective, or Major course. ENGRC 335 is recommended as a technical writing course for ISST Majors.

d. CS 211 is required by the Major and it is recommended that this course be counted as an engineering distribution course.

e. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

f. Nine credits of Major-complementary courses are required to be outside of the INFO rubric. These include one of ECON 301 or 313; one of INFO 245, ILROB 175 or ENGRC 335; and one additional course that is not an INFO course and is listed in the ISST degree requirements web page (www.infosci.cornell.edu/ugrad/ISSTRequirements.htm).

This engineering check list is formatted to conform to the general specifications of the College of Engineering. We strongly recommend that you visit 303 Upson Hall for an official ISST Major check list. This information can also be obtained by visiting the Information Science web site (www.infosci.cornell.edu/ugrad/).
**Major: Materials Science and Engineering**

Accredited by ABET (see inside front cover).

Offered by: Department of Materials Science and Engineering
214 Bard Hall, 255.9159, www.mse.cornell.edu

**Program Objectives**

Our undergraduate Major is based on the following educational objectives:

- **Preparation:** To prepare students to excel in graduate school or technical careers through a world-class, rigorous, and competitive program.

- **Core Competence:** To train students across the spectrum of basic and applied materials science, recognizing and exploiting common descriptions in disparate systems.

- **Breadth:** To train students with sufficient scientific and engineering breadth to design and create novel solutions to materials problems in engineering systems.

- **Professionalism:** To develop in students professional and ethical attitudes, effective communication and teamwork skills, and an ability to place science and engineering issues and solutions within the broader societal context.

- **Learning Environment:** To provide students with an academic environment committed to excellence and innovation that contributes to developing leadership, professionalism, and life-long learning for their professional careers.

**Common Curriculum Recommendations**

CHEM 209: Engineering General Chemistry

**Engineering Distributions**

ENGRD 261: Mechanical Properties of Materials: From Nanodevices to Superstructures

ENGRD 262: Electronic Materials for the Information Age

Either course (ENGRD 261 or 262) satisfies the Major entry requirement.

**Other Relevant Engineering Distributions**

ENGRD 202: Mechanics of Solids

ENGRD 210: Introduction to Circuits for Electrical and Computer Engineers

ENGRD 219: Mass and Energy Balances

ENGRD 241: Engineering Computation

ENGRD 252: The Physics of Life

ENGRD 260: Principles of Biological Engineering
ENGRD 264: Computer-Instrumentation Design
ENGRD 270: Basic Engineering Probability and Statistics

Required Major Courses

MS&E 206: Atomic and Molecular Structure of Matter
MS&E 261: Mechanical Properties of Materials: From Nanodevices to Superstructures (required unless used to affiliate)
MS&E 262: Electronic Materials for the Information Age (unless used to affiliate)
MS&E 301: Materials Chemistry
MS&E 303: Thermodynamics of Condensed Systems
MS&E 304: Kinetics, Diffusion, and Phased Transformation
MS&E 305: Electronic, Magnetic, and Dielectric Properties of Materials
MS&E 307: Materials Design Concepts I\(^a\)
MS&E 311–312: Junior Laboratory I and II
MS&E 402: Mechanical Properties of Materials, Processing, and Design
MS&E 403–404: Senior Materials Laboratory I and II\(^b\)
MS&E 407: Materials Design Concepts II

Electives\(^c\)

Two materials-related electives covering two groups of different materials\(^c\)
Three materials application–related electives in at least two different types of applications. Two of the materials application–related electives must be taken from outside MS&E.\(^d\)

One additional technical elective must be taken from outside MS&E.\(^e\)
Materials Science and Engineering Major (MS&E)
a. ENGRD 261 or ENGRD 262 satisfies the Major entry requirement.
b. May be taken in semester 1 or 2.
Note: This chart does not include Liberal Studies and Physical Education requirements.
# Materials Science and Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credit Hours</th>
<th>√ When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
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<tr>
<td>MATH 192</td>
<td>4</td>
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<td>MATH 293</td>
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<tr>
<td>MATH 294</td>
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<tr>
<td>CHEM 209 (or 215)</td>
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<td></td>
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<tr>
<td>PHYS 112 (or 116)</td>
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<tr>
<td>PHYS 213 (or 217)</td>
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<td>Introduction to Engineering: (ENGRI 1XX)</td>
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</tr>
<tr>
<td>Engineering Distribution 1: ENGRD 261 or 262</td>
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<tr>
<td>Engineering Distribution 2: ENGRD 2XX</td>
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</tr>
<tr>
<td>First Year Writing Seminar 1\textsuperscript{a}</td>
<td>3</td>
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<tr>
<td>First Year Writing Seminar 2</td>
<td>3</td>
<td></td>
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<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)\textsuperscript{f}</td>
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<tr>
<td>Liberal Studies 1</td>
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<td>Liberal Studies 2</td>
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<td>Liberal Studies 3</td>
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<td>Liberal Studies 4</td>
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<td>Liberal Studies 5</td>
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<td>Liberal Studies 6</td>
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<tr>
<td>Approved Elective (two courses; 6-credit minimum)</td>
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<tr>
<td>Approved Elective</td>
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<tr>
<td>Physical Education (two semesters) and swim test</td>
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<tr>
<td><strong>Required Major Courses (53-credit minimum)</strong></td>
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<tr>
<td>MS&amp;E 261 or MS&amp;E 262</td>
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<tr>
<td>MS&amp;E 206</td>
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<td>MS&amp;E 301</td>
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<td>MS&amp;E 407</td>
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<td>Materials-related elective I</td>
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<tr>
<td>Materials-related elective II</td>
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<tr>
<td>Applications-related MS&amp;E-numbered elective I</td>
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<tr>
<td>Applications-related elective II</td>
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<tr>
<td>Applications-related non–MS&amp;E-numbered elective III\textsuperscript{g}</td>
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</tr>
<tr>
<td>Outside non–MS&amp;E-numbered Technical Elective III\textsuperscript{g}</td>
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<tr>
<td><strong>Total Required Credits</strong></td>
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<tr>
<td>Additional Elective Courses (0 credits minimum, no maximum)</td>
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</tr>
<tr>
<td>Technical Writing Requirement\textsuperscript{f}:</td>
<td></td>
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</tbody>
</table>
Notes

a. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective or Major course. The combination of MS&E 307/407 with MS&E 403/404 or MS&E 405/406 satisfies this requirement.

b. Research-oriented students may replace MS&E 403 and 404 (senior lab) with MS&E 405 and 406 (senior thesis).

c. In addition to other Major requirements, a course involving significant computational or mathematical modeling or advanced mathematics is required. This requirement is typically fulfilled by one of the engineering distribution, approved elective, materials application–related elective, or outside technical elective courses. Courses satisfying this requirement will generally have MATH 293, MATH 294, or equivalent courses as a pre- or co-requisite. A list of example courses meeting this requirement is available in the MS&E office, or online at www.mse.cornell.edu.

d. A list of approved materials-related and materials application–related courses is available in the MS&E office or online at www.mse.cornell.edu.

e. The outside technical elective must be an upper level (200 or above) technical course and may be selected from engineering or other colleges subject to advisor approval.

f. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

g. Nine credits of elective courses must be taken from outside MS&E. These are satisfied by the outside technical elective and by 6 credits of the Major materials application–related electives.
Major: Mechanical Engineering

Accredited by ABET (see inside front cover).
Offered by: The Sibley School of Mechanical and Aerospace Engineering
108 Upson Hall, 255.3573, www.mae.cornell.edu

Program Objectives

Cornell University is a learning community that seeks to serve society by educating the leaders of tomorrow and extending the frontiers of knowledge. The faculty and staff of the Sibley School of Mechanical and Aerospace Engineering, as members of this community, affirm these objectives. Specifically, the Sibley School is committed to excellence and seeks to graduate mechanical engineers who, collectively:

• assume leadership positions in technology-based industries;
• conceive, design, and realize useful products, systems, and services, properly respecting economic, environmental, cultural, life-safety, and ethical standards or constraints;
• discover and apply new knowledge, and develop new tools for the practice of engineering;
• complete programs of graduate and/or professional studies and continue to learn throughout their lives;
• are valued in their careers, whether for mastery of the disciplines central to mechanical engineering or for the broader analytical or creative abilities fostered by their engineering education; and
• engage with their communities, profession, and the world.

These Program Educational Objectives describe long-term accomplishments for which we seek to prepare our graduates. Progress toward these objectives is expected to be measurable within three to five years of graduation.

Engineering Distributions
ENGRD 202: Mechanics of Solids (required)
ENGRD 221: Thermodynamics (recommended)

Required Major Courses
ENGRD 221: Thermodynamics
ENGRD 203: Dynamics
M&AE 212: Mechanical Properties and Selection of Engineering Materials
M&AE 225: Mechanical Synthesis
M&AE 323: Introductory Fluid Mechanics
M&AE 324: Heat Transfer
M&AE 325: Analysis of Mechanical and Aerospace Structures
M&AE 326: System Dynamics
M&AE 327: Mechanical Property and Performance Laboratory
M&AE 378: Mechatronics (recommended)
or
ENGRD 210: Introduction to Circuits for Electrical and Computer Engineers
or
PHYS 360: Electronic Circuits
M&AE 427: Fluids/Heat Transfer Laboratory
M&AE 428: Engineering Design
M&AE 429: Supervised Senior Design Experience

**Major-approved Electives**

Senior Design elective\(^a\)

Mathematics elective: T&AM 310: Introduction to Applied Mathematics I; or ENGRD 270: Basic Engineering Probability and Statistics; or CEE 304: Uncertainty Analysis in Engineering; or ENGRD 320: Engineering Computation

Technical elective\(^b\)

Major concentration electives (two courses)\(^c\)

The upper-level common curriculum (advisor-approved electives) and the Major-approved electives can be used to build a program with particular emphasis for individual students, appropriate for a wide range of career objectives, including supervised engineering practice, advanced professional engineering education, and other professional education (business, medicine, law).

For a complete list of designated senior design courses and concentration courses and for advisor approved electives and technical elective guidelines, consult: mae.cornell.edu.
**Mechanical Engineering Major (ME)**

a. Assuming no advanced placement, this course must be taken in the term indicated.
b. Most beneficial if taken before (or concurrently with) M&AE 326.
c. This course must be taken in the term indicated.
d. M&AE 378 is recommended. ENGRD 210 or PHYS 360 is also acceptable.

Note: Courses without prerequisites may be rearranged. This chart does not include Liberal Studies and Physical Education requirements.
## Mechanical Engineering Major Checklist

<table>
<thead>
<tr>
<th>Course/Description</th>
<th>Minimum Credit Hours</th>
<th>✔️ When Done</th>
</tr>
</thead>
</table>

- **MATH 191** 4
- **MATH 192** 4
- **MATH 293** 4
- **MATH 294** 4
- **CHEM 209 or 215** 4
- **PHYS 112 (or 116)** 4
- **PHYS 213 (or 217)** 4
- **PHYS 214 (or 218)** 4
- **CS 100M or CS 100J (M preferred)** 4
- **CS 101J or CS 101M (J preferred)** 1
- **Introduction to Engineering: (ENGRI 1XX)** 3
- **Engineering Distribution 2: ENGRD 221 (recommended)** 3
- **First Year Writing Seminar 1*** 3
- **First Year Writing Seminar 2** 3
- **Liberal Studies Distribution—six courses (18-credit minimum)**
  - **Liberal Studies 1**
  - **Liberal Studies 2**
  - **Liberal Studies 3**
  - **Liberal Studies 4**
  - **Liberal Studies 5**
  - **Liberal Studies 6**
- **Advisor Approved Elective (two courses; 6-credit minimum)**
- **Advisor Approved Elective**
- **Physical Education (two semesters) and swim test**

### Required Major Courses (52-credit minimum)

<table>
<thead>
<tr>
<th>Course/Description</th>
<th>Minimum Credit Hours</th>
<th>✔️ When Done</th>
</tr>
</thead>
</table>

- **ENGRD 203** 3
- **M&AE 378 (or ENGRD 210 or PHYS 360)** 4
- **ENGRD 221** 3
- **M&AE 212** 3
- **M&AE 225** 4
- **M&AE 323** 4
- **M&AE 324** 3
- **M&AE 325** 3
- **M&AE 326** 4
- **M&AE 327** 2
- **M&AE 427** 3
- **M&AE 428** 2
- **Major-approved Electives**
- **Senior Design Elective** 3
- **Mathematics Elective: T&AM 310 or ENGRD 270 or CEE 304 or ENGRD 320** 3
- **Technical Elective** 3
- **Concentration Elective** 3
- **Concentration Elective** 3

**Total Required Credits 127 minimum**

- **Additional Elective Courses (0 credits minimum, no maximum)**
- **Technical Writing Course**: M&AE 427

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Major Programs: Mechanical Engineering
Notes

a. Taken during the fourth year concurrently with M&AE 428 or after M&AE 428.

b. Generally any course at a level beyond the required courses of the college curriculum in engineering, mathematics, or science (chemical, physical, or biological). Business or organization courses excluded, except M&AE 461: Entrepreneurship for Engineers.

c. A Concentration comprises two designated M&AE courses in one of the following areas: aerospace engineering, biomechanics, energy systems, engineering materials, mechanical systems and design, thermo-fluids engineering, and vehicle engineering.

d. May simultaneously satisfy Major and distribution requirements. In this case, students may satisfy total required credits in a variety of ways following affiliation.

e. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective, or Major course (M&AE 427 satisfies this requirement).

f. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

g. The 9 credits of Major-complementary courses (outside the Major) are ENGRD 202, ENGRD 203, and T&AM 310 or ENGRD 270 or CEE 304 or ENGRD 320.

This engineering check list is formatted to conform to the general specifications of the College of Engineering. We strongly recommend you consult www.mae.cornell.edu for complete Mechanical Engineering academic program information or visit 108 Upson Hall for additional information.
Major: Operations Research and Engineering
Offered by: School of Operations Research and Information Engineering
206 Rhodes Hall, 255.4856, www.orie.cornell.edu

Engineering Distributions
ENGRD 270: Basic Engineering Probability and Statistics (required)
ENGRD 211\textsuperscript{a}: Objected-Oriented Programming and Data Structures

Required Major Courses
OR&IE 312: Industrial Data and Systems Analysis
OR&IE 320: Optimization I
OR&IE 321: Optimization II
OR&IE 350: Financial and Managerial Accounting
OR&IE 360: Engineering Probability and Statistics II
OR&IE 361: Introductory Engineering Stochastic Processes I
OR&IE 580: Monte Carlo Simulation
OR&IE 581: Discrete-Event Simulation

Electives
A behavioral science (organizational behavior) course
At least 9 credits of OR&IE electives
At least 9 credits of Major-approved electives, with at least 3 credits from outside OR&IE\textsuperscript{b}
At least 6 credits of advisor approved electives
At least one of the courses taken must satisfy the technical writing requirement.
Operations Research and Engineering Major (ORE)

a. May be taken in semester 3 or 4.
b. It is recommended that OR&IE 312 be taken in semester 4. However, if a student’s schedule does not permit it, the course can be taken in semester 6 or 8.
c. ORE affiliates may take MATH 293, CS 280, or MATH 304 to satisfy the fourth mathematics requirement. However, MATH 293 is a prerequisite for PHYS 214, thus students who do not take MATH 293 must plan to take CHEM 208.
d. The following courses may be substituted for PHYS 214: CHEM 208, MATH 293 (if not used to meet the mathematics requirement), CS 280 (if not used to meet the mathematics requirement), MATH 304 (if not used to meet the mathematics requirement), MATH 311, or MATH 336. Students who prefer PHYS 214 must take MATH 293 in semester 3.
e. May be taken in semester 1 or 2.

Note: This chart does not include Liberal Studies and Physical Education requirements.
<table>
<thead>
<tr>
<th>Course Description</th>
<th>Minimum Credit Hours</th>
<th>When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
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<td>MATH 293</td>
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<td>MATH 294</td>
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<td>CHEM 209</td>
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<td>PHYS 112 (or 116)</td>
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<td>PHYS 214 (or CHEM 208)</td>
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<td>CS 100J</td>
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<td>CS 101M</td>
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<td>Introduction to Engineering: (ENGRI 1XX)</td>
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<tr>
<td>Engineering Distribution 1: ENGRD 270</td>
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<td>Engineering Distribution 2: ENGRD 211* (recommended)</td>
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<tr>
<td>First-Year Writing Seminar 1*</td>
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<tr>
<td>First-Year Writing Seminar 2</td>
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<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)</td>
<td>18</td>
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<tr>
<td>Liberal Studies 1</td>
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<td>Liberal Studies 5</td>
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<td>Liberal Studies 6</td>
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<td>Advisor-approved Elective (two courses; 6-credit minimum)</td>
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<td>Advisor-approved Elective</td>
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<tr>
<td>Physical Education (two semesters) and swim test</td>
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<td>Required Major Courses (49-credit minimum)*</td>
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<td>OR&amp;IE 312</td>
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<td>OR&amp;IE 320</td>
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<td>OR&amp;IE 321</td>
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<td>OR&amp;IE Elective</td>
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<td>OR&amp;IE Elective</td>
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<td>Major-approved Electives—Non–OR&amp;IE</td>
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<td>Major-approved Elective</td>
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<tr>
<td>Additional Elective Courses (0 credits minimum, no maximum)</td>
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</tr>
</tbody>
</table>
a. ENGRD 211 is required by the Major. It is recommended that this course be counted as an engineering distribution.

b. All ENGRD courses may count as Major-approved electives. A complete list of Major-approved electives can be obtained in 203 Rhodes Hall.

c. ORE affiliates are required to complete MATH 191: Calculus for Engineers, MATH 192: Multivariable Calculus for Engineers, and MATH 294: Linear Algebra for Engineers (or their subject matter equivalents). Either MATH 293: Differential Equations for Engineers, CS 280: Discrete Structures, or MATH 304: Prove It! can be used to satisfy the fourth semester mathematics requirement. Students should discuss with their advisor which of these three courses is most appropriate to their future program of study in ORE. The following considerations should be borne in mind:

(i.) MATH 293 is essential for advanced study in financial engineering. Also, MATH 293 is a pre-requisite for PHYS 214: Physics III: Optics, Waves, and Particles, thus students who do not take MATH 293 must plan to take CHEM 208: General Chemistry.

(ii) CS 280 provides an introduction to discrete structures and algorithms of broad applicability in the field of operations research, particularly for fundamental models in the areas of optimization, production scheduling, inventory management, and information technology; it is also a pre-requisite for certain upper-class computer science courses in the areas of information technology and algorithmic analysis.

(iii) MATH 304 covers fundamentals of formal proof techniques; this material is strongly recommended for students who intend advanced (Ph.D.–level) study in Operations Research or a related field.

d. The following courses may be substituted for PHYS 214, if not used to meet other requirements: CHEM 208, MATH 293, CS 280, MATH 304, MATH 311: Introduction to Analysis, or MATH 336: Applicable Algebra.

e. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, or approved elective.

f. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages (not literature courses). At least two of the six courses must be at 200-level or higher.

g. The required 9 credits of Major-complementary courses (outside the Major) are ENGRD 211, the behavioral science, and one Major-approved elective course.

This engineering check list is formatted to conform to the general specifications of the College of Engineering. We strongly recommend that you visit 203 Rhodes Hall for an official Operations Research and Engineering check list.
Major: Science of Earth Systems
Offered by: Department of Earth and Atmospheric Sciences
2124 Snee Hall, 255.5466, www.eas.cornell.edu

Introduction to Engineering Courses
ENGRI 122: Earthquake! (recommended)

Common Curriculum: either
CHEM 209 and then 208: General Chemistry\(^a\)
or
CHEM 209: General Chemistry and CHEM 257: Introduction to Organic and Biological Chemistry\(^a\)

Engineering Distributions
ENGRD 2XX
ENGRD 2XX

Required Major Courses
BIO G 109–110: Biological Principles (or BIO G 101/103–102/104): Biological Sciences\(^a\)
EAS 220: The Earth System

Three courses selected from the following core courses:
EAS 301: Evolution of the Earth System
EAS 303: Introduction to Biogeochemistry
EAS 304: Interior of the Earth
EAS 305: Climate Dynamics

Field/Observation/Laboratory Course (at least 3 credits):
See Courses of Study.

Specialization Courses
Four specialization courses are selected with the advisor’s approval, all within one of four defined areas of specialization. The areas of specialization include geology (including geochemistry or geophysics), biogeochemistry, ocean sciences, or atmospheric sciences. Other areas of specialization within earth sciences are possible but must be approved by the SES Committee. The specialization courses are intermediate to advanced level (300 level or above) that build upon the base of the Common Curriculum and core courses. Two of the specialization courses count as Major-required courses and two of the specialization courses count as Major-approved electives.
Science of Earth Systems Major (SES)

a. Major requirement based on SES specialization.
b. If CHEM 207–208 is selected, CHEM 257 can replace a second semester of biology.
c. Recommended: ENGR 122.

Note: This chart does not include Liberal Studies and Physical Education requirements.

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 3</th>
<th>Semester 4</th>
<th>Semester 5</th>
<th>Semester 6</th>
<th>Semester 7</th>
<th>Semester 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>MATH 192</td>
<td>MATH 293</td>
<td>MATH 294</td>
<td>Core EAS 3XX</td>
<td>EAS spec³</td>
<td>EAS spec³</td>
<td>EAS spec³</td>
</tr>
<tr>
<td>CHEM 209</td>
<td>CHEM 208</td>
<td>PHYS 112</td>
<td>PHYS 213</td>
<td>Core EAS 3XX</td>
<td>EAS spec³</td>
<td>EAS spec³</td>
<td>EAS spec³</td>
</tr>
<tr>
<td>ENGR 1XX</td>
<td>CS 100M</td>
<td>BIO G 101/103 or 109</td>
<td>BIO G 102/104 or 110</td>
<td>Major Appr Elect</td>
<td>Outside Elect</td>
<td>Outside Elect</td>
<td>Outside Elect</td>
</tr>
<tr>
<td>First-Year Writing Seminar</td>
<td>First-Year Writing Seminar</td>
<td>ENGRD 2XX</td>
<td>EAS 220</td>
<td>ENGRD 2XX</td>
<td>Advisor Approved Elective</td>
<td>Advisor Approved Elective</td>
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<tr>
<td>CS 101J</td>
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</tbody>
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**KEY**
- Major Program
- Common Curriculum
- Engr Dist.
- Elective
- prerequisite
- prerequisite or corequisite
- usually taken concurrently
# Science of Earth Systems Major Checklist

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credit Hours</th>
<th>When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 191</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 192</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>MATH 293</td>
<td>4</td>
<td></td>
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<tr>
<td>MATH 294</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 209&lt;sup&gt;a&lt;/sup&gt; (or 215)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CHEM 208&lt;sup&gt;a&lt;/sup&gt; or 257</td>
<td>4/3</td>
<td></td>
</tr>
<tr>
<td>PHYS 112</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PHYS 213</td>
<td>4</td>
<td></td>
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<tr>
<td>CS 100M or 100J</td>
<td>4</td>
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<td>CS 101J or 101M</td>
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<td>ENGRI 1XX</td>
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<tr>
<td>ENGRD 2XX</td>
<td>3</td>
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</tr>
<tr>
<td>First-Year Writing Seminar 1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar 2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Liberal Studies Distribution—six courses (18-credit minimum)&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liberal Studies 1</td>
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<tr>
<td>Liberal Studies 2</td>
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<tr>
<td>Liberal Studies 3</td>
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<tr>
<td>Liberal Studies 4</td>
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<tr>
<td>Liberal Studies 5</td>
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</tr>
<tr>
<td>Liberal Studies 6</td>
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<td></td>
</tr>
<tr>
<td>Approved Elective (two courses; 6-credit minimum)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Approved Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Physical Education (two semesters) and swim test</td>
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<td></td>
</tr>
</tbody>
</table>

## Required Major Courses (48-credit minimum)<sup>d</sup>

<table>
<thead>
<tr>
<th>Course</th>
<th>Minimum Credit Hours</th>
<th>When Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAS 220</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BIO G 101/103 or 109</td>
<td>4/3</td>
<td></td>
</tr>
<tr>
<td>BIO G 102/104 or 110 or CHEM 257&lt;sup&gt;d&lt;/sup&gt;</td>
<td>4/3</td>
<td></td>
</tr>
<tr>
<td>EAS 3XX core</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>EAS 3XX core</td>
<td>4/3</td>
<td></td>
</tr>
<tr>
<td>EAS 3XX core</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Field Observation Course</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>EAS Specialization (Major required)</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>EAS Specialization (Major-required)</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>EAS Specialization (Major-approved elective)</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>EAS Specialization (Major-approved elective)</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>Major-approved elective (3XX or higher)</td>
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<td></td>
</tr>
<tr>
<td>Outside Major Elective</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>Outside Major Elective</td>
<td>3/4</td>
<td></td>
</tr>
<tr>
<td>Outside Major Elective</td>
<td>3/4</td>
<td></td>
</tr>
</tbody>
</table>

**Total Required Credits<sup>d</sup>** 123 minimum

**Technical Writing Course<sup>b</sup>**
Notes

a. Either CHEM 209–208, or CHEM 209–257 should be selected. If CHEM 209–208 is selected, then CHEM 257 can replace a semester of biology.

b. In addition to the first-year writing seminars, a technical writing course must be taken as an engineering distribution, liberal studies, approved elective or Major course.

c. The six courses must be chosen from at least three of the following six groups: (1) Cultural Analysis (CA), (2) Historical Analysis (HA), (3) Literature and the Arts (LA), (4) Knowledge, Cognition, and Moral Reasoning (KCM), (5) Social and Behavioral Analysis (SBA), (6) Foreign Languages must be selected so that the Major required total is at least 48 credits and the overall total is at least 123 credits.

d. Enough 4 credit courses among those listed as either 3 or 4 credits must be selected so that the Major required total is at least 48 credits and the overall total is at least 123 credits.
Engineering Minors

The Engineering Minor, a supplement to the bachelor's degree Majors in the college, including the Independent Major, recognizes formal study of a particular technical subject area in engineering outside the student’s Major.

Students undertaking a Minor are normally expected to complete the requirements during the time of their continuous undergraduate enrollment at Cornell. Since courses for Minor requirements may also satisfy other degree requirements (e.g. distribution courses, approved electives), the Minor may sometimes be completed within the traditional eight semesters. However, more than eight semesters may be needed.

Courses required for a Minor do not necessarily satisfy a Major requirement. For example, some Minor courses may not be used as Major-approved electives. Check with your advisor.

To complete an Engineering Minor, an engineering student must

- be enrolled in a Major that approves participation of its affiliates in the desired Engineering Minor.
- successfully complete all the requirements for a Bachelor of Science degree in engineering.
- satisfactorily complete six courses (18-credit minimum) as stipulated in the Engineering Minor offered by an engineering department/school other than that which offers the student’s Major.

Each course used to satisfy an Engineering Minor must be taken for a letter grade, if that option exists.

Students may apply for certification of an Engineering Minor at any time after the course work has been completed in accordance with published standards. Students who receive certification in an approved Engineering Minor will be recognized by means of an official notation on their Cornell transcript, following graduation.

The College of Engineering currently offers Minors in the following areas (offering units are indicated in parentheses):

Aerospace Engineering (M&AE)
Applied Mathematics (T&AM)
Biological Engineering (BEE)
Biomedical Engineering (BME)
Civil Infrastructure (CEE)
Computer Science (CS)
Electrical and Computer Engineering (ECE)
Engineering Management (CEE)
Engineering Statistics (OR&IE)
Environmental Engineering (BEE/CEE)
Game Design (CS)
Industrial Systems and Information Science Technology (OR&IE)
Information Science (CIS)
Materials Science and Engineering (MS&E)
Mechanical Engineering (M&AE)
Operations Research and Management Science (OR&IE)
Science of Earth Systems (SES)

Additional information on specific Minors can be found in the Major office of the department/school offering the Minor, in Courses of Study, in Engineering Advising, and on the pages that follow.

Students interested in applying the concepts and methods of the engineering, computational, and physical sciences to living systems or health issues may pursue one of three courses of study, which are presented for ease of comparison in the following chart. For more details on these courses of study, see the appropriate sections of “Engineering Minors.”

**Minor in Business for Engineering Students**

The Department of Applied Economics and Management in the College of Agriculture and Life Sciences offers a Minor in Business for Engineering Students on a selective basis. Engineering students may apply to the Minor at any point during their academic career, beginning in the first semester of their second year. At that time, Engineering students will be in the process of applying to affiliate with an Engineering Major and will need to begin taking the courses required for the Minor. Detailed information can be found under “Minor in Business for Engineering Students” on page 133.
Minor in Aerospace Engineering

Offered by: Sibley School of Mechanical and Aerospace Engineering
Administered by M&AE Associate Director for Undergraduate Affairs. For information, come to 108 Upson Hall, phone 255.3573, or send e-mail to np18@cornell.edu.

Eligibility

Students should consult the M&AE web site (www.mae.cornell.edu) for the most up-to-date list of Majors eligible to participate in the Aerospace Engineering Minor. Mechanical Engineering degree candidates may participate in this Minor. Pre-approval for the Aerospace Engineering Minor is required. Students intending to earn a Minor in Aerospace Engineering should seek advice and pre-approval of their Minor academic program from the Associate Director for Undergraduate Affairs in M&AE before taking courses toward the Minor.

Educational Objectives

The Aerospace Engineering Minor develops the engineering-analysis and design skills necessary for creating and understanding aerospace vehicles and their subsystems. The Minor includes diverse topics relevant to applications both in the Earth’s atmosphere (e.g., aerodynamics) and in space (e.g., spacecraft thermal systems or orbital mechanics). Students in this Minor will take at least four core aerospace courses, along with up to two supporting courses in engineering fundamentals or courses with applicability to aeronautics and spacecraft.

Requirements

1. Six courses from the lists below, each worth at least 3 credits. No substitutions accepted from other departments at Cornell or elsewhere.

2. Rules for ME Majors:
   (a) Select at least four courses from group A, of which you must choose M&AE 305 or M&AE 306 (or both).
   (b) Select at most two courses from group B. No courses from group C may be used.
   (c) You may use at most four courses to satisfy both the Aerospace Engineering Minor requirements and the requirements for the B.S. in Mechanical Engineering. The Major concentration courses may not be among these overlapped courses.

3. Rules for other Majors:
   (a) Select at least four courses from group A, of which you must choose M&AE 305 or M&AE 306 (or both).
   (b) Select a total of at most two courses from group B and group C.
   (c) You may not use any courses to satisfy requirements of both the Mechanical Engineering Minor and the Aerospace Engineering Minor.
Group A: Core Aerospace Engineering

M&AE 305: Introduction to Aeronautics
M&AE 306: Spacecraft Engineering
M&AE/ECE 415: GPS: Theory and Design
M&AE 429: Supervised Senior Design Experience (with Aerospace focus)
or M&AE 490: Special Investigations in Mechanical and Aerospace Engineering
(with Aerospace focus)
M&AE 423/523: Intermediate Fluid Dynamics
M&AE 506: Aerospace Propulsion Systems
M&AE 507: Dynamics of Flight Vehicles

Group B: Courses Applicable to Aerospace Engineering

M&AE 417/517: Introduction to Robotics: Dynamics, Control, Design
M&AE 455/CEE 477/MS&E 555/T&AM 455: Introduction to Composite Materials
M&AE 470/570: Finite Element Analysis for Mechanical and Aerospace Design
or CEE 472: Introduction to the Finite Element Method
M&AE 477/577: Engineering Vibrations
M&AE 478/M&AE 578/CHEME 472/ECE 472: Feedback Control Systems
M&AE 479/579: Modeling and Simulation of Mechanical and Aerospace Systems
M&AE 543: Combustion Processes
M&AE 571: Applied Dynamics
or T&AM 570: Intermediate Dynamics

Group C: Fundamentals

ENGRD 202: Mechanics of Solids
ENGRD 203: Dynamics
M&AE 212: Mechanical Properties and Selection of Engineering Materials
ENGRD/M&AE 221: Thermodynamics
M&AE 323: Introductory Fluid Mechanics
M&AE 324: Heat Transfer
M&AE 325: Analysis of Mechanical and Aerospace Structures
M&AE 326: System Dynamics
M&AE 378: Mechatronics
or ECE 210/ENGRD 210: Introduction to Circuits for Electrical and Computer Engineers

Academic Standards

At least a grade of C– in each course. In S/U only courses, S is acceptable

Note

a. M&AE 429 and 490 require a form signed by the project advisor, stating that the project focuses on Aerospace and is suitable as a core aerospace course for the Minor. M&AE 429 or 490 must be worth 3 credits or more. Students may count at most one M&AE 429 or one M&AE 490 toward the Minor (i.e., they may not count both M&AE 429 and M&AE 490 toward the Minor)
Minor in Applied Mathematics

Offered jointly by: Department of Theoretical and Applied Mechanics and Department of Mathematics

Administered by: Department of Theoretical and Applied Mechanics
Contact Person: Professor Richard Rand, 207 Kimball Hall, 255.7145, rhr2@cornell.edu

Eligibility

Engineering undergraduates affiliated with all Engineering Majors are eligible to participate in the Applied Mathematics Minor.

Educational Objectives

This Minor is aimed at providing a focus for students who are interested in applied mathematics.

Requirements

At least six (6) courses beyond MATH 294: Linear Algebra for Engineers, to be chosen as follows:

(a) At most one course may be chosen from any one of groups 1, 2, 3, or 4.
(b) At least three courses must be chosen from groups 5 and 6.
(c) At most one 200-level course may be chosen.
(d) At most one course may be chosen that is offered by the student’s Major department.

Group 1. Analysis

T&AM 310: Introduction to Applied Mathematics I
MATH 321: Manifolds and Differential Forms
MATH 420: Differential Equations and Dynamical Systems
A&EP 321: Mathematical Physics I

Group 2. Computational Methods

ENGRD 322: Introduction to Scientific Computation
CS 421: Numerical Analysis
ENGRD 241: Engineering Computation
OR&IE 320: Optimization I

Group 3. Probability and Statistics

ENGRD 270: Basic Engineering Probability and Statistics
OR&IE 360: Engineering Probability and Statistics II
ECE 310: Introduction to Probability and Random Signals
CEE 304: Uncertainty Analysis in Engineering
MATH 471: Basic Probability
Group 4. Applications
A&EP 333: Mechanics of Particles and Solid Bodies
CHEME 323: Fluid Mechanics
CEE 331: Fluid Mechanics
CEE 371: Structural Modeling and Behavior
ECE 320: Networks and Systems
ECE 425: Digital Signal Processing
M&AE 323: Introductory Fluid Mechanics
M&SE 303: Thermodynamics of Condensed Systems
CS 280: Discrete Structures
CS 285: Networks

Group 5. Advanced Courses
Only one of the following three may be chosen:
T&AM 311: Introduction to Applied Mathematics II
MATH 422: Applied Complex Analysis
A&EP 322: Mathematical Physics II
Only one of the following two may be chosen:
ECE 411: Random Signals in Communications and Signal Processing
OR&IE 361: Introductory Engineering Stochastic Processes I
Only one of the following two may be chosen:
CS 381: Introduction to Theory of Computing
CS 481: Introduction to Theory of Computing
Only one of the following two may be chosen:
M&AE 571: Applied Dynamics
T&AM 570: Intermediate Dynamics
Also, you may choose from:
CS 428: Introduction to Computational Biophysics
CS 482: Introduction to Analysis of Algorithms
OR&IE 321: Optimization II
OR&IE 431: Discrete Models
OR&IE 435: Introduction to Game Theory
OR&IE 462: Introductory Engineering Stochastic Processes II
OR&IE 568: Financial Engineering with Stochastic Calculus I
OR&IE 569: Financial Engineering with Stochastic Calculus II
T&AM 578: Nonlinear Dynamics and Chaos
T&AM 610: Methods of Applied Mathematics I
T&AM 611: Methods of Applied Mathematics II
Group 6. Mathematics Courses

Any 300+ level course offered by the Mathematics Department in algebra, analysis, probability/statistics, geometry, or logic, with the following exceptions:

(i) MATH 323: Introduction to Differential Equations or MATH 420, if any course from group 1 is chosen.

(ii) MATH 471, if any course from group 3 is chosen.

(iii) MATH 422, if T&AM 311 or A&EP 322 is chosen from group 5.

(iv) Only one of the following may be chosen:
    MATH 332: Algebra and Number Theory
    MATH 335: Introduction to Cryptology
    MATH 336: Applicable Algebra

Academic Standards

At least a grade of C for each course in the Minor.
Minor in Biological Engineering

Offered by: Department of Biological and Environmental Engineering
Administrative Contact: BEE Major Coordinator, 207 Riley-Robb Hall

Eligibility

Students in all Majors except Biological Engineering may participate in this Minor.

Note: Students should meet with the BEE Major Coordinator when they decide to pursue the Minor. At that time they will receive a BEE faculty advisor, who will guide them in completing the Minor program.

Educational Objectives

Biological engineering is the application of engineering to living systems. Examples of engineering efforts in this Major include the development of new biosensor technologies, study and control of biologically based matter-transformation systems, and development of engineered devices to study and regulate fundamental biological processes. The Biological Engineering Minor is an opportunity for students to further their understanding of living systems and to increase their knowledge of the basic transport processes that occur within these systems. Courses in the Minor provide opportunities to analyze, design, and manipulate living systems at the molecular, cellular, and system levels.

Requirements

At least six (6) courses (minimum of 18 credits), with at least three courses and 9 credits taught in BEE, chosen as follows:

I. Biology Foundation (at least one but no more than two courses)
   - BIOBM 330 or 331–332: Principles of Biochemistry
   - BIOMI 290: General Microbiology Lectures
   - BIONB 222: Neurobiology and Behavior II: Introduction to Neurobiology

II. Biological Engineering Core (at least one but no more than two courses)
   - BEE 260: Principles of Biological Engineering
   - BEE 350: Biological and Environmental Transport Processes
   - BEE 360: Molecular and Cellular Bioengineering
   - BEE 331: Bio-Fluid Mechanics

III. Biological Engineering Concentration Electives (Minimum of three courses)

Choose any three courses from the concentration lists below. Courses appearing in more than one concentration do not double count. BEE 360 may be taken as either a concentration elective or a core course.
Biomedical Engineering Concentration
A&EP 470: Biophysical Methods
BEE 360: Molecular and Cellular Bioengineering
BEE 365: Properties of Biological Materials
BEE 450: Bioinstrumentation
BEE 453: Computer-Aided Engineering: Applications to Biomedical Processes
BEE 454: Physiological Engineering
BEE 459: Biosensors and Bioanalytical Techniques
BME 330: Introduction to Computational Neuroscience
BME 401: Biomedical Engineering Analysis
BME 404: Biomedical System Design
BME 440: Electronics in Neurobiology
BME 539: Biomedical Materials and Devices for Human Body Repair
BME 565: Biomechanical Systems—Analysis and Design
CHEME 481: Biomedical Engineering
ECE 578: Computer Analysis of Biomed Images
M&AE 401: Biomedical Engineering Analysis
M&AE 463: Neuromuscular Biomechanics
M&AE 464: Orthopaedic Tissue Mechanics
MS&E 461: Biomedical Materials and Their Applications

Bioprocess Engineering Concentration
BEE 360: Molecular and Cellular Bioengineering
BEE 450: Bioinstrumentation
BEE 453: Computer-Aided Engineering: Applications to Biomedical Processes
BEE 459: Biosensors and Bioanalytical Techniques
BEE 464: Bioseparation Processes
BEE 484: Metabolic Engineering
CHEM 300: Quantitative Chemistry (Does not count for Engineering credit)
CHEME 332: Analysis of Separation Processes
CHEME 543: Bioprocess Engineering

Bioenvironmental Engineering Concentration
BEE 371: Physical Hydrology for Ecosystems
BEE 435: Principles of Aquaculture
BEE 471: Introduction to Groundwater
BEE 473: Watershed Engineering
BEE 478: Ecological Engineering
BEE 651: Bioremediation: Engineering Organisms to Clean Up the Environment
CEE 451: Microbiology for Environmental Engineering
CEE 452: Water Supply Engineering

**Academic Standards**

At least a grade of C– in each course in the Minor and a GPA $\geq 2.0$ in all courses in the Minor.
Minor in Biomedical Engineering

Offered by: Department of Biomedical Engineering
Administered by: Carol Casler, Undergraduate Minor Coordinator, 120 Olin Hall, minor_bme-mailbox@cornell.edu, 255.1489

Eligibility

All undergraduates in the College of Engineering, College of Arts and Sciences, College of Human Ecology, and College of Agriculture and Life Science are eligible to participate in the Biomedical Engineering Minor. Students may participate in either the Biological Engineering Minor or the Biomedical Engineering Minor, but not both.

Educational Objectives

Biomedical engineering is the application of engineering principles and methods to a wide array of problems associated with human health. The discipline includes the design of biocompatible materials, prostheses, surgical implants, artificial organs, controlled drug-delivery systems, and wound-closure devices. Diagnosing diseases and determining their biological origins depend on increasingly sophisticated instrumentation and the use of mathematical models. This Minor allows students to gain exposure to the breadth and depth of biomedical engineering offerings at Cornell, to prepare for advanced studies in biomedical engineering, and to obtain recognition for their interest and capability in this rapidly growing area.

Requirements

• Bioengineering Seminar (1 credit, one semester) and at least six (6) courses (minimum of 18 credits) from the five Categories listed below.

• Two courses need to be in Category 1 (Introductory Biology) and/or Category 2 (Advanced Biology) with no more than one course from Category 1.

• Four courses must come from Category 3 (Molecular and Cellular Biomedical Engineering); Category 4 (Biomedical Engineering Analysis of Physiological Systems); and Category 5 (Biomedical Engineering Applications), with courses from at least two of these categories represented.

• At least four of the six courses must not be specifically required Major degree courses or cross-listings.

Students are asked to complete a form declaring their interest in the Minor with the Biomedical Engineering undergraduate minor coordinator in 120 Olin Hall. On the form, you will be asked to choose a BME faculty advisor that you can consult about your BME Minor plan.

Category 1. Introductory Biology (maximum of 4 credits toward the Minor. Select one listing to fulfill category 1)

A score of 5 on (CEEB) Advanced Placement Biology

A score of 4 on (CEEB) Advanced Placement Biology and ENGRI 131: Introduction to Biomedical Engineering
A score of 4 on (CEEB) Advanced Placement Biology and BIO G 103 or BIO G 104: Biological Sciences, Laboratory
BIO G 101/103, and 102/104: Biological Sciences, Lectures and Laboratory
BIO G 105/106: Introductory Biology
BIO G 107/108: General Biology
BIO G 110: Biological Principles and ENGRI 131: Introduction to Biomedical Engineering

Category 2. Advanced Biology
BIOAP 311/VTBMS 346: Introductory Animal Physiology, Lectures
BIOBM 330: Principles of Biochemistry, Individualized Instruction
BIOBM 331: Principles of Biochemistry, Proteins and Metabolism
BIOBM 332: Principles of Biochemistry: Molecular Biology
BIOBM 333: Principles of Biochemistry, Proteins, Metabolism, and Molecular Biology
BIOGD 281: Genetics
BIOMI 290: General Microbiology Lectures
BIONB 222: Neurobiology and Behavior II: Introduction to Neurobiology

Category 3. Molecular and Cellular Biomedical Engineering
A&EP/ENGRD 252: The Physics of Life
BEE/BME 360: Molecular and Cellular Bioengineering
BME 301/CHEME 401a: Molecular Principles of Biomedical Engineering
BME 302/CHEME 402a: Cellular Principles of Biomedical Engineering

Category 4. Biomedical Engineering Analysis of Physiological Systems
BEE 454: Physiological Engineering
BIONB/BME/COGST/PSYCH 330: Introduction to Computational Neuroscience
BIONB/BME 491: Principles of Neurophysiology
BME 401/M&AE 466a: Biomedical Engineering Analysis of Metabolic and Structural Systems
BME 402a: Electrical and Chemical Physiology
CHEME/BME 481: Biomedical Engineering
M&AE/BME 464: Orthopaedic Tissue Mechanics

Category 5. Biomedical Engineering Applications
A&EP/BIONB/BME 570: Biophysical Methods
BEE 365: Properties of Biological Materials
BEE 450: Bioinstrumentation
BEE/M&AE 453: Computer-Aided Engineering: Applications to Biomedical Processes
BEE 459: Biosensors and Bioanalytical Techniques
BEE 494: Fundamentals of Tissue Engineering
BIONB/BME 442: Instrumentation for Biology
BME 411: Science and Technology Approaches to Problems in Human Health
CS/BIOBM/ENGRD 321: Numerical Methods in Computational Molecular Biology
ECE 402/BME 404: Biomedical System Design
ECE 578: Computer Analysis of Biomed Images
M&AE/BME 565: Biomedical Systems—Analysis and Design
MS&E 461: Biomedical Materials and their Applications
MS&E 541/ECE 536: Nanofabrication of Semiconductor Devices
MS&E/BME 562: Biomineralization: The Formation and Properties of Inorganic Biomaterials
FSAD 439/BME 539: Biomedical Materials and Devices for Human Body Repair

Required
BME/BEE 501: Bioengineering Seminar

Academic Standards
At least a grade of C– in each course in the Minor. A GPA \( \geq 2.0 \) for all courses in the Minor.

Note
a. Students interested in professional practice as biomedical engineers should consider the M.Eng. degree in BME. The recommended sequence for admission is as follows, two courses from category I and category II, BME 301, 302, 401, and 402. The program requires that students have knowledge of molecular and cellular biomedical engineering and of biomedical engineering analysis of physiological systems.
Minor in Civil Infrastructure
Offered by: School of Civil and Environmental Engineering
Administrative Contact: CEE Undergraduate Major Coordinator, 221 Hollister Hall, 607.255.3412. www.cee.cornell.edu

Eligibility
Students in all Majors except Civil Engineering may participate in this Minor.

Educational Objectives
The Civil Infrastructure Minor is intended to introduce engineering undergraduates to the engineering methodologies of mechanics, materials, analysis, design, and construction and to show how these are brought to bear in solving problems in the development, maintenance, and operation of the built environment that is vital for any modern economy.

Requirements
At least six (6) courses (minimum of 18 credits), chosen as follows:

**Required Course**
ENGRD 202: Mechanics of Solids

**Additional Courses: Choose any five (groupings are for information only)**

**Geotechnical Engineering**
CEE 341: Introduction to Geotechnical Engineering
CEE 440: Foundation Engineering
CEE 441: Retaining Structures and Slopes
CEE 444: Environmental Site and Remediation Engineering

**Structural Engineering**
CEE 371: Structural Modeling and Behavior
CEE 372: Inelastic and Nonlinear Behavior of Materials and Structures
CEE 471: Fundamentals of Structural Mechanics
CEE 472: Introduction to the Finite Element Method
CEE 473: Design of Concrete Structures
CEE 474: Design of Steel Structures
CEE 478: Structural Dynamics and Earthquake Engineering

**Other Related Courses**
CEE 595: Construction Planning and Operations
Academic Standards
At least a grade of C in each course in the Minor.

Note
a. Other CEE courses approved by petition in advance.
Minor in Computer Science
Offered by: Department of Computer Science
Administered by: Department of Computer Science, 303 Upson Hall
Contact Person: Nicole Roy, 303 Upson Hall, 255.0982, nicole@cs.cornell.edu

Eligibility
Students in all Majors except Computer Science and Information Science, Systems, and Technology may participate in this Minor.

Educational Objectives
This Minor is for students who anticipate that computer science will have a prominent role to play in their academic and professional career.

Requirements
At least six (6) courses (minimum of 18 credits) chosen as follows:

Required Courses
CS/ENGRD 211: Object-Oriented Programming and Data Structures
CS 321: Numerical Methods in Computational Molecular Biology
or
CS/ENGRD 322: Introduction to Scientific Computation
or
CS 421: Numerical Analysis
or
CS 422: Numerical Analysis: Linear and Nonlinear Problems
or
CS 428: Introduction to Computational Biophysics
or
CS/ECE 314: Computer Organization
or
CS 316: Systems Programming

Additional Courses
Three (3) CS courses numbered 300 or higher, with the following exceptions:
CS 490 seminars are excluded.
CS 280 is allowed.

Academic Standards
At least a grade of C in each course in the Minor.

Note
Cross-listed courses cannot be applied to the Minor unless taken as CS (e.g., CS 430 counts, but INFO 430 does not), with the sole exception of ECE 314. All qualifying courses must be taken at Cornell for a letter grade. No substitutions allowed.
Minor in Electrical and Computer Engineering
Offered by: School of Electrical and Computer Engineering
Administrative Contact: ECE undergraduate Major coordinator, 223 Phillips Hall

Eligibility
Students in all Majors except Electrical and Computer Engineering may participate in this Minor.

Educational Objectives
The School of Electrical and Computer Engineering offers a Minor to students who wish to complement their Major by obtaining a background in electrical and computer engineering. The Minor offers the opportunity to study analog and digital circuits, signals and systems, electromagnetic fields, and additionally specialize at higher levels in one of several different areas such as circuit design and electronic devices, communications and signal processing, computer engineering and networks, or electromagnetic and space engineering.

Requirements
At least six (6) courses (minimum of 18 credits), chosen as follows:

Required Courses
ENGRD/ECE 210: Introduction to Circuits for Electrical and Computer Engineers
ECE 220: Signals and Information
ENGRD/ECE 230: Introduction to Digital Logic Design

Two (2) of the following
ECE 303: Electromagnetic Fields and Waves
ECE 314/CS 314: Computer Organization
ECE 315: Introduction to Microelectronics
ECE 320: Networks and Systems
One (1) other non-project ECE course at the 300 level or above (3-credit minimum)
One (1) other non-project ECE course at the 400 level or above (3-credit minimum)

Academic Standards
The grades and grade point averages for courses used to satisfy the Electrical and Computer Engineering Minor must meet the same requirements as the Electrical and Computer Engineering Major: at least a grade of C– for every course in the Minor and a GPA ≥2.3 for all courses in the Minor.
Minor in Engineering Management

Offered by: School of Civil and Environmental Engineering
Administrative Contact: CE Undergraduate Major Coordinator, 221 Hollister Hall, 607.255.3412. www.cee.cornell.edu

Eligibility
Students in all Majors may participate in this Minor. (CE Majors may not use courses to fulfill the Minor requirement and simultaneously as a Major-approved Elective or as a Design course.) ORE Majors have some specific restrictions and requirements as noted below.

Educational Objectives
This Minor focuses on giving engineering students a basic understanding of engineering economics, accounting, statistics, project-management methods, and analysis tools necessary to manage technical operations and projects effectively. The Minor provides an important set of collateral skills for students in any engineering discipline.

Requirements
At least six (6) courses (minimum of 18 credits), chosen as follows:

Required Courses (3)

CEE 323: Engineering Economics and Management
or
OR&IE 451: Economic Analysis of Engineering Systems

OR&IE 350\(a\): Financial and Managerial Accounting

CEE 304\(b\): Uncertainty Analysis in Engineering
or
ENGRD 270: Basic Engineering Probability and Statistics
or
ECE 310: Introduction to Probability and Random Signals

Additional Courses (choose any three)\(c\)

CEE 406: Civil Infrastructure Systems

CEE 492: Engineers for a Sustainable World: Engineering in International Development

CEE 593\(d\): Engineering Management Methods: Data, Information, and Modeling

CEE 594\(d\): Economic Methods for Engineering and Management

CEE 595: Construction Planning and Operations

CEE 596: Management Issues in Forensic Engineering

CEE 597: Risk Analysis and Management

CEE 598: Introduction to Decision Analysis
NBA 507: Entrepreneurship for Scientists and Engineers
or
M&AE 461/ENGRG 461/OR&IE 452: Entrepreneurship for Engineers
or
BEE 489: Engineering Entrepreneurship, Management, and Ethics

**Academic Standards**
At least a grade of C in each course in the Minor.

**Notes**

a. ORE Majors must substitute NCC 556: Managerial Finance or NBA 500: Intermediate Accounting for OR&IE 350.

b. T&AM 310: Introduction to Applied Mathematics I cannot be substituted for CEE 304.

c. Other courses approved by petition in advance.

d. This course is not accepted for ORE Majors.
**Minor in Engineering Statistics**

Offered by: Department of Statistical Science and School of Operations Research and Information Engineering
Administered by: ORE undergraduate Major consultant, 203 Rhodes Hall.

**Eligibility**

Students in all Majors except Operations Research and Engineering may participate in this Minor.

**Educational Objectives**

This Minor requires the student to develop expertise in engineering statistics. The goal of the program is to provide the student with a firm understanding of statistical principles and engineering applications and the ability to apply this knowledge in real-world situations.

**Requirements**

At least six (6) courses (minimum of 18 credits), chosen as follows:

**Required Courses**

ENGRD 270: Basic Engineering Probability and Statistics
OR&IE 360: Basic Engineering Probability and Statistics II
or
ECE 310: Introduction to Probability and Random Signals

**Four courses (11 credits minimum) taken from the following list**

OR&IE 361: Introductory Engineering Stochastic Processes I
or
ECE 411: Random Signals in Communications and Signal Processing
OR&IE 476: Applied Linear Statistical Models
OR&IE 576: Regression
OR&IE 563: Applied Time-Series Analysis
OR&IE 575: Experimental Design
OR&IE 577: Quality Control
OR&IE 580: Monte Carlo Simulation
OR&IE 581: Discrete Event Simulation
MATH 471: Basic Probability
or
BTRY 409: Theory of Statistics
BTRY 602: Statistical Methods II
BTRY 603: Statistical Methods III
or
ILRST 411: Statistical Analysis of Qualitative Data
or
ILRST 310: Statistical Sampling
ILRST 410: Techniques of Multivariate Analysis
**Academic Standards**

At least a grade of C– in each course in the Minor and a GPA ≥2.0 in all courses in the Minor.

**Notes**

a. Other course options approved by petition in advance. The student should be aware that some of these courses require others as prerequisites. All these courses are cross-listed under the Department of Statistical Science.

A student may not receive credit for more than one Minor offered by the School of Operations Research and Information Engineering.
Minor in Environmental Engineering

Offered by: Department of Biological and Environmental Engineering and School of Civil and Environmental Engineering
Administrative Contact: BE Undergraduate Major Coordinator, 207 Riley-Robb Hall, or CE Undergraduate Major Coordinator, 221 Hollister Hall

Eligibility

Students in all Majors except Environmental Engineering may participate in this Minor. Students majoring in Biological Engineering or Civil Engineering are eligible if they are not following the Environmental Concentration offered by those Majors. Eligible Civil Engineering students may not use courses to fulfill the Minor requirement and simultaneously as a Major-approved Elective or as a Design course.

Educational Objectives

A fundamental challenge for the engineering profession is development of a sustainable society and environmentally responsible industry and agriculture reflecting an integration of economic and environmental objectives. We are called upon to be trustees and managers of our nation's resources, the air in our cities, and water in our aquifers, streams, estuaries, and coastal areas. This Minor encourages engineering students to learn about the scientific, engineering, and economic foundations of environmental engineering so that they are better able to address environmental management issues.

Requirements

At least six (6) courses (minimum of 18 credits), chosen as follows:

Students must select courses from the following group listings, with at least one (1) course from each group.

Group A. Environmental Engineering Processes

BEE/ENGRD 251: Engineering for a Sustainable Society
CEE 351: Environmental Quality Engineering
CEE 451: Microbiology for Environmental Engineering
CEE 452: Water Supply Engineering
CEE 453: Laboratory Research in Environmental Engineering
CEE 454: Sustainable Small-Scale Water Supplies
CEE 455: Sustainable Water Supply Project
CEE 492: Engineers for a Sustainable World: Engineering in International Development
BEE 476: Solid Waste Engineering
BEE 478: Ecological Engineering
CEE 444: Environmental Site and Remediation Engineering
BEE 651: Bioremediation: Engineering Organisms to Clean Up the Environment
CEE 653: Water Chemistry for Environmental Engineering
CEE 656: Physical/Chemical Processes
CEE 657: Biological Processes
CEE 658: Biodegradation and Biocatalysis

**Group B. Environmental Systems**
ENGRI 113: Sustainability Design for Appledore Island (May count only if taken before the third year)
BEE 475: Environmental Systems Analysis
CEE 597: Risk Analysis and Management
CEE 623: Environmental Quality Systems Engineering

**Group C. Hydraulics, Hydrology, and Environmental Fluid Mechanics**
CEE 331: Fluid Mechanics (CHEME 323: Fluid Mechanics or M&AE 323: Introductory Fluid Mechanics may be substituted for CEE 331)
CEE 332: Hydraulic Engineering
BEE 371: Physical Hydrology for Ecosystems
BEE 471: Introduction to Groundwater
CEE 432: Hydrology
CEE 436: Case Studies in Environmental Fluid Mechanics
CEE 437: Experimental Methods in Fluid Dynamics
BEE 473: Watershed Engineering
BEE 474: Water and Landscape Engineering Applications
CEE 631: Computational Simulation of Flow and Transport in the Environment
CEE 633: Flow in Porous Media and Groundwater
CEE 655: Transport, Mixing, and Transformation in the Environment
BEE 671: Analysis of the Flow of Water and Chemicals in Soils
BEE 672: Drainage

**Academic Standards**
At least a grade of C– in each course in the Minor and a GPA ≥2.0 in all courses in the Minor.
Minor in Game Design

Offered by: Department of Computer Science
Administered by: Department of Computer Science; 303 Upson Hall
Contact Person: Nicole Roy, 303 Upson Hall, 255.0982, nicole@cs.cornell.edu

Eligibility

Students in all Engineering Majors may participate in this Minor.

Educational Objectives

This Minor is for students who anticipate that game design will play a prominent role in their academic and professional career.

To apply for a Game Design Minor:

• Complete course work required for the Minor (see below).
• Obtain the form “Application to Certify Completion of an Engineering Minor” from Engineering Advising in 167 Olin Hall.
• Obtain an official transcript from the University Registrar’s Office in B7 Day Hall.
• Complete the form and attach the copy of your transcript on which each course used for the Minor is highlighted or underlined.
• Submit the form and the transcript to the Computer Science undergraduate office, 303 Upson Hall.

Requirements

At least six (6) courses (18 credit minimum) chosen as follows:

Required Courses: Complete the following two courses:

CIS 300: Introduction to Computer Game Design
CIS 400: Advanced Projects in Game Design

Additional Courses: Choose three of the following courses:

CIS 565: Advanced Animation
CS 211: Object-Oriented Programming and Data Structures
CS 419: Computer Networks
CS 465: Introduction to Computer Graphics
CS 472: Foundations of Artificial Intelligence
CS 567: Physically Based Animation for Computer Graphics
CS 569: Interactive Computer Graphics
COMM 422: Psychology of Television (and Beyond)
ECE 476: Designing with Microcontrollers
INFO 200: Introduction to Game Design Theory (pending approval)
INFO 345: Human–Computer Interaction Design
INFO 440: Advanced Human–Computer Interaction Design

**Academic Standards**
At least a letter grade of C is required for each course in the Minor.

**Note**
CS Majors may not count CS courses toward the completion of this Minor.
Minor in Industrial Systems and Information Technology
Offered by: School of Operations Research and Information Engineering
Administered by: OR&E undergraduate Major consultant, 203 Rhodes Hall.

Eligibility
Students in all Majors except Operations Research and Engineering may participate in this Minor.

Educational Objective
The aim of this Minor is to provide an in-depth education in the issues involved in the design and analysis of industrial systems and the tools from information technology that have become an integral part of the manufacturing process. Students will become familiar with the problems, perspectives, and methods of modern industrial engineering and be prepared to work with industrial engineers in designing and managing manufacturing and service operations. That is, rather than providing a comprehensive view of the range of methodological foundations of operations research, this Minor is designed to give the student a focused education in the application area most closely associated with these techniques.

Requirements
At least six (6) courses (minimum of 18 credits), chosen as follows:

At least three of the following
ENGRD 270: Basic Engineering Probability and Statistics
OR&IE 312: Industrial Data and Systems Analysis
OR&IE 320: Optimization I
OR&IE 480: Information Technology

The remaining courses/credit hours from the following
OR&IE 350: Financial and Managerial Accounting
OR&IE 416: Design of Manufacturing Systems
OR&IE 451: Economic Analysis of Engineering Systems
OR&IE 525: Production Planning and Scheduling Theory and Practice
OR&IE 577: Quality Control
OR&IE 580: Monte Carlo Simulation
OR&IE 581: Discrete Event Simulation

Academic Standards
At least a grade of C– in each course in the Minor and a GPA ≥2.0 in all courses in the Minor.

Note
A student may not receive credit for more than one Minor offered by the School of Operations Research and Information Engineering.
Minor in Information Science
Offered by: Department of Computer Science
Administered by: Department of Computer Science, 303 Upson Hall
Contact Person: Christine Stenglein, 303A Upson Hall, 255.9837, minor@infosci.cornell.edu

Eligibility
Students in all Majors except Information Science, Systems, and Technology may participate in this Minor. Students interested in pursuing the Information Science Minor must initiate the process by sending an e-mail message with their name, college, year of study (e.g., second-semester second-year student), expected graduation date, and (intended) Major to minor@infosci.cornell.edu.

Educational Objective
The program has three main areas: Information Systems, Human-Centered Systems, and Social Systems. The Minor has been designed to ensure that students have substantial grounding in all three areas in addition to having a working knowledge of basic probability and statistics necessary for analyzing data occurring in the real world.

Requirements
At least six (6) courses (minimum of 18 credits) chosen as follows:
Statistics: one course
Information Systems: two courses
Human-Centered Systems: one course
Social Systems: one course
Elective: one additional course from either Human-Centered Systems or Social Systems

Statistics
An introductory course that provides a working knowledge of basic probability and statistics and their application to analyzing data occurring in the real world.
ENGRD 270: Basic Engineering Probability and Statistics
CEE 304: Uncertainty Analysis in Engineering

Information Systems
INFO 172: Computation, Information, and Intelligence
CS 211a: Object-Oriented Programming and Data Structures
INFO 230a: Intermediate Design and Programming for the Web
CIS 300: Introduction to Computer Game Design
INFO 330: Data-Driven Web Applications
LING 424: Computational Linguistics
INFO 430: Information Retrieval
INFO 431: Web Information Systems
CS 432: Introduction to Database Systems
CS 465: Introduction to Computer Graphics
CS 472: Foundations of Artificial Intelligence
LING 474: Introduction to Natural Language Processing
CS 478: Machine Learning
OR&IE 480: Information Technology
OR&IE 481: Delivering OR Solutions with Information Technology
OR&IE 483: Applications of Operations Research and Game Theory to Information Technology
CS 501: Software Engineering
CS 513: System Security
CS 530: The Architecture of Large-Scale Information Systems
ECE 562: Fundamental Information Theory
CS 578: Empirical Methods in Machine Learning and Data Mining

**Human-Centered Systems**

COGST 101: Introduction to Cognitive Science
PSYCH 205: Perception
INFO 214: Cognitive Psychology
INFO 245: Psychology of Social Computing
PSYCH 280: Introduction to Social Psychology
INFO 345: Human–Computer Interaction Design
PSYCH 347: Psychology of Visual Communications
PSYCH 380: Social Cognition
PSYCH 413: Information Processing: Conscious and Nonconscious
PSYCH 416: Modeling Perception and Cognition
INFO 440: Advanced Human–Computer Interaction Design
INFO 445: Seminar in Computer-Mediated Communication
INFO 450: Language and Technology
DEA 470: Applied Ergonomic Methods

**Social Systems**

INFO 204: Networks
S&TS 250: Technology in Society
INFO 292: Inventing an Information Society
ECON 301a: Microeconomics
SOC 304: Social Networks and Social Processes
ECON 313a: Intermediate Microeconomic Theory
INFO 320: New Media and Society
AEM 322a: Information Technology Strategy
INFO 349: Media Technologies
INFO 355: Computers: From the 17th Century to the Dot.com Boom
INFO 356: Computing Cultures
INFO 366: History and Theory of Digital Art
ECON 368a: Game Theory
INFO 387: The Automatic Lifestyle: Consumer Culture and Technology
S&TS 411: Knowledge, Technology, and Property
ECON 419: Economic Decisions Under Uncertainty
INFO 415: Environmental Interventions
INFO 429: Copyright in the Digital Age
INFO 444: Responsive Environments
OR&IE 435a: Introduction to Game Theory
INFO 447: Social and Economic Data
H ADM 474a: Strategic Information Systems
ECON 476/477: Decision Theory I and II
INFO 515: Culture, Law, and Politics of the Internet

**Academic Standards**

At least a grade of C in each course in the Minor.

**Note**

a. Computer Science Majors cannot use INFO 230. CS 211 cannot be used by Majors for whom it is a required course, e.g., Computer Science and Operations Research and Engineering. Only one of ECON 301 and ECON 313 can be taken for IS credit. Only one of OR&IE 435 and ECON 368 can be taken for IS credit. Only one of AEM 322 and H ADM 474 can be taken for IS credit.
Minor in Materials Science and Engineering

Offered by: Department of Materials Science and Engineering
Administrative Contact: MS&E undergraduate program director, 214 Bard Hall, 255.9159

Eligibility

Students in all Majors except Materials Science and Engineering may participate in this Minor.

Educational Objectives

Materials form the core basis of many engineering disciplines including mechanical, civil, chemical, and electrical engineering. This Minor provides engineers in related Majors with the fundamental understanding of mechanisms that determine the performance, properties, and processing of modern materials.

Requirements

At least six (6) courses (≥18 credits), chosen as follows:

Required
MS&E 261: Mechanical Properties of Materials: From Nanodevices to Superstructures
or
MS&E 262: Electronic Materials for the Information Age

Two of the following:
MS&E 206: Atomic and Molecular Structure of Matter
MS&E 301: Materials Chemistry
MS&E 303: Thermodynamics of Condensed Systems
MS&E 304: Kinetics, Diffusion, and Phase Transformation
MS&E 305: Electronic, Magnetic, and Dielectric Properties of Materials
MS&E 402: Mechanical Properties of Materials, Processing, and Design

Three electives chosen from the following:

- MS&E 261, MS&E 262, and any MS&E course at the 300 level or above
- Selected courses in materials properties and processing (at the 300 level or above) from A&EP, CHEME, CEE, ECE, M&AE, PHYS, and CHEM, as approved by the MS&E undergraduate coordinator. (Courses listed as “Materials Applications Electives” on the MS&E web site meet this requirement.)

Academic Standards

At least a grade of C in each course in the Minor.
Minor in Mechanical Engineering
Offered by: Sibley School of Mechanical and Aerospace Engineering
Administered by: M&AE Associate Director for Undergraduate Affairs
Contact: M&AE Undergraduate Coordinator: 108 Upson Hall, 255.3573, np18@cornell.edu

Eligibility
Engineering undergraduates affiliated with the following Majors are eligible to participate in the Mechanical Engineering Minor: BE, ChemE, CE, CS, ECE, EnvE, EP, ISST, MS&E, ORE, and SES.

Students intending to earn a Minor in Mechanical Engineering should seek advice and pre-approval of their Minor academic program from the Associate Director for Undergraduate Affairs in Mechanical Engineering. Contact np18@cornell.edu, 108 Upson Hall before taking courses toward the Minor.

Educational Objectives
The primary educational objective of this Minor is to give students from outside M&AE the necessary skills and tools to interact technically with mechanical engineers on various multidisciplinary fronts. This Minor has the appearance of being very broad since it encompasses nearly all of the M&AE upper-division courses. However, the prerequisites of the upper-division courses will dictate, to a large extent, that a student concentrate in a subarea of mechanical engineering. Many upper-level M&AE courses have multiple prerequisites. A recommended strategy for designing a Minor is to select a few upper-level courses of interest and work backward from them to determine what courses will be needed as prerequisites or prerequisites of prerequisites. (Note: Instructors may waive certain prerequisites in some circumstances.) The prerequisite structure dictates that most curricula will focus either on fluids/thermal systems or mechanical systems/design courses.

Requirements
At least six (6) courses (≥18 credits) from among the following: M&AE courses at the 200+ level; ENGRD 202: Mechanics of Solids; and ENGRD 203: Dynamics.

Rules for Selecting Courses
The selection of courses must satisfy the following three requirements.

• At least two courses must be numbered above 300.
• At least one course must be either (i) numbered above 500 or (ii) numbered above 326 and have as its prerequisite ENGRD 202, ENGRD 203, or an M&AE course.
• Each course must be worth at least 3 credits.

All courses used to satisfy the ME Minor must be M&AE courses, ENGRD 202, or ENGRD 203. No substitutions will be accepted from other departments at Cornell or
elsewhere. Transfer credit cannot be used to satisfy the ME Minor. M&AE 111: Naval Ship Systems, or M&AE: 498 Teaching Experience in Mechanical Engineering, may not be used to satisfy the ME Minor. Applications for the ME Minor may be obtained in 108 Upson Hall.

**Academic Standards**

At least a grade of C– in each course in the Minor
Minor in Operations Research and Management Science

Offered by: School of Operations Research and Information Engineering
Administrative Contact: OR&E undergraduate Major consultant, 203 Rhodes Hall, 255.5088

Eligibility
Students in all Majors except Operations Research and Engineering and Information Science, Systems and Technology may participate in this Minor.

Educational Objectives
Operations Research and Management Science (OR/MS) aims to provide rational bases for decision-making by seeking to understand and model complex situations and to use this understanding to predict system behavior and improve system performance. This Minor gives the student the opportunity to obtain a wide exposure to the core methodological tools for OR/MS, including mathematical programming, stochastic and statistical models, and simulation. The intent of this Minor is that the student should obtain a broad knowledge of these fundamentals, rather than training the student in a particular application domain. In this way, the student can adjust the selection of the advanced courses in the Minor, so as to pursue those areas, either methodological or application-oriented, of greatest interest and relevance to the overall educational goals.

Requirements
At least six (6) courses (≥18 credits), chosen as follows:

Choose three courses from the following list
ENGRD 270: Basic Engineering Probability and Statistics
OR&IE 320: Optimization I
OR&IE 321: Optimization II
OR&IE 360: Engineering Probability and Statistics II
OR&IE 361: Introduction Engineering Stochastic Processes I
OR&IE 580: Monte Carlo Simulation
OR&IE 581: Discrete-Event Simulation

Any OR&IE courses at the 300 level or higher (including those above)

Academic Standards
At least a grade of C– in each course in the Minor and a GPA ≥2.0 in all courses in the Minor.

Note
A student may receive credit for at most one Minor offered by the School of Operations Research and Information Engineering.
Minor in Science of Earth Systems
Offered by: Department of Earth and Atmospheric Sciences
Administrative Contact: 2124 Snee Hall, 255.5466, www.eas.cornell.edu

Eligibility
Students affiliated with all Majors except Science of Earth Systems are eligible to participate.

Educational Objectives
Some of the major problems facing mankind in this century involve earth science, and engineering will be challenged to solve these problems. This Minor will prepare engineering students to understand the natural operating systems of Earth and the tools and techniques used by earth scientists to understand and monitor these solid and fluid systems.

Requirements
At least six (6) courses (≥18 credits), chosen as follows:

Required introductory course
EAS 220: The Earth System

At least two selections from the following core courses:
EAS 301: Evolution of the Earth System
EAS 303: Introduction to Biogeochemistry
EAS 304: Interior of the Earth
EAS 305: Climate Dynamics

Additional EAS courses at the 300 level or higher.
These may include additional courses from the above list, undergraduate research courses, and outdoor field courses.

Academic Standards
At least a grade of C– in each course in the Minor and a GPA ≥2.0 in all courses in the Minor.
Minor in Business for Engineering Students

Offered by: College of Agriculture and Life Sciences
Administered by: College of Agriculture and Life Sciences, 150 Warren Hall and Engineering Advising, 167 Olin Hall

Eligibility

All Engineering undergraduates are eligible to apply beginning the first semester of their second year. Acceptance into the minor is on a selective basis. An application form is available to students on the Engineering college web site, and in 167 Olin Hall and 150 Warren Hall. A deadline for applications that falls before pre-enrollment will be established each semester.

Educational Objectives

This Minor provides a focus for Engineering students interested in business.

Requirements

ECON 101: Introductory Microeconomics or equivalent (including AP credit as equivalent)
AEM 210: Introductory Statistics
or
ILR 210: Economic and Social Statistics
or
PAM 210: Introduction to Statistics
or
ENGRD 270: Basic Engineering Probability and Statistics
or
CEE 304: Uncertainty Analysis in Engineering or equivalent (including AP credit as equivalent)
AEM 221: Financial Accounting
or
OR&IE 350: Financial and Managerial Accounting
AEM 220: Introduction to Business Management
AEM 240: Marketing
AEM 323: Financial Management

Academic Standards

A C– or better in all courses counting toward the Minor.

a. ECE 310, which is allowed as a substitute for ENGRD 270 in some majors in Engineering, is not allowed as a substitute in the Minor in Business for Engineering Students.

b. These courses will not satisfy the two-semester sequence in financial and managerial accounting needed for AEM majors. Any Engineering student contemplating a transfer to AEM as a Major should be aware that AEM 221: Financial Accounting and AEM 323: Managerial Accounting will still be required for the AEM major.
Special Programs

Dual-Degree Option

The dual-degree program is intended for superior students. Students in the program can earn both Bachelor of Science and either a Bachelor of Arts or Bachelor of Fine Arts degree in about five years. Students registered in the College of Engineering, the College of Arts and Sciences, or the College of Architecture, Art, and Planning may apply and, after acceptance of their application, begin the dual-degree program in their second or third year. Contact the appropriate coordinators of dual-degree programs at the following locations for more information: 55 Goldwin Smith Hall (for Arts and Sciences) or B1 Sibley (for Architecture, Art, and Planning); and Engineering Advising, 167 Olin Hall.

Ordinarily, students need at least ten semesters to complete a dual-degree program, although exceptional students may be able to arrange an accelerated program and have it approved by petition. Such a program may not rely on summer work or credits earned at community colleges. Students who run into trouble are not required to finish the work for both degrees, but it may be difficult to complete the requirements for either degree in four years because of the way their curriculum has been structured.

Double Majors

The double-Major option makes it possible to develop expertise in two allied engineering disciplines. Students must complete all the requirements of two different Majors, which generally requires at least one semester beyond the usual four years. (Students dependent on financial aid who spend more than eight semesters as an undergraduate will need to change their financial-aid package.)

A student who wants to embark on a double Major must complete the prerequisites for entry into both Major programs and have a cumulative GPA $\geq 3.0$ after the first four semesters. Affiliation with the first Major proceeds in the usual manner. Before the end of the third year, the student presents a Petition for Double Major form to enter the second Major. The Petition for Double Major form must include a plan of study, and it requires the formal approval of the faculty in both Majors and the Committee on Academic Standards, Petitions, and Credit (ASPAC). The second Major may set its own requirements, and admission is not guaranteed. (Petition for Double Major forms are available from Engineering Advising and should be returned to the Engineering Registrar, 158 Olin Hall when completed.)

Double-Major students have a faculty advisor in each Major. Both Majors maintain records, approve course changes, and eventually certify to the registrar that all requirements for the B.S. degree have been met.

Double-Major students must meet the standards for academic performance set by both Majors, although the consequences for failing to do so for one or the other are somewhat different. A required leave of absence from the primary Major results in a required leave of absence from the college, while deficient performance in the secondary Major simply terminates the double Major. Similarly, a student withdrawn
from the primary Major is withdrawn from the college, while a student withdrawn from the secondary Major may be allowed to continue, with the permission of the primary Major.

Further information is available from Engineering Advising, 167 Olin Hall, and the individual Major consultant offices.

**The Independent Major**

The Independent Major is a special opportunity for students whose educational objectives cannot be met by any of the regular Majors. This option allows students to create a specially tailored, interdisciplinary course of study. The program is developed by the student in consultation with faculty advisors and must be approved by the Independent Major Committee, which is responsible for supervising the student’s work.

Every curriculum developed under the Independent Major, with the exception of certain faculty-sponsored programs, must include a primary engineering area and an educationally related secondary area. The primary engineering area may be any subject area offered by the schools or departments of the college; the secondary area may be in a logically connected area taught anywhere in the university. Total credits for courses must be at least 48, of which 32 must be in the primary engineering area. The overall program must clearly constitute an engineering education in scope and in substance, and all requirements of the Common Curriculum must be met.

Students who wish to enter the Independent Major must apply by the end of the first semester of the second year and must be in good academic standing. They should seek assistance in developing a coherent program from professors in the proposed primary and secondary subject areas. If approved, the program becomes a curricular contract to which the student must adhere. For more information on the Independent Major, contact Engineering Advising, 167 Olin Hall.

Note: Because no single standardized curriculum exists, the Independent Major is not accredited. Independent Major students who intend to seek legal licensing as a Professional Engineer should be aware that this non-accredited degree program will require additional education, work, and/or experience to qualify for eligibility to take the Fundamentals of Engineering examination.

**Minor in Business for Engineering Students**

The Department of Applied Economics and Management in the College of Agriculture and Life Sciences offers a Minor in Business for Engineering students on a selective basis. Engineering students may apply to the Minor at any point during their academic career, beginning in the first semester of their second year. At that time, Engineering students will be in the process of applying to affiliate with an Engineering Major and will need to begin taking the courses required for the Minor. Detailed information can be found under “Minor in Business for Engineering Students” on page 133.
International Engineering Programs

An international perspective, sensitivity to other cultures, and the ability to speak a second language are increasingly important to today's engineer. The College of Engineering encourages students to study or work abroad during their undergraduate years to prepare for participation in the global marketplace.

Because most engineering curricula are highly structured with many sequential courses, students who wish to pursue this option must decide early and plan carefully. Advisors and faculty members in the college can suggest a variety of ways for students to study abroad and still meet graduation requirements for Cornell. Students interested in studying or working abroad should begin gathering information early in the first year.

• The College of Engineering has two study-abroad programs with Ecole Central Paris: a junior-year abroad program and a “2-2-1” program. In the 2-2-1 program, students spend their first two years at Cornell, the second two years in Paris, and come back to Cornell for a year in the M.Eng. program. See Engineering Advising, 167 Olin Hall, for details.

• Students in several Majors may spend a semester at IIT Kanpur, India.

• Students may spend the fourth semester in Dresden, Germany, or Guadalajara, Mexico, through a program of Boston University.

• Second- and third-year students may spend a semester or two at the Hong Kong University of Science and Technology.

• CE Majors may spend a year at Cantabria, Spain.

On campus, there are several sources of specific information on study abroad:

• Cornell Abroad office, 300 Caldwell Hall

• Engineering Advising, 167 Olin Hall

• the associate director of undergraduate studies in the student’s Major

Engineering Communications Program

The Engineering Communications Program (ECP) provides instruction in technical writing, oral presentation, and the use of graphics in both.

Information about ECP members, courses, annual student awards, and the college's technical-writing requirement is available at www.engineering.cornell.edu/programs/undergraduate-education/engineering-communications/.

The ECP’s courses give students experience with the task of explaining technical information to audiences having various levels of technical expertise. Students improve their writing style, become more comfortable with and effective at oral presentation, use standard forms and formats for presenting technical information, do library and Internet research on engineering topics, and study engineering ethics.

ECP courses have up to 20 students per section; like writing seminars elsewhere at Cornell, they are discussion classes. Students' work receives abundant written comments, and conferences are frequent.
The ECP oversees the communications component of the Writing-Intensive Co-op and sits on the College Curriculum Governing Board's Subcommittee on Technical Writing. Members of the ECP are available to help engineering faculty members develop materials for their own writing and oral-presentation assignments.

Feel free to call 255.8558, visit the ECP’s office at 465 Hollister Hall, or stop at any ECP member’s office elsewhere on the fourth floor of Hollister Hall.

**Engineering Cooperative Education Program (Co-op)**

Engineering undergraduates can participate in the Engineering Cooperative Education Program (Co-op), which provides an opportunity for undergraduates to gain 28 weeks of practical experience in industry and other enterprises before they graduate. By supplementing course work with carefully monitored, paid jobs, co-op students are able to explore their own interests and acquire a better understanding of engineering as a profession.

To be eligible, a student must have been enrolled at Cornell for four semesters before working, and in most cases, maintain a 2.7+ cumulative GPA. (Students majoring in computer science and biological and environmental engineering outside of the college are eligible, even if they are not registered in the College of Engineering.) Applicants interview with participating employer representatives and select their work assignments from any offers they receive. Co-op employers and work locations may be local, national, or international, and with advanced planning, the co-op experience may be combined with Study Abroad opportunities. Students who are offered assignments and elect to join the program usually take their fifth-term courses at Cornell during the summer following their second year and begin their first co-op work assignment that fall. They return to Cornell to complete term six with their classmates and then undertake a second work assignment with the same employer the following summer. Alternatively, should a student’s schedule allow, co-op positions may run spring/summer (January through August) or summer/fall (June through December) of the third year. Co-op students return to campus for their fourth year and graduate with their class.

Further information may be obtained at www.engineering.cornell.edu/student-services/engineering-coop-career-services/co-op/index.cfm/ or at the Engineering Cooperative Education and Career Services office, 201 Carpenter Hall.

**Undergraduate Research**

Engineering Learning Initiatives (ELI) is committed to facilitating connections and providing funding support for undergraduate students who are motivated to pursue research opportunities during their time at Cornell. Research enhances the undergraduate experience by allowing students to apply the skills and knowledge learned in the classroom to real engineering problems and to contribute to the advancement of knowledge in their field. Research gives students the opportunity to interact closely with faculty mentors and, in many instances, to develop valuable industry connections. Engineering students and faculty members may apply for funding awards to support undergraduate research projects for the fall, spring, and summer terms. Funds may be used to provide a student stipend or to cover project expenses. Projects usually involve one student and one professor, although some
projects may involve student teams. Student researchers submit a report and present their work in a public poster session at the end of the term. For more information on tips for locating a faculty mentor, suggested research topics, application information, selection criteria, and funding sources, visit Engineering Learning Initiatives on the web at www.engineering.cornell.edu/student-services/learning/index.cfm/.

Leadership and Teamwork Opportunities

Numerous opportunities exist for engineering undergraduate students to participate in co-curricular and classroom activities that can develop leadership and team-building skills. There are more than 30 engineering student organizations, including engineering honor societies, Major-specific organizations, and active chapters of the Society of Women Engineers (SWE), the National Society of Black Engineers (NSBE), the Society of Hispanic Professional Engineers (SHPE), and the American Indian Science and Engineering Society (AISES).

Other opportunities for developing teamwork and leadership skills include peer-educator experiences such as peer advisors, undergraduate teaching assistants, Academic Excellence Workshop facilitators, tutoring, Encourage Youth, Educate Society (EYES), and program assistants for pre-freshman programs offered through Engineering Student Services.

Cooperative Programs with the Johnson Graduate School of Management

Two programs make it possible for students to earn degrees from both the College of Engineering and the Johnson Graduate School of Management (JGSM).

The Knight Scholarship Program allows a student to complete an M.Eng. degree while deferring admission to the JGSM for three to five years. The Knight Program is a scholarship opportunity for admitted students to receive financial assistance toward the completion of both an M.Eng. and an M.B.A. degree. Undergraduates should begin the application process for the Knight program in the fall semester of their fourth year.

The Five-Year Program leads to a B.S. degree in engineering and an M.B.A. (master of business administration) degree. The six-year program leads to three degrees: the B.S. in engineering, the M.Eng. (master of engineering), and the M.B.A. Both the five- and six-year programs are highly selective, and opportunities are limited. The programs require students to take a specific set of courses at the undergraduate level; these curricula allow for a shortening of the combined programs by one academic year. Information about the specific requirements for each Major is available from the appropriate undergraduate Major consultant and graduate faculty representative. The curriculum must include eight core courses required for the M.B.A. or allowed substitutes. (The chart on the following page may be helpful in planning how to meet this requirement.) Undergraduates should consider selecting these courses for the fall term of their second year.

Students who decide to pursue any of these programs must apply separately to the College of Engineering and the Johnson Graduate School of Management. Students
are also required to take the Graduate Management Admission Test (GMAT). For more information on any of the Knight Scholarship Programs, stop by the Office of Research and Graduate Studies, 222 Carpenter Hall, or the admissions office of the Johnson Graduate School of Management.
M.B.A. Course Requirement Substitutes and Possible Classifications for Business Courses or Substitutes for Five- and Six-Year Joint Programs

<table>
<thead>
<tr>
<th>M.B.A. Core Requirement</th>
<th>Substitutions Allowed</th>
<th>Engineering Distribution</th>
<th>Social Science</th>
<th>Approved Elective</th>
<th>Field-Approved Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCC 500: Financial Accounting (3 cr)</td>
<td>none&lt;sup&gt;b&lt;/sup&gt;</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>NCC 501: Statistics for Management (3 cr)</td>
<td>ENGRD 270: Basic Engineering Probability and Statistics (3 cr)</td>
<td>+</td>
<td>–</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>NCC 502: Microeconomics for Management (3 cr)</td>
<td>ECON 313: Intermediate Microeconomic Theory</td>
<td>–</td>
<td>+</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>NCC 503: Marketing Management (3 cr)</td>
<td>none</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>NCC 504: Management and Leading in Organizations (3 cr)</td>
<td>none</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>NCC 506: Managerial Finance (3 cr)</td>
<td>none</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>NCC 508&lt;sup&gt;c&lt;/sup&gt;: Managing Operations (3 cr)</td>
<td>OR&amp;IE 320: Optimization I and OR&amp;IE 416: Design of Manufacturing Systems (8 cr)</td>
<td>–</td>
<td>–</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>NBA XXX: (4th, 5th, or 6th year) The Strategy Requirement (1.5 cr)</td>
<td>none</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Notes

a. Must be completed before the start of the sixth year.

b. Students who have already taken OR&IE 350: Financial and Managerial Accounting might want to take the NCC 500 exemption exam.

c. NCC 508 may be taken in the fifth (M.Eng.) year with permission of the M.Eng. representative.

If ECON 101: Introductory Microeconomics and ECON 102: Introductory Macroeconomics are not taken before acceptance into the five- or six-year programs, a student may petition (through Engineering Advising) to use NCC 502 as a social science course to fulfill undergraduate degree requirements.
Course Registration

Registration
Being registered with the university and the College of Engineering and completing course enrollment are two different things. To be registered with both the university and the College of Engineering, new students must have

- obtained their ID card,
- paid their bursar bill,
- submitted all required health forms to Gannett Health Services, and
- attended a first-year or transfer briefing.

Students who have not followed this procedure must register with both the university registrar (B7 Day Hall) and the engineering registrar (158 Olin Hall) and then meet with an advisor in Engineering Advising (167 Olin Hall) to receive and discuss course registration materials.

Continuing students are automatically registered after the due date of the tuition fee payment, provided the above criteria have been met and the student has no academic or judicial holds preventing registration. Just the Facts, an online student service on Bear Access, will provide students with information regarding their registration status at the beginning of each semester.

The Course Add/Drop Form
Early in the semester, students can use Cornell’s electronic add/drop system on Just the Facts to make most of their course-enrollment changes. Some “permission only” courses may require students to submit an add/drop form, which can be obtained at the Engineering Registrar’s office, 158 Olin Hall.

The add/drop form requires the following information:

- Student Identification Number, semester, and year of study, and full name.

- The six-digit course identification number (CID), the department/course name, and the number of credit hours for the course a student wishes to change. (This information can be found either online through Bear Access or in the Course and Room Roster, which is available in the Engineering Registrar’s office.)

- Approval from the department offering the course. Because each department keeps a running tally of the numbers of students enrolled in each lecture, section, or laboratory, students must receive departmental approval before making formal changes to their schedule. (The location of departmental offices can be found in the campus directory or Courses of Study.)

- The student’s signature and the date.

The completed add/drop form should be delivered in person to the Engineering Registrar’s office in 158 Olin Hall. There, a staff member will process the changes and return one copy of the form to the student. It is important that students keep
this record of the change and check their schedules periodically on Bear Access during the semester for accuracy.

Adding a Course
Students may add courses to their schedule at any time before the end of the third week of classes, using Cornell's electronic add/drop system or an add/drop form mentioned in the previous section for “permission only” courses.

After the end of the third week of classes, a petition (available in the Engineering Registrar's office, 158 Olin Hall) will be required in addition to the add/drop form to add a course. Like the add/drop form, the petition must be endorsed by the student’s advisor. The completed petition and add/drop form should be submitted to Engineering Advising, 167 Olin Hall.

Dropping a Course
Students may drop courses from their schedule at any time before the end of the seventh week of classes, using Cornell's electronic add/drop system or an add/drop form mentioned earlier for “permission only” courses.

During weeks 8 to 12 (after the end of the seventh week of classes and before the end of the twelfth week), a petition (available in the Engineering Registrar's office, 158 Olin Hall) will be required in addition to the add/drop form to drop a course. Like the add/drop form, the petition must be signed by the student’s academic advisor. The completed petition and add/drop form should be submitted to Engineering Advising, 167 Olin Hall.

Courses dropped after the seventh week will be automatically marked with a “W” (for withdrawal) on the official transcript where the grade would normally appear. “W” is a matter of record: its removal cannot be petitioned.

No courses may be dropped following the end of the twelfth week of classes, even with a petition.

Changing a Grade Option
During weeks one to three of the semester, changing a grade option (on courses where a choice between letter or S/U grade is offered) may be accomplished with the online add/drop system, or with an add/drop form for “permission only” courses. If an add/drop form is used, permission of the faculty advisor and course instructor or departmental representative must be obtained. The completed add/drop form should be submitted to the Engineering Registrar’s office, 158 Olin Hall, by the end of the third week of classes.

Important: After the end of the third week of classes, the grading option may not be changed, nor will students be permitted to add a course in which they were previously enrolled (in the current semester) under a different grade option. This deadline is strictly enforced. (For more information on the S/U Grading Option, see “Grades and Credits” in this handbook.)
Changing Credit Hours

Certain upper-level courses in the Engineering curriculum are offered with “variable” credit hours. Students decide the number of credits they wish to register for at the time they enroll in the course, in consultation with the instructor and their faculty advisor. (For example, a course might be listed as “variable to 5 credits.” This means that a student could enroll in the course for as many as 5 credit hours, although options involving 4 or fewer credit hours exist.)

During weeks one to three of the semester, changing credit hours (on courses that offer variable credit) may be accomplished with the online add/drop system, or with an add/drop form for “permission only” courses. If an add/drop form is used, permission of the faculty advisor and course instructor or departmental representative must be obtained. Submit the completed add/drop form to the Engineering Registrar’s office, 158 Olin Hall, by the end of the third week of classes.

After the end of the third week of classes, variable credit hours may not be changed except by petition (see previous section on “adding a class after week three” for specific instructions).

Course Pre-Enrollment through CoursEnroll

Each semester, there is a period (usually near the middle of the term) during which students electronically request courses they plan to take during the following term, using an online service called CoursEnroll. It provides the most accurate, up-to-date listings of course offerings for the coming semester and is available through any campus terminal connected to Bear Access.

Each semester, the University Registrar’s office assigns each class (first-through fourth-year) a one-week period during which CoursEnroll will be accessible through Bear Access. This access schedule will be published in written form by the University Registrar’s office and in the weekly e-mail newsletter, The Sundial.

To request courses through CoursEnroll students should

• determine their pre-enrollment access period by reading The Sundial or by contacting the Engineering Registrar’s office, 158 Olin Hall.

• pick up a copy of the Course and Time Roster from the Engineering Registrar’s office in 158 Olin Hall. (This step is optional because the most accurate course data can be found directly on CoursEnroll.)

• decide which courses they want to take for the next semester, keeping in mind the requirements for both the Common Curriculum and their intended Major program.

• use CoursEnroll to enter their course choices.

• make an appointment to meet with their faculty advisor early in the pre-enrollment period. During this meeting, the student and their advisor will discuss the proposed course schedule and make changes as necessary.

When both student and advisor are satisfied with the proposed course schedule, the student (or the advisor) should “lock” the course request by entering a special PIN code (available only from the advisor) into CoursEnroll. Once the schedule is
locked, a student may not make additional changes until the add/drop period for the following semester.

This formally completes the pre-enrollment process.

**Maximum Number of Credits per Semester**

The College of Engineering permits (but does not encourage) students to take a maximum of 23 credits a semester—excluding physical education courses, supplementary courses, and other courses that do not count toward the degree. Those who wish to attempt more than 23 credits must petition to do so. Add/drop forms that result in a schedule of more than 23 credits will not be processed without a completed petition endorsed by the student’s faculty advisor and approved by a representative of ASPAC in Engineering Advising.

**Special Courses**

**Supplementary Courses**

Some Majors offer supplementary courses in which material taught in other courses is reviewed. Although students are encouraged to take advantage of these courses, they cannot be used to fulfill graduation requirements, and grades received do not affect academic or class standing.

**ROTC Courses**

The use of ROTC courses to fulfill college degree requirements is regulated by the College Curriculum Governing Board. Under current policy, ROTC courses may be used to satisfy engineering degree requirements under these circumstances:

1. up to 6 credits of ROTC courses at or above the 300-level may be used as advisor-approved electives;

2. ROTC courses which are co-listed by another department. (For example, NAV S 301: Principles of Navigation is co-listed as BEE 305.) Some Majors further restrict the use of particular courses co-listed with Military Science, and students should check with their undergraduate coordinator office to find out whether such courses will count toward graduation.

**Writing Workshop**

The Writing Workshop offers a special writing seminar, *An Introduction to Writing in the University*, for students who have had little education in composition or who have serious difficulty with writing assignments. This course is graded S/U and does count as a first-year writing seminar. In the fall many students are urged to attend a writing assessment session during Freshman Orientation to see if they would benefit from this seminar. The University Orientation brochure will have full details about the assessment.
At any time during the semester, students enrolled in other writing courses who are having problems with their writing assignments can go to the Writing Workshop office (174 Rockefeller Hall, 255.6349) to discuss their writing with a member of the workshop staff.

**English as a Second Language**

Many Cornell students are not native speakers of English. Because these students must still take a two-semester sequence of first-year writing seminars, the Writing Program offers a special writing seminar, *English for Later Bilinguals*, which focuses on language issues. Designed for second-language students whose writing skills are weak, this course allows students to improve their mastery of English while taking a first-year writing seminar. Enrollment is by permission of the instructor. Students interested in this course should take the writing assessment during orientation. The orientation brochure contains full details about the assessment.
# Grades and Credit

## Grades

The grading system used at the university is shown below.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Grade Point Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.3</td>
<td>Excellent to Very Good: comprehensive knowledge and understanding of subject matter; marked perception and/or originality</td>
</tr>
<tr>
<td>A</td>
<td>4.0</td>
<td>knowledge and understanding of subject matter</td>
</tr>
<tr>
<td>A–</td>
<td>3.7</td>
<td>marked perception and/or originality</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
<td>Good: moderately broad knowledge and understanding of subject matter; noticeable perception and/or originality</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>Good: moderately broad knowledge and understanding of subject matter; noticeable perception and/or originality</td>
</tr>
<tr>
<td>B–</td>
<td>2.7</td>
<td>Good: moderately broad knowledge and understanding of subject matter; noticeable perception and/or originality</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
<td>Satisfactory: reasonable knowledge and understanding of subject matter; some perception and/or originality</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
<td>Satisfactory: reasonable knowledge and understanding of subject matter; some perception and/or originality</td>
</tr>
<tr>
<td>C–</td>
<td>1.7</td>
<td>Satisfactory: reasonable knowledge and understanding of subject matter; some perception and/or originality</td>
</tr>
<tr>
<td>D+</td>
<td>1.3</td>
<td>Marginal: minimum knowledge and understanding of subject matter; limited perception and/or originality</td>
</tr>
<tr>
<td>D</td>
<td>1.0</td>
<td>Marginal: minimum knowledge and understanding of subject matter; limited perception and/or originality</td>
</tr>
<tr>
<td>D–</td>
<td>0.7</td>
<td>Marginal: minimum knowledge and understanding of subject matter; limited perception and/or originality</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
<td>Failing: unacceptably low knowledge and understanding of subject matter; severely limited perception and/or originality</td>
</tr>
<tr>
<td>S</td>
<td>–</td>
<td>“Satisfactory” equivalent to C– or above</td>
</tr>
<tr>
<td>U</td>
<td>–</td>
<td>“Unsatisfactory” equivalent to below C–</td>
</tr>
</tbody>
</table>

## Symbols Used in Lieu of Grades

- **INC**: The student has substantial passing-level equity in the course but is unable to complete it because of circumstances beyond his/her control.
- **R (Registered)**: This grade substitute is given after the first semester of a full-year course that does not require a grade until the end.
- **W (Withdrew)**: The student withdrew from the course (with college permission) after the seventh week (or beyond three-fifths of the duration of shorter courses).

## S/U Grading Option

In some courses students have the option of receiving a grade of satisfactory or unsatisfactory (S or U) instead of a letter grade. Students may pre-register for such a course under the S/U option or change the grading option during the first three weeks of the semester. Changing a grade option is accomplished by completing the
“Changes to Grade Option or Credit Hours” section of an add/drop form; this requires permission of the student’s faculty advisor and the course instructor or departmental representative. A grade of “S” is equivalent to a letter grade of A+ through C–; a “U” is equivalent to a grade of D+ or less.

**Important:** After the end of the third week of classes, the grading option may not be changed, nor will students be permitted to add a course in which they were previously enrolled (in the current semester) under a different grade option.

Engineering students may choose to receive an S/U grade option under the following conditions:

- The course in question must be offered with an S/U option.
- The student must have previously completed at least one full semester of study at Cornell. First-year students may not take any courses on an S/U basis during their first semester except for courses that are graded “S/U Only.”
- The proposed S/U course must count as either a liberal-studies distribution or an approved elective in the Engineering curriculum.
- Students may elect to enroll S/U in only one (1) course each semester in which the choice between letter grade and S/U is an option. (Additional courses offered “S/U only” may be taken in the same semester as the “elected S/U” course.)

Note: S/U courses do not count toward eligibility for the Dean’s List and may weaken a student’s chances for acceptance into graduate school. Address questions regarding the S/U option to Engineering Advising.

**Incomplete Grades**

There are many legitimate reasons for delaying completion of a course beyond the time allotted. An extended illness or serious injury, for example, might make it impossible to finish by the end of the semester. Under these circumstances, it becomes desirable to receive a temporary grade of incomplete and finish up the course work at a later time.

To receive an incomplete, students must

- have an extenuating reason that prevents them from completing the course in the time allotted; and
- have passing equity in the course at the time of the request. (This is generally defined as completion of at least half the course work at a passing level.)

Incomplete grades are granted at the discretion of the instructor of the course. Students who think an incomplete is appropriate should discuss it with the instructor, making sure to arrange specific conditions under which the missing work is to be completed and set a deadline for submission. Having this “contract” in writing is desirable.

Evidence of an incomplete remains permanently on the student’s transcript. When the course has been completed, a grade is entered with an asterisk, indicating that it was not completed during the regular semester. Students should weigh the cost of
taking an incomplete against the reasons for doing so. Students may find it helpful to discuss the matter with their faculty advisor or a staff member in Engineering Advising.

**Advanced Placement and Transfer Credit**

**Where Credit Is Due**

Many students begin their careers at Cornell having already completed advanced placement courses in high school or having taken courses at an accredited college that are similar to courses offered here. Students who think they are already competent in the subject matter of a course offered at the introductory level can demonstrate their proficiency and receive credit for the course without actually taking it.

There is a difference between advanced placement (AP) credit and transfer credit. AP credit is awarded when students show their competence in a particular subject by doing well on an approved exam. Transfer credit, on the other hand, is awarded for courses that have been satisfactorily completed at another college and have not been used to meet high school graduation requirements.

The only courses for which students may obtain AP or transfer credit are those that fit degree requirements in the undergraduate engineering program. The College of Engineering decides whether credit should be awarded for particular courses, and in all cases this decision is final.

**The Pros and Cons of AP Credit**

Advanced placement (or transfer) credit is designed to enable students to begin their college studies at an appropriate level in each subject. They generally profit from these options, but must judge their own ability to handle a demanding academic program. The advisability of accepting credit depends on many personal factors, such as the extent of study skills, the activities students wish to engage in during their first year, and the thoroughness of their preparation. Whether to accept AP or transfer credit—or take the corresponding course—is a decision for which the student, alone, is responsible.

Students may become eligible for AP credit in four ways:

- by taking a College Entrance Examination Board (CEEB) examination,
- by successfully completing a General Certificate of Education (GCE) Advanced (A-Level) examination,
- by successfully completing an International Baccalaureate (IB) Higher Level examination, or
- by taking a Cornell departmental examination, given during Orientation week prior to the beginning of the fall term.

If a student’s performance on one of these exams is satisfactory, college credit will be offered.
**Advanced Placement (AP) credit need not be accepted.**—Choosing to accept AP credit will depend, in part, on whether the course in question is a technical course that will be a prerequisite for other courses in a student’s academic program. If it is not a technical prerequisite, there is no reason not to accept it. If it is a technical prerequisite, students should make certain that they are really prepared to take the next course in the sequence.

Departmental examinations test technical preparedness, and in this sense, they are better than CEEB AP exams, which may not test for what Cornell expects a student to know. The departmental exam is designed to test the depth of knowledge in the entire range of material customarily covered in a particular course offered at Cornell. Satisfactory performance on such an exam indicates that students already know what they would have learned if they had taken the Cornell course. Satisfactory performance on the CEEB AP exam is not as good an indication that a student knows the entire range of material. When in doubt, students should feel free to take a departmental exam, even if they have already passed the CEEB AP exam.

Since the amount of AP or transfer credit awarded can affect the degree of difficulty of the first year and subsequent success as an engineering student, students should consider their options carefully, seeking advice from their faculty advisors during Orientation Week and talking with the undergraduate coordinator (see pages 10–12) for their primary Major of interest. The first year at Cornell is crucial to the development of an undergraduate program; wise use of AP and transfer credit can make a positive difference.

### Acceptable Subjects and Scores

A table showing the most common subjects for which AP credit is awarded in the College of Engineering, and the scores needed on qualifying tests, follows. In mathematics, physics, chemistry, and computer science, AP credit is awarded only for courses required in the engineering curriculum. (The College of Engineering does not presently award AP credit for statistics.)

**Modern Languages**

Students may earn AP credit for competence in a foreign language by taking the CEEB AP test or by taking the Cornell Advanced Standing Examination (CASE). Those with a score of 4 or 5 on the CEEB AP test in French, German, Italian, or Spanish will be awarded 3 credits. To qualify for the CASE (in any language), students must score at least a 65 on a college placement test (taken either in high school or at Cornell during Orientation Week). Students achieving a passing score on the CASE will be awarded 3 credits. Modern language credits, earned via AP or CASE, may be used to satisfy part of the liberal-studies distribution requirement (in the foreign language category) or the approved elective requirement, contingent on discussion with the student’s faculty advisor.
Other Subjects

AP credit is granted for many subjects not discussed here. If guidelines for a subject area are not spelled out below, the College of Engineering follows the AP guidelines found in the “General Information” section of Courses of Study.

General Policies for AP Credit

The general policies in the College of Engineering governing awards of AP credit are as follows.

1. AP credit will not be offered in any subject area without a documented examination.

2. All AP examinations are normally taken and scored before fall-term classes begin. Students who take CEEB AP tests in high school should have an official report of their scores sent directly to Cornell as soon as possible. Students who have completed either GCE A-level or IB Higher Level examinations must present the original or a certified copy of their examination certificate to Engineering Advising, 167 Olin Hall. Those who wish to take departmental examinations must do so during Orientation Week; permission to take these tests after the start of fall-term classes must be requested in a written petition to the college’s committee on Academic Standards, Petitions, and Credit (ASPAC).
## AP Credit Table

<table>
<thead>
<tr>
<th>Requirements</th>
<th>CEEB AAP Exams</th>
<th>GCE A-Level</th>
<th>IB Higher Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>191 required</td>
<td>4 or 5 on BC Cornell Departmental Exam</td>
<td>A, B, or C</td>
<td>No credit a</td>
</tr>
<tr>
<td>192 required</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Physics</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>112 required</td>
<td>4 or 5 on mechanics portion of C; 5 on B with successful completion of a high school level calculus course</td>
<td>A or B</td>
<td>6 or 7</td>
</tr>
<tr>
<td>213 required</td>
<td>5 on electricity and magnetism portion of C</td>
<td>A or B plus credit for MATH 191</td>
<td></td>
</tr>
<tr>
<td>112 and 213</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Chemistry</td>
<td></td>
<td></td>
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<tr>
<td>209 or 211 b</td>
<td>5</td>
<td>B</td>
<td>6 or 7</td>
</tr>
<tr>
<td>209 and 208</td>
<td></td>
<td>A</td>
<td></td>
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<tr>
<td>Computing</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CS 100J required</td>
<td>5 on A, or 4 or 5 on AB</td>
<td></td>
<td></td>
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<tr>
<td>Biology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 credits</td>
<td>4</td>
<td>A or B</td>
<td>6</td>
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<tr>
<td>6 credits</td>
<td>5</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>8 credits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-Year Writing Seminar (2)</td>
<td>5 (English) c</td>
<td>A</td>
<td>7</td>
</tr>
<tr>
<td>One seminar</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes

a. Students are encouraged to take the Cornell departmental examination during orientation.

b. Students who obtain AP credit for CHEM 209 and are thinking of majoring in ChemE or MS&E should consider enrolling in CHEM 215. Those who are offered AP credit for CHEM 209 and then elect to take CHEM 215 will also receive academic credit for CHEM 209. You may want to discuss this option with your faculty advisor.

c. Students receiving a 4 on the CEEB AP English Literature and Composition exam or the CEEB AP English Language and Composition exam, a 6 on the IB Higher Level English exam, or a B on the GCE A-level English exam will be eligible for 3 credits, which may be applied toward the Literature and the Arts category in the Liberal Studies Distribution requirement.
Transfer Credit for Transfer Students

Transfer students entering as first-, second-, or third-year students may transfer up to 36 credits for each year spent in full-time study at another institution, provided that the courses are acceptable for meeting graduation requirements. No more than 72 total transfer credits (combination of those taken both before and after matriculation) may be used to meet graduation requirements. Transfer credits from institutions on the quarter system or trimester system are not directly comparable to semester credits. In general, the number of trimester credits or quarter credits will be reduced when converted to semester credits, and credit will not be given for more than 10 courses per year. Transfer credit awards for matriculating transfer students are evaluated and determined by the undergraduate Major representative in the student’s intended Major of study in engineering.

Transfer students transferring 12 to 23 credits are exempt from one PE course. Transfer students transferring 24 or more credits are exempt from two PE courses and the swim test.

Transfer Credit for Advanced Study in High School

College-level courses completed in high school under the auspices of cooperative college/high school programs do not generally lead to Cornell engineering credit. Students who would like credit for such courses should seek Advanced Placement credit by taking a CEEB Advanced Placement or Cornell departmental exam. Transfer credit for high school courses is awarded only if the course was taught at an accredited college or university, by its own faculty members, and if the student can present a signed statement from the high school registrar certifying that the course was not used to fulfill high school graduation requirements.

General Policies for Transfer Credit

• Cornell does not award transfer credit for courses in which a student earned a grade less than C (not C–); schools and departments may stipulate a higher minimum grade.

• A maximum of 18 transfer or Cornell extramural credits may be applied to engineering degree requirements after a student matriculates at Cornell. (Credit for summer-session courses taken at Cornell can not be transferred.)

• First-year and transfer students must complete the transfer credit award process by the end of their first semester at Cornell or their registration will be blocked for the next semester until the process is completed.

• Transfer credit will not be awarded without a completed Transfer Credit Form, a detailed course syllabus or outline, and a certified copy of the student’s official transcript (photocopies are not acceptable).

• Transfer credit will not be awarded for courses taken during a semester in which a student is enrolled at Cornell.

• The final transfer credit award is recorded by the Engineering Registrar, 158 Olin Hall. Students should consult the registrar two weeks after submitting the necessary documents to find out the status of the application.
Transfer Credit for First-Year Students

Students who have taken a course or courses at an accredited college or university may wish to transfer the credits and apply them toward course requirements at Cornell.

During the summer months prior to arriving on campus, Engineering Advising will work directly with those students who indicate on the Student Information Card that they have taken college-level courses at another institution. These students will be provided additional information by e-mail.

To be eligible to receive transfer credit the following must apply:

• Students must have received at least a grade of C (not C–) in the course, and the subject matter must be applicable to the Engineering curriculum at Cornell.

• Engineering Advising must possess a signed statement from the high school registrar certifying that the course has not been used to fulfill high school graduation credit, and that it was taught by college faculty in a college setting.

• An official transcript must be received.

• Transfer credit requests must be completed by the end of the first term of residence or registration will be blocked for the next semester until the process is completed.

Students who want credit for cooperative courses taken in high school must seek AP credit, not transfer credit. Academic credit is never awarded for technical skills and general knowledge acquired through personal experience, employment, or vocational or military training. Credit in excess of that awarded by Cornell for the equivalent course is never granted, nor will Cornell award more than the number of credits completed at another institution.

Students who are awarded credit will receive documentation of the award at their Academic Briefing during Orientation.

How to Use AP or Transfer Credit

AP or transfer credit can be used in at least three ways.

• enrolling immediately in a more advanced course in the same subject area, for example, second-term mathematics in the first term.

• substituting elective course work during the first year or subsequent year. However, students must meet the criteria for good academic standing.

• enrolling in fewer courses, using the credit to fulfill basic requirements. (Students must enroll for a minimum of 12 credits each semester to be considered in good academic standing.)

Further Information

For further information about advanced placement or transfer credit, students should contact Engineering Advising, College of Engineering, Cornell University, 167 Olin Hall, Ithaca, NY 14853-5201; Telephone: 607.255.7414, e-mail: adv_engineering@cornell.edu.
Academic Standing

Full-time students are expected to remain in good academic standing. The criteria for good standing change somewhat as a student progresses through the four years of the engineering curriculum. At all times, the student must be making adequate progress toward a degree, but what this actually means varies from Major to Major.

Requirements for students not yet affiliated with a Major are listed below. Failure to meet these standards will result in a review by the committee on Academic Standards, Petitions, and Credit (ASPAC), which may issue a warning, may require a student to take a leave of absence, or may even require a student to withdraw from the college.

To be in good standing at the end of each semester, unaffiliated engineering students must have:

- at least 12 credits, including at least two courses in mathematics, science, or engineering (PE courses and courses below the 100 level do not count);
- at least a grade of C– in the mathematics course;
- a semester GPA ≥ 2.0;
- no F, U, or INC grades.

Because mathematics is pivotal to the study and practice of engineering, students must earn at least a grade of C– in MATH 191, 192, 293, or 294 and an approved Major-specific mathematics course. Students failing to meet this standard must repeat the course immediately and receive a satisfactory grade before enrolling in the next course in the sequence. Failure to achieve at least a grade of C– the second time will result in dismissal from the College of Engineering. Physics and advanced mathematics courses often have mathematics prerequisites, and having to repeat the prerequisite course may delay progress in the physics and mathematics curricula. Students are expected to continue the core engineering mathematics courses each semester until completed.

Some of the requirements for good standing in Majors are listed below; complete and up-to-date information is available from the undergraduate consultant for each Major.

The university requirement for full-time status (for financial aid) is a minimum of 12 credits, but students who believe they have a good reason to carry a lighter course load should see their faculty advisor and the undergraduate consultant for their Major or intended Major beforehand. Students may have to postpone graduation or attend summer classes as a result of reducing their course load.

Criteria for Good Standing in Major Programs

Affiliated students must continue to meet college requirements for good standing as described earlier in this section. In addition, they must meet the following criteria to remain in good standing in their chosen Major program:
Biological Engineering

(Criteria for students during the time they are registered in the College of Engineering as their primary college)

- Semester GPA $\geq 2.0$
- Cumulative GPA $\geq 2.0$
- Semester GPA $\geq 2.0$ in biological and environmental engineering courses and engineering distribution courses
- A passing grade in at least 12 credits each semester
- No failing grades

Chemical Engineering

- Cumulative GPA $\geq 2.2$
- Semester GPA $\geq 2.0$
- GPA $\geq 2.2$ each semester in required chemical engineering courses
- At most one grade below C– in required chemical engineering courses during the undergraduate program
- No failing grades

Civil Engineering

- Semester GPA $\geq 2.0$
- Cumulative GPA $\geq 2.0$
- Semester GPA $\geq 2.0$ in core courses, design courses, Major-approved electives, and engineering distribution courses.
- At most one grade below C– in required core courses, design courses, Major-approved electives, and engineering distribution courses.
- 12 credits hours each semester
- No failing grades

Computer Science

- Semester GPA $\geq 2.3$
- Semester GPA $\geq 2.5$ in courses required for the CS Major program, with no course grade less than C–
- No failing grades
- A passing grade in at least 14 credits each semester
Electrical and Computer Engineering

- Semester GPA ≥2.3
- No course with a grade less than C– may be used to satisfy degree requirements in the Major program or serve as a prerequisite for a subsequent ECE course.
- Students must satisfactorily complete the following requirements: (a) two of the following courses: ECE/ENGRD 210, ECE 220, or ECE/ENGRD 230; (b) all mathematics and physics courses through MATH 294 and PHYS 214 by the end of the first semester in the Major (typically the second semester of the second year) and make adequate progress toward the degree in subsequent semesters.

Engineering Physics

- Semester GPA ≥2.3
- At least a grade of C– in all required courses
- No failing grades

Environmental Engineering

(Criteria for students during the time they are registered in the College of Engineering as their primary college)
- Semester GPA ≥2.0
- Cumulative GPA ≥2.0
- Semester GPA ≥2.0 in core courses, design courses, Major-approved electives, and engineering distribution courses.
- At most one grade below C– in required core courses, design courses, Major-approved electives, and engineering distribution courses.
- 12 credits hours each semester
- No failing grades

Independent Major

- A passing grade in at least 12 credits each semester
- No more than one grade below C– in required Independent Major or Minor courses during the undergraduate program
- Semester GPA ≥2.0
- Cumulative GPA ≥2.0

Information Science, Systems, and Technology

- Semester GPA ≥2.0
- Semester GPA ≥2.3 in courses used toward the ISST Major and all mathematics courses required by the Engineering college.
• At least a grade of C– in ENGRD 211, ENGRD 270, and all courses used toward the ISST Major. Note: For each of these courses, at least a grade of C– is required for the course to count toward the ISST Major graduation requirements. If a student receives a lower grade, then the course must be retaken.
• Satisfactory progress (a minimum of 14 credits per semester)
• No failing grades

Materials Science and Engineering
• Semester GPA >2.0
• Cumulative GPA >2.3
• Not more than one grade as low as C– in the Major curriculum (Major required courses, materials electives, materials applications electives, and the outside technical elective)

Mechanical Engineering
• A passing grade in at least 12 credits each semester, with the exception of the final semester.
• Cumulative GPA ≥2.0.
• At least a grade of C– in all ME Major required courses used to satisfy the Major program except M&AE 378, ENGRD 210, PHYS 360, PHYS 214, M&AE 427, and M&AE 428. Consult www.mae.cornell.edu for additional academic standards information.

Operations Research and Engineering
• Cumulative GPA ≥2.0
• Cumulative GPA ≥2.0 in required Operations Research and Engineering courses
• At least a grade of C– in ENGRD 211, ENGRD 270, and all required Operations Research and Engineering Major courses
• Satisfactory progress (a minimum of 12 credits per semester)
• No failing grades

Science of Earth Systems
• Cumulative and semester GPA ≥2.0
• At least a grade of C– in all required courses
**Academic Actions**

At the end of each semester, the records of all students who have not yet affiliated with a Major are reviewed by the faculty committee on Academic Standards, Petitions, and Credit (ASPAC), and the records of students who have joined a Major are reviewed by faculty committees in those areas. Students who fail to meet the conditions for good standing may receive written warnings, may be required to take a leave of absence, or may be withdrawn from the college.

A warning should be taken very seriously. A student who receives a warning and continues to perform unsatisfactorily, may be dropped from the degree program. Poor performance also diminishes a student's prospects for employment or graduate school. Students should determine what their underlying difficulties are and address them, perhaps with the help of their faculty advisor or the staff in Engineering Advising.

When students fail to make adequate progress in a technical subject in a given semester, the review committee may require them to take time off to improve their understanding of the areas in which they are having difficulty. This is known as a required leave of absence. It will result in a postponement of graduation, but it can be regarded as an opportunity to address academic deficiencies before rejoining the engineering degree program. Students on a required leave of absence are not usually permitted to enroll in courses at Cornell, and they may choose to go to other institutions to retake the courses that caused them difficulty. After a required leave of absence, students are allowed to return to the engineering program but are required to repeat the courses that were not satisfactorily completed before their leave—courses taken elsewhere are not counted toward graduation unless permission is granted by ASPAC (or the Major, for affiliated students). Any exceptions to these rules must be requested in writing to ASPAC (or, for affiliated students, to the undergraduate consultant of their Major).

Occasionally, the faculty committee decides that a student is having such basic academic problems that they should leave the engineering program. This action is generally permanent. Students in this situation may wish to investigate other Majors at Cornell—the Career Counseling Office in Barnes Hall is an excellent resource, as is the Internal Transfer Division in Day Hall. Students who want to continue their study of engineering are advised to seek admission to a different college or university.

**Academic Integrity**

The Code of Academic Integrity Handbook is distributed to new and transfer students and is available on the web at web.cornell.edu/UniversityFaculty/docs/AcadIntegHdbk9.07Rev.pdf. The code also appears (along with other campus policies) in the *Policy Notebook for the Cornell Community*, which is published by the Office of the Dean of Students and distributed to new students, and is available on the web at cuinfo.cornell.edu/Academic/AIC.html.

The following is taken directly from the code (refer to the documents mentioned above for the entire code): “Absolute integrity is expected of every Cornell student in all academic undertakings . . . Academic integrity is expected not only in formal
course work situations but in all university relationships and interactions connected to the educational process, including the use of university resources. A Cornell student’s submission of work for academic credit indicates that the work is the student’s own. All outside assistance should be acknowledged, and the student’s academic position truthfully reported at all times. In addition, Cornell students have a right to expect academic integrity from each of their peers.”

The authority to determine whether a specific action shall be treated as a violation of the Code of Academic Integrity lies with the Academic Integrity Hearing Board. Those who violate the Code of Academic Integrity will be subject to penalties under this code and may also be subject to penalties under state and federal laws.

Students and staff members discovering an apparent violation should report the matter to the faculty member in charge of the course or to the chair of the appropriate Hearing Board. Procedures for dealing with alleged academic integrity violations are outlined in the code.

Class Ranking

Each summer the engineering registrar ranks the engineering students by ranking class (i.e. third-year, fourth-year). This takes into account all degree-applicable grades received for enrolled students up to the time of the ranking. Fourth-year students graduating in May are ranked immediately after graduation. Changes in grades made after ranking is completed do not affect the class rank of other students.

Dean’s List

Dean’s List citations are presented each semester to engineering students with exemplary academic records. The criteria for this honor are determined by the dean of the college.

For 2007–2008, the requirement is a semester GPA ≥3.40 (without rounding); no failing, unsatisfactory, missing, or incomplete grades (even in physical education); and at least 12 letter-grade credits (not S/U). Students may earn Dean’s List status retroactively if they meet these criteria after making up incompletes. Students who make the Dean’s List receive certificates from the Engineering Registrar’s office, and the honor is noted on their transcript.

Graduating with Distinction

Meritorious students graduating with a B.S. degree from the College of Engineering may also receive degrees designated as cum laude, magna cum laude, or summa cum laude.

Cum laude is awarded to all engineering students with an overall grade point average (GPA) ≥3.50. Cum laude is also awarded to all engineering students who received a semester GPA ≥3.50 in each of the last four semesters of attendance at Cornell; in each of these semesters, at least 12 letter-grade credits must be taken with no failing, unsatisfactory, missing, or incomplete grades. If the student is an Engineering Co-op student, then the Engineering Co-op summer term will count
as one of the last four. Students who were approved for prorated tuition in their final semester will be awarded cum laude if they received a semester GPA $\geq 3.50$ in their last semester and meet the conditions above in the prior four semesters.

**Magna cum laude** is awarded to all engineering students with a GPA $\geq 3.75$ (based on all credits taken at Cornell).

**Summa cum laude** is awarded to all engineering students with a GPA $\geq 4.0$ (based on all credits taken at Cornell).

Note: All GPA calculations are minimums and are not rounded.

**Major Honors Programs**

To be eligible for Major honors, a student must enter the program with and maintain a cumulative GPA $\geq 3.50$. A student must be in the program for at least two semesters before graduation. If the student’s Major has an approved honors program and the GPA, Bachelor of Science degree, and Major honors program requirements are fulfilled, the faculty of the Major may recommend that a student graduate with the additional notation of “With Honors” on their diploma and transcript.

**Biological Engineering (BE) Honors Program**

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated above, and must have at least 9 credits beyond the minimum required for graduation in BE. These 9 credits shall be drawn from one or more of the following with at least 6 credit hours in the first category:

- A significant research experience or honors project under the direct supervision of a BEE faculty member using BEE 495: Honors Research, to be completed in their fourth year. A written senior honors thesis must be submitted as part of this component. A minimum grade of A– is required for successful completion of the honors requirement.

- A significant teaching experience under the direct supervision of a faculty member or as part of a regularly recognized course in the department (i.e., BEE 151, 251, or 260) under BEE 498: Undergraduate Teaching.

- Advanced or graduate courses. These additional courses must be technical in nature (i.e. in engineering, mathematics, biology, chemistry, and physics at the 400 and graduate level).

**Timing**

Complete a written application (available in 207 Riley-Robb Hall) no later than the end of the third week of the first semester of the fourth year, but it is better to make arrangements with a faculty member during the second semester of the third year.

**Procedures**

Each applicant must have a BEE faculty advisor to supervise the honors program. A written approval of the faculty member who will direct the research is required.
After the college verifies the student’s GPA, the student will be officially enrolled in the honors program.

**Civil Engineering (CE) Honors Program**

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated above. The program consists of at least 9 credits beyond the minimum required for graduation in CE. These 9 credits shall be drawn from one or more of the following components (with at least 2 credits in any selected component):

- A significant research experience or honors project under the direct supervision of a CEE faculty member using CEE 400: Senior Honors Thesis (1–6 credits per semester). A significant written report or senior honors thesis must be submitted as part of this component. Letter grade only.

- A significant teaching experience under the direct supervision of a faculty member or as part of a regularly recognized course in the College of Engineering (i.e., ENGRG 470: Undergraduate Engineering Teaching or CEE 401: Undergraduate Engineering Teaching in CEE [1–3 credits per semester]).

- Advanced or graduate courses at the 500 level or above.

No research, independent study, or teaching for which the student is paid may be counted toward the honors program.

**Timing**

Interested students must apply no later than the beginning of the first semester of their fourth year but are encouraged to apply as early as the first semester of their third year.

**Procedures**

A CE faculty advisor or faculty member must supervise each applicant’s individual program. (This need not be the student’s faculty advisor.) The application to the program shall be a registration form for CEE 400 and a letter from the student describing the specific proposed honors program and include the explicit approval of both the faculty advisor and honors advisor. Each program must be approved by the CE Curriculum Committee, although the committee may delegate approval authority to the associate director for all but unusual proposals.

**Computer Science (CS) Honors Program**

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:

- At least one CS course (3-credit minimum) at or above the 500-level with at least a grade of A– (no seminars or 2-credit project courses).

- At least two 3-credit semesters of CS 490: Independent Reading and Research with a CS faculty member with at least a grade of A– each semester.
Honors courses may not be used to satisfy the CS electives, the CS project course, the mathematics elective, the technical electives, or courses in the specialization. In essence, honors course work represents a depth of work that is well beyond the minimum requirements needed to fulfill the Major.

Timing

Honors determinations are made during the fourth year. Students wanting to be considered for Major honors should e-mail the undergraduate office at ugrad@cs.cornell.edu with the subject line “Honors Track.” Related questions may also be addressed to the same e-mail address, or candidates can call or stop by 303 Upson Hall, 255.0982.

Preparation

Arrangements for doing CS 490 projects should be made directly with faculty members in the department. Students are encouraged to discuss potential contacts with their advisors and to browse the department’s web page at www.cs.cornell.edu for specific leads on research opportunities.

The department reserves the right to make changes to the honors program at any time.

Electrical and Computer Engineering (ECE) Honors Program

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:

- Apply during the first three weeks of the sixth semester.
- Have at least 139 credit hours for graduation, which includes the basic ECE degree requirements as well as Honors Program courses (9 credit hours).
- Achieve at least a grade of B in the three required courses.
- Enroll in ECE 311: Electrical and Computer Engineering Honors Seminar during the third year for 2 credits and a letter grade.
- Complete a fourth-year Honors Project (3 credit hours minimum). This project can include research or directed reading, at the 400 level, with an ECE faculty member.
- Earn at least 3 additional credit hours of advanced ECE course work. This course must have at least a 300-level ECE course prerequisite.

Engineering Physics (EP) Honors Program

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:

- Complete at least 8 credits of Major-approved electives at the 400 level or higher with at least a grade of A– in each course. These 8 credits are in addition to the credits obtained by completing the senior thesis or special project requirement as discussed in the next item.
• Enroll in A&EP 490: Independent Study in Engineering Physics or an equivalent course over two semesters for the purpose of completing an independent research project or senior thesis under the supervision of a Cornell engineering or science faculty member. The minimum enrollment is 2 credits in the first semester and 4 credits in the second. The level of work required for a successful completion of this project or thesis is to be consistent with the amount of academic credit granted.

Timing
Complete a written application no later than the end of the third week of the first semester of the fourth year, but it is better to make arrangements with a faculty member during the second semester of the third year.

Procedures
Before enrolling in A&EP 490, or the equivalent, the honors candidate must submit a brief proposal outlining the topic and scope of the proposed project or thesis and a faculty supervisor's written concurrence to the associate director for undergraduate studies. This proposal will be reviewed and either approved or returned to the candidate to correct deficiencies. The proposed research project or senior thesis is to consist of a research, development, or design project and must go beyond a literature search. A written report is required in the form of a technical paper with, for example, an abstract, introduction, methods section, results section, conclusions section, references, and figures. This report will be evaluated by the faculty supervisor and the chair of the EP Honors Committee. Following completion of the written report, an oral report is presented to an audience consisting of the faculty supervisor, the chair of the Honors Committee, and at least one other departmental faculty member, along with the other honors candidates. At least a grade of A– is required for successful completion of the honors requirement.

Environmental Engineering (EnvE) Honors Program
Students interested in pursuing an honors program should contact the Undergraduate Program Director of Biological Engineering or the Associate Director of Civil and Environmental Engineering for information on the program requirements.

Independent Major (IM) Honors Program
To participate in this Major's Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:

• Complete at least 9 credits above the minimum required for graduation, from courses selected at the advanced or graduate level (excluding credits awarded for research) and approved by the Major advisor;

• Have a written proposal of the honors project accepted by the Major advisor and the Independents Major Committee by the beginning of the seventh semester.

• Complete an honors thesis involving research of breadth, depth, and quality and demonstrating professional communication skills.
Information Science, Systems, and Technology (ISST) Honors Program

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:

• Four credit hours of ISST graded course work at least at the 500-level (no S/U courses; no seminars or 2-credit project courses.)

• Six credit hours of INFO 490: Independent Reading and Research with an IS faculty member, spread over two semesters, with at least a grade of A– in each semester

or

• Three credit hours of INFO 490 with an IS faculty member and three credit hours of INFO 491: Teaching in Information Science, Systems, and Technology, both with at least a grade of A–. It is expected that the INFO 490 research will result in either a programming project and/or a written report. Courses at the 500- or 600-level taken to fulfill the honors requirement may be counted toward fulfillment of the primary or associated option requirements.

Materials Science and Engineering (MS&E) Honors Program

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:

• Complete at least 9 credits above the minimum required for graduation in Materials Science and Engineering, so that the minimum number of credits for an honors degree is 141. The additional courses must be technical in nature, i.e. in engineering, mathematics, chemistry, and physics, at the 400 and graduate levels, with selected courses at the 300 level, which must be approved by the Major advisor.

• Write a senior honors thesis (8 credits) with at least a grade of A.

Timing

Complete a written application no later than the end of the third week of the first semester of the fourth year but it is better to make arrangements with a faculty member during the second semester of the third year.

Procedures

A faculty advisor must supervise the honors program of each applicant. Written approval by the faculty member who will direct the research is required.

Operations Research and Engineering (ORE) Honors Program

To participate in this Major’s Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157. An honors program shall consists of at least 9 credits beyond the minimum required for graduation in ORE, so that no part of the honors program can also be used to satisfy graduation requirements. The 9 credits shall be from one or more of the following with at least four hours from the first category:
• Advanced courses in OR&IE at the 500 level or above.
• A significant research experience or honors project under the direct supervision of an OR&IE faculty member using OR&IE 499: OR&IE Project. A significant written report must be submitted as part of this component.
• A significant teaching experience under the direct supervision of a faculty member in OR&IE using OR&IE 490: Teaching in OR&IE or ENGRG 470: Undergraduate Engineering Teaching.

Timing
Complete a written application no later than the end of the third week of the first semester of the fourth year but it is better to make arrangements with a faculty member during the first semester of the third year.

Procedures
A faculty advisor must supervise the honors program of each applicant. The honors advisor need not be the student's faculty advisor. The application to the program shall be a letter from the student describing the specific proposed honors program and include the explicit approval of the honors advisor. Each program (as well as any subsequent changes to the program) must be approved by the associate director of undergraduate studies.

Science of Earth Systems Honors Program
To participate in this Major's Honors Program, students must meet the Major Honors Programs criteria as delineated on pages 154–157 and:
• At least 9 credits above the minimum required for graduating and approved by the Major advisor;
• Have a written proposal of the honors project accepted by their faculty advisor and the director of undergraduate studies;
• Complete an honors thesis (EAS 491–492 or 499, at least 2 credits each) involving research of breadth, depth, and quality.

Timing
A written proposal of the honors project must have been accepted by a student’s advisor and the director of undergraduate studies by the beginning of the seventh semester.

Procedures
A faculty advisor must supervise the honors program of each applicant. Written approval by the faculty member who will direct the research is required.
Changes in Status

Petitions to the Faculty

A petition is the official way to request action on academic matters that are not routine. The petition form, which may be obtained in Engineering Advising or online at www.engineering.cornell.edu/student-services/registrar/forms/index.cfm; is used to notify the petitioner, the registrar, and the faculty advisor.

Petitions are required for such purposes as:

- amending a program of study by adding courses after the first three weeks of the semester or dropping courses after the first seven weeks;
- amending a college curriculum requirement, such as substituting a course or a stated sequence of courses in a degree-requirement area;
- requesting an exception to a college academic policy based on extenuating circumstances.

The petition should include convincing evidence that an exception is warranted. A clearly stated petition has a better chance of approval than a poorly prepared one.

Students not yet affiliated with a Major should submit their petition to Engineering Advising. Affiliated students should check with their Major to determine where to submit their petition.

Leave of Absence

Students sometimes find it necessary to suspend their studies for a while. To do this, they must request a voluntary leave of absence in writing for a specified period of time and receive written approval.

Affiliated students request a voluntary leave through their Major. Unaffiliated students request a voluntary leave through Engineering Advising; the first step is an interview to establish conditions for the leave and subsequent return. Those who take a voluntary leave before affiliating with a Major and while not in good standing may be given a “conditional leave.” This requires them to meet specific conditions, established at the time the leave is granted, before they will be reinstated.

Students needing to take a medical leave of absence based on medical or psychological issues must initiate this leave with Gannett Health Services. The medical leave policy can be found at www.gannett.cornell.edu/MLOA.html.

Leaves of absence last for at least six months and are not generally granted for more than two years. A leave of absence granted during a semester goes into effect on the day it is requested. Leaves granted after the twelfth week of a semester generally result in withdrawal from all course work (i.e., a “W” will appear next to each course on the transcript). Students who owe money to the university are ineligible for leaves of absence. Courses taken during a leave are to satisfy Cornell degree requirements, and must be approved in advance through a formal transfer petition. No more than 18 transfer credits may be used to meet degree requirements after matriculation.
Students who intend to take a leave of absence should check with the Office of Financial Aid and Student Employment to find out about financial implications. This is especially important if they have taken out educational loans. Eligibility for medical insurance may also be affected.

**Extramural Students**

Students not enrolled full-time who register for individual courses through the School of Continuing Education and Summer Sessions are called extramural students. Tuition for extramural study is calculated according to the number of credits; no one may register as an extramural student for more than 11 credits per semester. Extramural students do not have the privilege of health insurance or the use of Gannett Health Services, unions, physical education facilities, or other services for which full-time Cornell students pay a fee. Engineering students on a leave may not take Cornell extramural courses. Exceptions are granted only in extraordinary circumstances with the permission from Engineering Advising.

In the College of Engineering, credits earned in extramural courses are counted as transfer credits. Summer-session courses taken at Cornell are not considered for transfer credit (see section on transfer credit (pages 148–153) for details).

Students may not enroll in courses extramurally during their last semester of undergraduate enrollment.

Since extramural students are not full-time, they may need to begin paying back student loans while taking classes. The Office of Financial Aid and Student Employment has more information.

The School of Continuing Education and Summer Sessions is located in B20 Day Hall.

**Withdrawal**

Students who voluntarily withdraw from the engineering degree program sever all connection with the college. Unaffiliated students who wish to withdraw should do so through Engineering Advising. Affiliated students should contact their Major.

A student who fails to register in the first three weeks of the semester, without benefit of a leave of absence or permission for study in absentia, will be deemed to have withdrawn.

Students who withdraw from the College of Engineering are eligible to apply for admission to one of the other six undergraduate colleges at Cornell. The intr-university transfer process should be followed.

Students who have withdrawn but wish to return must make a formal application for readmission. This is rarely granted. It is subject to a review of the student’s academic background and depends on available space in the college and in the student’s Major.

**Rejoining the College After a Leave of Absence**

To return after a leave of absence, the conditions established when the leave was granted must be satisfied and the college must be notified.
Students who wish to rejoin the college and have not yet affiliated with a Major should request permission to rejoin in a letter to Engineering Advising. This must be done at least six weeks before the beginning of the semester in which the student wishes to return. The letter should describe the student’s activities while away from Cornell, detail any academic work completed during this time, and specify the courses the student intends to take when he/she returns. If permission to rejoin is granted, Engineering Advising will respond directly to the student. When a student rejoin the college, (s)he must see the faculty advisor to finalize course selection and should plan to return at least three working days before the beginning of classes. A call to set up an appointment is a good idea.

Unaffiliated students who rejoin after a required leave of absence are not permitted to have advanced beyond the level at which they left Cornell. For example, a student who failed PHYS 112 in his/her last semester at Cornell may receive credit for a similar course taken elsewhere, but not for the equivalent of PHYS 213. (An exception to this policy may be granted via petition, but permission should be secured before taking the course in question.)

Affiliated students should apply to their Major for permission to rejoin the college. Majors must accept students in good standing who have successfully completed all appropriate portions of the Common Curriculum, including prerequisites for the Major, and who have met the requirements for affiliation. They are not required, however, to accept rejoining second-year students who are not in good standing or have not made adequate academic progress.

Ordinarily, students who take a leave of absence after affiliating with a particular Major return to that same Major. However, an affiliated student on leave of absence who wishes to transfer to a different Major at the time of rejoining must apply to the new Major. This process may take a few weeks, so notification of intent to rejoin with a change in Major must be received early. Majors are not required to accept a student who began the third year in another Major and later requested transfer. A student who is not accepted into the new Major must rejoin in the original Major.

Transferring from One Engineering Major to Another

Students who have affiliated with a Major program sometimes want to transfer to a different Major. Other possible candidates for transfer are students who have been notified that they have been withdrawn from their Major (and, therefore, from the college). Such students may still be eligible to apply to another Major. Contact Engineering Advising for more information.

Students who transfer from outside Cornell into the College of Engineering are affiliated with a specified Major when they are admitted and are not usually eligible to transfer to another Major for a period of one year. Therefore, transfer students who want to change Majors may find it necessary to take a leave of absence or to delay graduation.

To apply for transfer to another engineering Major, students must complete a Change of Major and/or Advisor form, which is available through Engineering Advising (167 Olin Hall) or any Engineering undergraduate Major office. Students must have permission from the intended Major to transfer; Majors are under no obligation to accept students who have already begun the fifth semester with a different affiliation.
Transferring to Another College at Cornell

Students sometimes come to the conclusion that they no longer wish to remain in the College of Engineering. When this happens, it is necessary for them to reevaluate their goals and motivations. Help is available from the student's faculty advisor, Engineering Advising, and the Career Center in Barnes Hall.

Students interested in transferring within Cornell should consult with Vivian Geller of the Internal Transfer Division, 220 Day Hall. Ms. Geller can provide expert counseling on the transfer process and information about each of the Cornell colleges to help students pinpoint their interests. (Students planning to transfer within Cornell should make an appointment to see Ms. Geller as early in the semester as possible.)

Students with satisfactory academic records may apply to the target college and, if accepted, transfer directly. Students who do not have strong academic records and those who have not taken courses in their target college should apply for registration in the Internal Transfer Division. This arrangement gives students the opportunity to demonstrate their abilities in the subjects they would be studying in the target college.

Procedures for Direct Intra-University Transfer

Students wishing to transfer to another undergraduate division within Cornell should visit the Internal Transfer Division office (220 Day Hall) and complete an application for transfer form. Completing this form prompts the Engineering Registrar to forward the following materials to the target college:

- Student’s original application to Cornell University
- High school transcript
- SAT scores
- Transcripts of college-level study completed at other institutions
- Transcript of Cornell course work

The College of Engineering retains any materials (such as petitions) that are not needed by the target college. Students who wish to have other portions of their records forwarded to the target college should submit a written request at the time they complete the transfer application form.

Admissions decisions are generally made at the end of each semester after final grades are available, and students are notified shortly thereafter.

Transferring with the Assistance of the Internal Transfer Division (220 Day Hall)

Students who are not in a position to transfer directly between colleges must apply to the Internal Transfer Division (ITD). This involves writing an essay explaining the reasons for the desired transfer, having an interview with the Internal Transfer Division director, and submitting an application for transfer form to the Engineering Registrar’s office. Students applying to the ITD must also fulfill the application requirements (e.g., interviews, essays) of their target college, as if they were applying
for direct transfer. Students can apply for direct transfer and to ITD simultaneously so that if direct transfer is denied, they might be offered the option of admission to ITD. The application process must be completed by the last week of classes of the semester before the one in which it is to take effect.

While in the Internal Transfer Division, students are usually “sponsored” by the college into which they wish to transfer. This means that the college agrees to accept them after successful completion of one semester of specified courses.

Students from the College of Engineering who register in the Internal Transfer Division may return to engineering under the following circumstances:

• A student who was in good standing when transferred to the Internal Transfer Division is allowed to compete with other internal transfer applicants for available space in the College of Engineering.

• A student who was in good standing but has taken no engineering courses in the Internal Transfer Division may apply to be sponsored by the College of Engineering.

**Change of Name or Address**

All students must keep the college advised of changes in their name or address. This applies to both their home and local addresses. Important correspondence may be delayed by forwarding, and failure to receive mail on time is not a valid excuse for missed deadlines.

Students can update their addresses and phone numbers themselves (online) through *Bear Access* on any networked campus terminal. (Public terminals are located outside the University Registrar's office and in many of the campus libraries and residence halls.) Changes of name or social security number should be submitted in writing to the University Registrar’s office.
As students approach the final year of study in engineering, they will need to plan for the next stage of life. Some will obtain additional education or training, while others will seek immediate employment. The College of Engineering, the university, and the engineering faculty and staff provide support for choosing options, seeking a job, and finding appropriate advanced study.

In addition to career development, students should consider the many aspects of professional and personal development. It is recommended that students begin early to connect with professional and technical societies that can provide a network for the future. During the undergraduate years, participation in student branches of professional and technical societies provides preparation for this next move. Obtaining legal recognition of commitment to engineering is also important. Students are encouraged to take the first steps toward professional engineering licensure during the fourth year by taking the Fundamentals of Engineering exam (apply by April of the third year for the October exam in fourth year).

Career and professional development decisions are among the most important of life’s decisions. Students are encouraged to seek advice early during their years at Cornell and to give careful thought and attention to the process.

The following information is designed to assist students in their career and professional development.

Deciding on a Career

Deciding on a career path and finding employment takes effort and commitment—especially in the fourth year. It is recommended that students plan, since this process can take much time and effort. The following resources can help with the process.

ENGRG 325: Career Development for Engineering

During the spring semester, undergraduates may enroll in this 2-credit course, team-taught by Cornell Career Services staff and faculty members. Topics include presentations and small-group discussions on career decision-making, values, skills, and interests, as well as résumés, cover letters, interviews, networking, and the job-search process.

Career Services at Cornell

Engineering Cooperative Education and Career Services

201 Carpenter Hall, 255.5006
www.engineering.cornell.edu/student-services/engineering-coop-career-services/co-op/index.html

The Engineering Cooperative Education and Career Services office assists students who are contemplating the next stage of their careers, whether that be employment (full-time entry-level, co-op, and summer) or graduate study.
The office coordinates an on-campus recruiting program that annually brings 200 employers to campus to conduct more than 6,000 interviews with engineering students for full-time entry-level, co-op, and summer positions. Additionally, and in conjunction with Cornell Career Services, an extensive list of job postings is maintained on CornellTRAK. See the web site www.career.cornell.edu.

The office coordinates seminars on job search and résumé/interview preparation; counselors are available to discuss career-related issues individually. Students are encouraged to use these services in preparing for success in the job market.

**Cornell Career Services**

103 Barnes Hall, 255.5296  
www.career.cornell.edu

Cornell Career Services (CCS) educates students about the career planning and job-search process and promotes linkages between students and employers or graduate and professional schools. CCS offers a broad range of programs and services that complement those provided in Engineering Cooperative Education and Career Services focusing on five Major areas:

- **Career development**—career testing, counseling on decisions concerning Majors and careers, and networking opportunities.

- **Career information**—career library with an extensive collection of print, electronic, audio, and video reference materials on careers and career decision-making; employment; internships; graduate and professional schools; fellowships; and international opportunities to assist students with job searches and applying to graduate and professional school.

- **Job search strategies**—job search seminars, employment career fairs, company information sessions, and on-campus interviews. A Career Guide manual provides sample résumés, cover letters, and advice on the job-search process. The on-campus recruiting program brings to campus more than 180 employers who conduct interviews for positions in the management consulting, financial services, retail, health care, and insurance industries.

- **Employment information via the Internet**—on summer jobs, internships, and full-time jobs after Cornell.

- **Graduate and professional school, including health careers and fellowships**—advising and seminars on the application process, information resources, and Graduate and Professional School Days. A credentials service allows students and alumni to maintain confidential files of recommendation letters and personal data to be used in securing employment or in applying to graduate or professional school.

Cornell Career Services’ web page www.career.cornell.edu provides a calendar of events, hours of office operations, career resources, and links to Internet career sites.
Graduate Programs and Professional Study

Students who wish to continue with advanced study at Cornell or another institution should start planning early in the fourth year. They should identify the course of advanced study they wish to pursue and the schools, colleges, and universities they might attend. Peterson’s *Graduate and Professional Programs* is a useful tool for identifying potential institutions, with names and addresses of people to contact. Faculty members can often give advice about appropriate schools to consider. If possible, students should visit the graduate and professional schools they are considering.

Graduate Programs in Engineering at Cornell

Information about graduate programs in the College of Engineering at Cornell is available through the Graduate Field Office of each school or department and from their web sites. Further information on graduate studies at Cornell can be found at www.gradschool.cornell.edu/.

Three graduate degrees are available in the College of Engineering: Master of Science (M.S.), Master of Engineering (M.Eng.), and Doctor of Philosophy (Ph.D.).

Application Process

Students interested in graduate study in the College of Engineering choose a field of study and apply for admission through the Cornell Graduate School, which will refer the application to the field. For detailed information on graduate programs, requirements, application process, and contacts, a display of fields of study with links to field web sites can be found for M.S./Ph.D. at www.engineering.cornell.edu/programs/graduate-education/ms-phd-fields/index.cfm and for M.Eng. at www.engineering.cornell.edu/programs/graduate-education/master-engineering/index.cfm.

The M.S. and Ph.D. Degree Programs

The M.S./Ph.D. degree programs offer rich opportunities to investigate scientific phenomena in depth and to make translations into technologies. Cornell has extensive and deep strengths in a number of disciplines and Cornell’s world-renowned faculty is responsible for many key scientific and engineering breakthroughs. Faculty members engage in many research projects with federal, state, and corporate sponsors, which make it possible for students to choose thesis research from a wide variety of topics. Research activities at Cornell are supported by more than 30 government, corporate, and university-sponsored interdisciplinary research centers, programs, and facilities—including three NSF nanotechnology centers, an NSF center in advanced materials, and a supercomputing center. Students also have unique opportunities to enrich their experiences outside of Ithaca, for example in biomedical engineering through collaborations with the Cornell Weill Medical College and in financial engineering through the Wall Street office of the School of Operations Research and Information Engineering.

Students in good standing in the M.S./Ph.D. programs generally receive full support during their graduate studies, which covers tuition, health insurance, plus a stipend for both the academic year and the summer. Support may be in the form of fellowships, teaching assistantships, or research assistantships.
The Master of Engineering Program

The Master of Engineering (M.Eng.) degree features intensive, one-year professional programs of study built around core courses and a project, which offer students advanced training in science, current technology, and engineering design. M.Eng. programs are offered in 15 Major fields of study:

Aerospace Engineering
Biological and Environmental Engineering
Biomedical Engineering
Chemical Engineering
Civil and Environmental Engineering
Computer Science
Electrical Engineering
Engineering Mechanics
Engineering Management
Engineering Physics
Materials Science and Engineering
Mechanical Engineering
Operations Research and Information Engineering
Science of Earth Systems
Systems Engineering

The M.Eng. Major fields are highly interdisciplinary in nature and afford a great deal of flexibility in tailoring a program to fit individual needs and interests. In addition, Minors are available in bioengineering, manufacturing, engineering management, and systems engineering.

Many M.Eng. programs offer opportunities for students to gain industry experience through collaborative partnerships. In addition, M.Eng. students can gain hands-on experience working collaboratively with other engineering fields and sometimes other colleges at Cornell on special project teams in national and international competitions. For qualified students, it is possible to earn an M.Eng. and an M.B.A. degree from Cornell’s Johnson Graduate School of Management in two years.

Typical M.Eng. graduates enter the work force with greater opportunities and at significantly higher salaries than those entering with a B.S. degree, and many are offered earlier chances of advancement.

The M.Eng. Early Decision Option

Highly qualified engineering students may apply to the M.Eng. program at the beginning of their fourth year with a request for an early decision. This relatively informal application process is usually done in October for the following fall semester and applicants are notified of admission and awards (if information is
available) in December. The early decision option may help fourth-year students with decision-making as they near the completion of the B.S. degree. Information on Early Decision is available through the Graduate Field Offices.

The M.Eng. Early Admission Option

Students with at most 8 credits to earn toward their undergraduate degree in the last semester of their undergraduate program may apply. Accepted students may then begin work on their M.Eng. degree while completing the requirements of their undergraduate degree. Applicants must have an undergraduate GPA of ≥2.7 at the time of application and must submit an “Early Admission Petition and Course Record Form” with their application. The form, which must be approved by both the student’s Major advisor and the Undergraduate College Registrar, must show the student’s course and time plan for completing both undergraduate and graduate degree requirements. The student must complete all requirements for the B.S. degree before enrolling as a graduate student in the M.Eng. program and the student must be enrolled in the Graduate School as a full-time M.Eng. student for a minimum of one semester. The form for Early Admission is available in all Graduate Field Offices and at the Office of Research and Graduate Studies, 222 Carpenter Hall.

National GEM Consortium

The university participates in the National GEM Consortium, which provides financial assistance and academic support for underrepresented minority students at the master’s and Ph.D. level. Graduate fellowships include tuition, a summer internship with pay, and an academic year stipend.

Students may apply during their third or fourth year. Applications must be completed online at www.gemfellowship.org by November 1. Fellowship awards are announced by February 1. Additional information may be obtained in the Diversity Programs in Engineering office, 146 Olin Hall.

Professional Development and Lifelong Learning

Professional and technical societies provide lifelong connections with colleagues and with the wider developments of the engineering profession and technology. Students are encouraged to join the student branches of these societies while undergrads and to seek full professional membership as graduation approaches. (A list of Engineering undergraduate student organizations can be found later in this publication.)

Professional Engineer Licensing

Legal recognition of qualification to practice engineering is obtained through the licensing process. All engineers who offer their services to the public are required to have a valid license to practice. Licensing requirements vary from state to state for the Professional Engineer (P.E.) license. However, obtaining the P.E. license is a multistate process that has a common first step across the nation of passing the Fundamentals of Engineering exam. Students are eligible for the first step as they
near graduation from an accredited engineering degree program. After passing the first exam, engineers must complete several years of practice with increasing responsibility to later qualify for the P.E. exam in the state(s) of their choice. Passing the P.E. exam gives an engineer full legal right to public practice. For most employment of engineers, the P.E. license is not required; however, the P.E. license provides mobility to private or consulting-firm employment that would not otherwise be available.

To obtain the Professional Engineer (P.E.) license, a candidate must pass an Intern Engineer Examination, Fundamentals of Engineering, have a prescribed amount of experience in engineering practice, and pass the Professional Engineer Examination. Licensing for the P.E. is by individual state agency for the state in which the student wishes to practice. In New York, it is the New York State Board for Engineering and Land Surveying. Applications and other details are available from

- Engineering Unit
- Division of Professional Licensing Services
- State Education Department
- Cultural Education Center
- Albany, NY 12230
- Telephone: 518.474.3846

Applications and informational brochures are available in 167 Olin Hall. Fourth-year students graduating in May are eligible to take the Fundamentals of Engineering exam in April. When students complete an application, the college forwards it to Albany, certifying that they are “within 20 credits of graduation from an accredited engineering curriculum.” The examinations are given in various locations throughout the state. Syracuse is the test location closest to Ithaca. Applications must be sent to Albany at least 60 days before the examination. Thus, the filing deadline for the April examination is early February. To meet this deadline, students are urged to begin preparing their materials in December.
Engineering Awards

Several awards are offered to engineering students. Some require submitting a paper, and others are awarded in recognition of merit. The following are the principal awards:

The ABB Lummus Global Essay Awards
An annual prize of $1,000 divided among first-, second-, and third-place technical essays written by chemical engineering students. Students may select their own topics. Essays are typically due in April.

The American Institute of Chemical Engineers’ Donald F. Othmer Sophomore Academic Excellence Award
Award presented to the junior in chemical engineering who has the best academic record upon completion of the sophomore year.

The American Institute of Chemists Award
Presented to a senior in chemical engineering who has a record of leadership, ability, character, and scholastic achievement.

The ASCE John P. Riley ’22 Award
A first-year membership in the American Society of Civil Engineers (ASCE), presented to a member of the graduating class in Civil and Environmental Engineering who is a member of the student chapter of ASCE and has rendered meritorious service and special leadership to fellow students and to the Civil Engineering profession.

The ASCE Marshal Case Haggard Award
Established in 1992 in memory of Marshal Haggard ’81, president of the Cornell ASCE Student Chapter in 1980–81, who lost his life while in service in the Peace Corps in Nepal. It is presented to a member of the student chapter in recognition of outstanding contributions to the community, following the role of Marshal, who had a strong influence in developing the service activities that have become a tradition of the Cornell chapter.

The ASCE Student Service Award
Presented to a member of the graduating class in Civil and Environmental Engineering who is a member of the student chapter of the American Society of Civil Engineers and has rendered the most meritorious service to fellow students and to the profession of Civil Engineering.

The ASCE Winslow T. Shearman (Student Merit) Award
Presented to a member of the graduating class in Civil and Environmental Engineering who is an active member of the student chapter of the American Society of Civil Engineers and is considered most worthy of the honor by virtue of high character and academic achievement.

The Jerry Goff Awards
Two awards are given to encourage research and student projects. One or two students are selected annually. A $1,000 award is given to fund a research/student project in biomedical engineering. Proposals are submitted by a faculty member to John Belina in ECE by August 1, and the awards are presented by August 15. A $250 award is also given annually. This award is based on best project or project contribution. Students are nominated by the ECE faculty and the names submitted to John Belina. The deadline for nominations is May 1 and the award is decided by May 15.

The Roger K. Berman ’70 Memorial Prize
A cash award given annually for excellent oral presentation in an engineering communications course, typically given to eight students and carrying a cash award of $150 each.

The R. Bolgiano, Sr. Outstanding Teaching Assistant Award
Presented to the teaching assistant in the Sibley School of Mechanical and Aerospace Engineering who is judged most outstanding. Selection is based mainly on
recommendations of faculty members, student comments, and other relevant information. Presented in May at the Sibley Commencement ceremony.

The Chester Buchanan Memorial Award
A prize of $1,000 awarded each spring to "that outstanding senior majoring in Science of Earth Systems that is recommended by the faculty of the Department of Earth and Atmospheric Sciences."

The Lynn Bussey Prize
Awarded at commencement to an outstanding student in ORE who is continuing in the Master of Engineering Program.

The Dorothy and Fred Chau Award
An award of $1,200 is provided—in general annually—to a senior in engineering physics in high academic standing who has performed outstanding, publishable research in engineering physics or related Majors. The award includes travel support of up to $500 to present the work at a relevant scientific conference and an award of $500 to the faculty member or senior researcher guiding the student’s research. The student is expected to present his/her work to the students and faculty of the School of Applied and Engineering Physics.

The David Delano Clark Award
A $1,000 cash prize awarded annually for the best Master of Engineering project.

The Clark Construction Group, LLC Prize
An award of $3,000 given to a junior in Civil and Environmental Engineering with an interest in construction management for academic merit, leadership, and extracurricular activities.

The Computer Science Prize for Academic Excellence
An award of $500 and a commemorative plaque in recognition of a senior in the Major of computer science who has performed exceptionally well academically and who has shown strong commitment to the ideals of the educational mission at Cornell. Special consideration is given to students who have displayed an interest in research and who plan eventually to pursue doctoral-level studies. This award represents the highest honor given to an undergraduate by the Department of Computer Science.

The Bart Conta Prize in Energy and the Environment
The Bart Conta Prize is awarded annually to one or more undergraduate or master of engineering students in the Sibley School of Mechanical and Aerospace Engineering. The award is made to the student or students who have done the best work on a research or design project dealing with energy and the environment. The recipient(s) of the prize are selected by a faculty committee, based on a review of project summaries presented to the committee. The prize is presented at the Sibley School commencement ceremonies in May.

The Margaret Arronet Corbin ’21 Prize
An award of approximately $4,000 presented to a graduate in Civil and Environmental Engineering who has combined academic excellence with meritorious activities and service in the Cornell community and who demonstrates a commitment to continue his/her education in Civil and Environmental Engineering.

The Charles Lee Crandall Prizes
Annual prizes of $1,000 and $500 for the best papers written by students in the School of Civil and Environmental Engineering. Papers are judged in three categories: civil infrastructure, environment, and systems engineering and information technology.

The T. R. Cuykendall Awards
A prize of $300 awarded each spring to the outstanding member of the senior class in engineering physics, and a prize of $300 awarded to the outstanding teaching assistant of undergraduate engineering physics courses.

The LTC John B. Davenport Award
An annual award to an engineering student who is a member of the Army ROTC. Established in 1980 by Mrs. Elizabeth Hennessey in honor of her late husband.
The John McMullen Dean’s Prizes
Entering first-year students are selected, on the basis of merit, as John McMullen Dean’s Scholars. Prizes are awarded within the context of the university’s financial-aid program and renewed if the recipient remains in good standing in the College of Engineering.

William S. Einwechter Award
Presented to an outstanding senior who has demonstrated a distinguished record of service to the School of Electrical and Computer Engineering (particularly its students), to the College of Engineering, and to the university while maintaining good academic performance.

The Nanotechnology Fellowship
Approximately $500 awarded to a junior or senior Materials Science and Engineering student involved in research.

The Frank O. Ellenwood Prize
Given to the student in the Sibley School of Mechanical and Aerospace Engineering who ranks highest in the third-year required courses related to power engineering. Presented in May at the Sibley Commencement ceremony.

The William Nichols Findley Award
A $500 cash prize awarded annually for an outstanding research paper by a graduate student in Applied Physics.

The Fuertes Medal
A gold medal awarded to the graduating senior in Civil and Environmental Engineering who has maintained the highest degree of scholarship in his/her study during four consecutive years.

The Samuel Garmezy ’13 Prize
An annual prize for winning a competition using the Samuel Garmezy testing machine in the School of Civil and Environmental Engineering. Established by Robert H. Garmezy ’44 in honor of his late father.

The Professor James L. Gregg Prize
Approximately $1,000 awarded each year to the outstanding student entering their junior year in Materials Science and Engineering.

The Paul Hartman Prize
Given each spring to the physics or engineering physics senior that has done the most outstanding work in experimental physics during their Cornell career.

The R. N. Janeway Automotive Engineering Award
Given to juniors and seniors and graduate students in the Sibley School of Mechanical and Aerospace Engineering and Electrical and Computer Engineering for the paper or papers that present the most promising improvement in automotive vehicles. Presented in May at the Sibley Commencement ceremony.

The Joseph O. Jeffries Prize
Awarded to a senior in Materials Science and Engineering for the most outstanding materials design project.

Alan S. Marx Memorial Prize for Excellence in Support of Undergraduate Education
Given to a graduating senior who has demonstrated excellence in, and exceptional commitment to, the support of undergraduate teaching activities in the Department of Computer Science. The winner receives a check for $500 and is recognized with a commemorative plaque presented by the faculty on commencement day. The recipient is selected from the ranks of students who have served as course consultants, graders, or undergraduate teaching assistants.

The Jonathan E. Marx Cornell Tradition Fellowships
Two fellowships of $2,500 each are awarded annually to computer science students who hold jobs on campus to help pay for their education and who also have demonstrated a commitment to scholarship and leadership activities.

The Jonathan E. Marx Memorial Senior Prizes
Two $500 awards given to the two seniors in computer science who have a record of friendly and helpful attitudes, show leadership qualities, and have been involved in extracurricular activities.
The McManus Design Award
An annual prize is awarded to the Sibley School of Mechanical and Aerospace Engineering student or students, undergraduate or graduate, who present the most outstanding solution to a design problem or project. Presented in May at the Sibley Commencement ceremony.

Merck Engineering and Technology Fellowship
Tuition support of $5,000 for two years and two summer internships at Merck to a chemical engineering sophomore. Chosen by Merck on the basis of scholarship and character from nominees submitted by the chemical engineering faculty.

The Merrill Presidential Scholars Award
Graduating seniors honored as Merrill Presidential Scholars serve as degree marshals and banner bearers at graduation convocation, and are also recognized at the Merrill Presidential Scholars luncheon, to which they may invite a teacher from their high school and an instructor from Cornell University who influenced their academic careers. This award is based on grade-point average and other indicators of excellence, including demonstrated leadership ability, community involvement, and potential for continued contributions to society.

The Michael W. Mitchell Memorial Award
A prize of $1,000 awarded each year to a senior in Science of Earth Systems who has proven adept at liberal arts as well as earth sciences—a “student of the world.”

The Mogensen Prize
Awarded at commencement to an outstanding student in ORE who is continuing in the Master of Engineering Program.

The Moles Student Award
A $1,000 prize and award certificate is given to a graduating Civil and Environmental Engineering senior who is selected in recognition of high academic achievement, enthusiasm, and effort, and who shows outstanding promise for a career in construction engineering and management.

The Moles Scholarship
A $4,000 scholarship is given annually to a deserving and academically qualified senior studying Civil Engineering with high academic standings and expressed interest to pursue his/her career in the construction industry.

John E. Perry Undergraduate Prize
An award of $500 given to one or more graduating seniors in Civil and Environmental Engineering who demonstrate “enthusiastic participation in student life and commitment to the profession of engineering” as well as scholarship.

John E. Perry Teaching Assistant Prize
An award of $500 given to one or more teaching assistants in the School of Civil and Environmental Engineering who exhibit “concern and care for the students in their class and fulfill the teaching functions enthusiastically and skillfully.”

The John G. Pertsch Jr. Prize
Given to the student in electrical and computer engineering who has the highest academic rank upon completion of the junior-year course work.

The Procter and Gamble Technical Excellence Award
An annual prize of $1,000 awarded to the senior in chemical engineering who gives the best talk on a technical problem solved by the student.

The Frank H. T. Rhodes Award
This prize, established in 2005 by the Andrew Allen Foundation in honor of Frank H. T. Rhodes, is presented each year to the senior in the Department of Earth and Atmospheric Sciences who has excelled academically.

The Ferdinand Rodriguez Outstanding Student Award in Polymers and Electronic Materials
An award of $3,500 to an undergraduate or M.Eng. student in Chemical Engineering for outstanding research in polymers or electronic materials. Sponsored by Rohm & Haas.
The Byron W. Saunders Prize
A cash award for the senior(s) graduating from the School of Operations Research and Information Engineering with the best academic record.

The George F. Scheele Outstanding Junior Award
An award of $3,500 given to a junior in chemical engineering who excels in scholarship, campus activities, and leadership. Sponsored by Genentech.

The Sibley Prizes
Two prizes awarded annually to seniors in the Sibley School of Mechanical and Aerospace Engineering who have the highest scholastic averages. Presented in May at the Sibley Commencement ceremony.

The Douglas Whitney ’61 Award
An annual award for excellent writing in an engineering communications course, typically given to one or two students and carrying a cash award of $1,000 or $500, respectively.

The Frank W. and Emily Wood Fund
This fund provides scholarship assistance to students who are planning to pursue studies at Imperial College of Science, Technology, and Medicine in London, U.K. Information is available from Cornell Abroad, 474 Uris Hall.

The Ve-Sing and Tseng Soo Koo Award
This prize, established in 1990 by Professor Benjamin Koo, Ph.D. ’46, consists of approximately $4,000 and an award certificate, which is awarded to an outstanding senior in structural engineering in Civil and Environmental Engineering who is planning to pursue graduate studies at Cornell.
Student Organizations

Student organizations at the College of Engineering help connect classroom and career, develop professionalism, increase technical proficiency, and refine ethical judgment. Some are involved in community service; many sponsor teams that compete in intramural soccer, football, hockey, and softball games; and a few manage coffee shops on weekday mornings in the departmental lounges. A complete listing of student organizations is available at the Engineering Student Council web site, esc-cornell.org/index.asp.

Alpha Epsilon

c/o Professor Jim Bartsch
314 Riley-Robb Hall

Alpha Epsilon, the national honor society in agricultural, food, and biological engineering, is dedicated to providing service to the community at large and to promoting the welfare of the Major of agricultural, food, and biological engineering. The chapter organizes peer advising, class tutoring, fund-raisers, and social events. The Cornell chapter, founded in March 1998, recently won the Alpha Epsilon Outstanding Chapter award for its accomplishments.

Alpha Sigma Mu

c/o Professor Shefford Baker
129 Bard Hall

Alpha Sigma Mu is an honorary society for students in materials engineering. It recognizes outstanding students who attain a high rank in scholarship and possess, to an unusual degree, the qualities of integrity, leadership, and initiative.

American Association of Petroleum Geologists (AAPG)

c/o Professor Teresa Jordan
4108 Snee Hall

The American Association of Petroleum Geologists aims to familiarize students with major and professional opportunities in petroleum exploration and development. The organization strives to foster professional ethics, including honesty, integrity, loyalty, fairness, impartiality, candor, fidelity to trust, and inviolability of confidence among its members. Membership is open to undergraduate and graduate students interested in the petroleum industry.

American Indian Science and Engineering Society (AISES)

c/o Diversity Programs in Engineering Office
146 Olin Hall

The goal of AISES is to provide opportunities for American Indians and Alaskan Natives to pursue studies in science, engineering, business, and other academic areas. Members practice leadership skills, bring cultural programs to campus, and
search for ways to improve the social and academic environment for Native Americans on campus.

American Institute of Aeronautics and Astronautics (AIAA)

108 Upson Hall

The student chapter of the American Institute of Aeronautics and Astronautics (AIAA) is open to everyone who is interested in atmospheric and space flight. The group arranges movies and field trips, as well as an annual student conference. Members receive Aerospace America, the official publication of the AIAA.

American Institute of Chemical Engineers (AIChE)

120 Olin Hall, aiche@cornell.edu
www.cheme.cornell.edu/cheme/undergraduate/info/activities.cfm

The Cornell student chapter of the AIChE is composed of chemical engineering students at the undergraduate and graduate levels. The goals of the chapter are to promote the professional development of its members by its programs, its relations with other student chapters and its relations with the parent body, National AIChE; and to contribute to the development of chemical engineering at Cornell through activities involving faculty and students. Programs and activities include: professional workshops, group trips to the AIChE national and regional conferences, sponsorship of corporate visitors and company information sessions, engineering education and community outreach events, AIChE ChemE Car competition, professor–student lunches, bowling, poker tournaments, intramural sports games, movie nights, bi-weekly social gatherings, the annual welcome back barbecue, holiday party, and the senior award dinner.

American Society of Civil Engineers (ASCE)

c/o Professor Jery Stedinger
213 Hollister Hall

Cornell has one of the most active student chapters of the ASCE in the United States. Projects include the design and construction of community service projects, organization of preparatory courses for the Fundamentals of Engineering exam, and sponsorship of intramural teams. ASCE organizes social events, the annual CEE awards dinner, company information sessions, and monthly meetings featuring professional speakers. The chapter participates in regional and national ASCE conferences and competes in concrete canoe races and steel bridge competitions.

American Society of Mechanical Engineers (ASME)

108 Upson Hall
www.rso.cornell.edu/ASME/

The Cornell chapter of ASME is one of the strongest in its region. It has more than 150 active members and runs various activities for students and the local community. The group participates in a variety of intramural sports, hosts social events, cooks
fantastic barbecues, holds monthly meetings and always welcomes new ideas for events. Membership is open to all undergraduates; affiliation with mechanical engineering is not required. First-year students may join national ASME for free.

**Association of Computer Science Undergraduates (ACSU)**

c/o Nicole Roy, 303 Upson Hall  
acsu.cornell.edu

The purpose of the ACSU is to increase interaction between undergraduate computer science Majors, and the computer science faculty and to foster a friendly environment in CS. Membership is open to all Cornell undergraduates. The organization produces an exclusive résumé book for seniors seeking permanent employment as well as underclassmen who seek summer employment. Members are encouraged to join the ACM, which is the national professional organization for computer scientists and software developers.

**Biological and Environmental Engineering Society**

c/o Larry Geohring  
212 Riley-Robb Hall

The Cornell student branch of the American Society of Agricultural and Biological Engineers (ASABE) is a group of undergraduate and graduate students in Biological and Environmental Engineering. As student members of ASABE (a large and international professional engineering society), members have access to scholarships, conferences, and opportunities for networking. The student group can organize and arrange invited speakers, field trips, participate in Engineering Day at the mall, get involved in community projects, and carry out other educational and social activities.

**Biomedical Engineering Society**

c/o Professor Michael Shuler  
270 Olin Hall

The Cornell Chapter of the Biomedical Engineering Society (BMES) is affiliated with the national professional society. Our mission is to foster interest, knowledge, and education in biomedical engineering. The chapter welcomes undergraduate and graduate students from all engineering disciplines as well as those from the biological systems area. The group conducts tours, hosts guest lectures and social events, and organizes trips to the annual meeting of BMES, which has student activities, research presentations, and career development sessions. Opportunities to serve as chapter officers are open to all students.

**Chi Epsilon**

c/o Professor James M. Gossett  
215 Hollister Hall

Chi Epsilon, the national honor society in Civil Engineering, is dedicated to maintaining and promoting the status of civil engineering. It fosters the
development of technical ability and character among Civil Engineers. The chapter also seeks to promote and recognize excellence in teaching among the Civil Engineering faculty by conducting an annual CEE Instructor of the Year award. A biennial national conclave offers members the opportunity to meet students from other schools and exchange ideas. The chapter actively supports the CEE school administration in other endeavors to improve the quality of Civil Engineering education at Cornell University.

Cornell Chapter of the American Meteorological Society (CCAMS)
c/o Mark W. Wysocki
1114 Bradfield Hall

The CCAMS is open to all students interested in meteorology. The primary goals are to promote understanding of all aspects of meteorology, increase interaction between faculty members and students, and keep students current with the job market. The club organizes professional events such as forecasting workshops, technical seminars, job seminars, and group trips to the annual Northeast Storm Conference and social events such as bowling and pizza parties. The club also sponsors and maintains the “Weather Phone,” a daily forecast prepared by students for the Cornell community and residents of Tompkins County. Club members participate in local science fairs and attend the annual AMS National Convention.

College Curriculum Governing Board (CCGB)
The CCGB establishes the Common Curriculum, the course of study requirements for students in the College of Engineering. It consists of faculty representatives from the departments, staff members, and several students. Student representatives are selected to serve on various committees of the CCGB through the Engineering Student Council (ESC).

Cornell AEP Society (CAEPS)
c/o Professor Chris Xu
212 Clark Hall

The CEPS was founded in 1990 by students in the School of Applied and Engineering Physics. Activities include seminars in applied science by various faculty members, lectures by visiting Cornell A&EP alumni and A&EP recruiters, career information sessions, outreach programs, and a variety of social events. Undergraduate and graduate students are welcome as members of CAEPS.

Cornell Materials Society (CMS)
c/o Professor Michael Thompson
328 Bard Hall

The CMS represents the university’s undergraduate chapter of the Materials Research Society (MRS), The Materials Information Society (ASM), and The Minerals, Metals, and Materials Society (TMS). This student-run organization is devoted to the
advancement of materials science by hosting events, information sessions, industrial involvement, outreach programs, and other social activities. All students are welcome especially MS&E Majors and others with an interest in the fields of nanotechnology, biomedical engineering, semiconductors, and other materials.

**Cornell SciTech Magazine**
217 Carpenter Hall

The *Cornell Science and Technology Magazine* (a.k.a. SciTech) is an undergraduate publication devoted to the coverage of science and technology, distributed free to the Cornell community. The magazine is intended to be an informative, exciting, and timely forum for the latest developments, news, ideas, and controversies in science and engineering. Students are responsible for every aspect of publication, from writing to layout to business, and can gain valuable journalism, graphic design, financial, and communications experience. No previous experience is necessary to join the staff.

**Digital Gaming Alliance (DGA)**
c/o David Schwartz
5137 Upson Hall

The DGA is a coalition of student organizations at Cornell interested in promoting a community of gamers and game developers. DGA has its own elected officers and a full calendar of events.

**Encourage Young Engineering Students (EYES)**
Public Service Center
200 Barnes Hall

EYES, a national community-service organization, is committed to increasing the mathematics and science skills of evolving elementary, middle, and high school students. EYES encourages local youth to succeed and achieve while raising educational standards and accomplishes its mission by tapping the wealth of talented undergraduate engineering students to deliver exciting activities to instill an interest in engineering disciplines.

**Engineering Ambassadors Association**
102 Hollister Hall
www.ea.cornell.edu

The Engineering Ambassadors Association is a group of student volunteers who introduce prospective first-year students to the College of Engineering. They work closely with the Admissions Office staff. The ambassadors participate in group information sessions, lead tours of the engineering quad, and take visitors to lunch. They also participate in phonathons. More information can be found in Engineering Admissions, 102 Hollister Hall or at www.ea.cornell.edu.
Engineering Representative to the Student Assembly

Engineering Student Assembly
Office of the Assemblies
165 Day Hall

Each spring two representatives to the Student Assembly are elected from the College of Engineering. The Student Assembly meets every week on Thursdays, 4:45 to 6:30 p.m., to discuss and make decisions about issues concerning student life at Cornell, including housing and dining. Other functions pertain to setting the Student Activities Fee, disbursement of funds to student organizations, influencing general university policy, and communication with college and university administrators. All students are welcome to attend Student Assembly meetings and participate in the discussions. Agendas are available before meetings from the Office of the Assemblies, 165 Day Hall, or at assembly.cornell.edu/SA/home.

Engineering Student Council (ESC)

162 Olin Hall
esc-cornell.org/index.asp

The goals of the college-wide ESC are to represent the interests of students in the college and university, promote and coordinate engineering student services and events, and provide leadership training for students and organizations. ESC activities include National Engineers Week, the Engineering Spring Career Fair, and serving as the student voice to administration. General membership is open to all undergraduate and graduate students.

Engineers for a Sustainable World (ESW)

c/o Professor Park Doing
396 Rhodes Hall
www.rso.cornell.edu/esw

ESW is a national nonprofit organization with a network of engineering students and professionals working to reduce poverty and improve global sustainability. Cornell is home to the country’s first chapter of ESW. Members learn about and promote awareness of the technological needs of developing communities. Their activities include inviting guest speakers to discuss issues related to technology, development, and community service; coordinating and participating in volunteer service activities related to engineering; and interacting with other ESW chapters nationwide. They also assist in CEE 492: Engineers for a Sustainable World: Engineering in International Development.

Eta Kappa Nu (HKN)

c/o Clifford Pollock
224 Phillips Hall

HKN, the electrical and computer engineering honor society, promotes interaction between members and service to Cornell and the community at large. The Cornell
chapter operates a tutoring program to assist others studying electrical engineering. It sponsors lectures by ECE professors on state-of-the-art research at Cornell. Election to HKN is a lifelong mark of distinction.

### Information Science Student Association (ISSA)

c/o Christine Stenglein  
303 Upson Hall

The goals of the ISSA are: To connect Information Science (IS) and Information Science, Systems, and Technology (ISST) students with one another and with faculty through special events and activities; to serve as a bridge between current students and alumni; to provide students with information regarding career opportunities, internships, graduate schools, professional associations, and research opportunities in the field of information science and technology through web-based and print resources and information sessions; and to inform others, both inside and outside of Cornell, of the IS and ISST Majors.

### Institute of Biological Engineering (IBE)

c/o Professors Dan Luo and Norm Scott  
226 and 216 Riley-Robb Hall

IBE has been established to encourage inquiry, application, and interest in biological engineering in the broadest and most liberal manner and to promote the professional development of its members. Through its exclusive sponsorship of the Annual Bioengineering EXPO, IBE has established itself as the foremost organization for the promotion of biological engineering at Cornell. IBE is open to all members of the Cornell community with a genuine interest in biological engineering.

### Institute of Electrical and Electronics Engineers (IEEE)

c/o John Belina  
201 Phillips Hall

IEEE is one of the largest and most active professional organizations in the United States. Cornell's student branch runs many programs to serve the electrical engineer. The group sponsors many activities to promote student-to-student and student-to-faculty interaction and sponsors company information sessions to provide an opportunity for students to meet corporate interviewers. IEEE runs a lecture series for students and organizes presentations on course selection.

### Institute for Operations Research and the Management Sciences (INFORMS)

c/o Cindy Jay  
203 Rhodes Hall

The Cornell chapter of INFORMS sponsors a broad program of activities, including group trips to manufacturing and consulting firms, programs in which professional
people from industry discuss career opportunities, and social activities, including monthly informal faculty/student lunches.

**Mu Sigma Tau**
c/o Christa Downey
201 Carpenter Hall
Mu Sigma Tau is a co-op honor society reactivated in 1991 by Engineering Cooperative Education students. The group’s main duties are to promote the co-op program to prospective students, improve the quality of the co-op experience, provide a forum for sharing co-op experiences, keep alumni involved in co-op activities, and serve as a social network for all participants.

**National Society of Black Engineers (NSBE)**
c/o Diversity Programs in Engineering Office
146 Olin Hall
The Cornell University chapter of NSBE was formed in 1977. Major objectives include stimulation and development of student interest in the engineering disciplines; achievement of significant increases in the enrollment and retention of black students in engineering; and development of programs to strengthen the relationship between students and industry. Membership in NSBE–CU is open to all Cornell students who have or are working toward a degree in engineering or the sciences.

**Omega Rho International Honor Society**
c/o ORE
203 Rhodes Hall
The local chapter of the Omega Rho International Operations Research Honor Society was founded in 1995. It recognizes outstanding students who attain a high rank in scholarship in the School of Operations Research and Information Engineering. Students must be nominated by a faculty member and be in the top fourth of their class.

**Peer Advisor Program**
c/o Engineering Advising
167 Olin Hall
The Peer Advisor Program is an organization of engineering second-, third-, and fourth-year students whose goals are to help first-year engineering students adjust to life at Cornell and in the College of Engineering, understand the course selection and registration processes, and meet other engineering students in an informal social setting. Two peer advisors who are assigned to each section of ENGRG 150: Engineering Seminar serve as mentors for the approximately 18 students in the class.
Pi Tau Sigma
108 Upson Hall
The Cornell chapter of Pi Tau Sigma, the honorary society in mechanical engineering, provides a tutoring service for engineering students, organizes student/faculty luncheons and workshops, and generally seeks to enhance the academic and social aspects of the undergraduate ME program. To become candidates for membership, ME students must be in the top quarter of their junior class or the top third of their senior class.

Society of Automotive Engineers (SAE)
c/o Professor Albert George
208 Upson Hall
Activities sponsored by SAE include orientation for those with little or no knowledge of automobiles, design, and construction of a Formula SAE racing car, and lectures on the state of the art in automotive engineering.

Society of Hispanic Professional Engineers (SHPE)
c/o Diversity Programs in Engineering Office
146 Olin Hall
The goals of the Cornell chapter of SHPE are to advance Hispanic representation at Cornell and to assist Hispanic students in fulfilling their academic obligations and planning professional careers. Workshops and seminars by faculty and corporate representatives are geared toward self-improvement in academia and the transition to the corporate world. Social activities such as picnics and barbecues, intramural athletics, and study breaks foster a fraternal spirit among engineers from diverse Latino backgrounds.

Society of Women Engineers (SWE)
c/o Diversity Programs in Engineering Office
146 Olin Hall
SWE is a national professional and educational service organization of women and men whose goals are to improve the status, training, and support of women engineers. Membership in Cornell SWE is open to undergraduate and graduate students in engineering physics, chemistry, and computer science. Activities fall into three categories: academic support, professional and career development, and pre-college education.

Tau Beta Pi
c/o Professor John Belina
201 Phillips Hall
The Tau Beta Pi Association was founded in 1885 to honor outstanding students and alumni in all Majors of engineering. To be eligible for membership, students must be
in the top eighth of their junior class or the top fifth of the senior class and display exemplary character. Cornell's chapter of Tau Beta Pi sponsors a variety of programs including balloting for the college's Excellence-in-Teaching Award each spring. There are social events for members and lectures on topics of interest to the Cornell community as well as projects of service to the Ithaca community.

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Notes

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