# How to Find Out More

## School of Engineering Directors of Undergraduate Study

<table>
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<tr>
<th>Program</th>
<th>Representative</th>
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## Other School of Engineering Contacts

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<thead>
<tr>
<th>Program</th>
<th>Representative</th>
<th>Office</th>
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<tbody>
<tr>
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</tr>
<tr>
<td>Biomedical Computation</td>
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<tr>
<td>Computer Systems Engineering</td>
<td>Russ Shackelford</td>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
</tbody>
</table>
STANFORD UNIVERSITY
SCHOOL OF ENGINEERING

HANDBOOK FOR
UNDERGRADUATE ENGINEERING
PROGRAMS

2003-2004

UGHB.STANFORD.EDU
# Table of Contents

## Introduction for New Students
- Getting Started at Stanford 1
- Planning Your First Year 2
- Choosing a Major 5
- General Advice 6

## An Overview of Engineering Majors
- Departmental Majors 7
- Preapproved School of Engineering Majors 8
- Individually Designed Majors 9
- Accreditation 11
- Undergraduate Program Sheets 12

## Approved Courses
- The Mathematics Requirement 16
- The Science Requirement 17
- The Technology in Society Requirement 17
- The Engineering Fundamentals Requirement 18
- The Experimentation Requirement 19

## Policies and Procedures
- Petitions and Substitutions 21
- Transfer Credit 22
- Advanced Placement Credits 24
- Declaring an Engineering Major 24
- Graduation Procedures 25

## Other Degree Programs
- Alternative Bachelor's Degrees 33
- Coterminal Degree Programs 33
- Minors 34
- Honors Programs 45

## Special Programs and Organizations
- Engineering Diversity Programs (EDP) 49
- Technical Communications Program 51
- Stanford Technology Ventures Program 52
- Stanford Center for Professional Development 53
- Engineers and Overseas Studies Programs 54
- Student Engineering Societies 61
- Research Programs for Undergraduates 64
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUMMER EMPLOYMENT AND CAREER PLANNING</td>
<td>65</td>
</tr>
<tr>
<td>CAREER DEVELOPMENT CENTER</td>
<td>65</td>
</tr>
<tr>
<td>OVERSEAS RESOURCE CENTER</td>
<td>66</td>
</tr>
<tr>
<td>FUNDAMENTALS OF ENGINEERING EXAM</td>
<td>68</td>
</tr>
<tr>
<td>AERONAUTICS AND ASTRONAUTICS</td>
<td>71</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>71</td>
</tr>
<tr>
<td>FLOW CHART</td>
<td>74</td>
</tr>
<tr>
<td>INSTRUCTIONS FOR DECLARING A MAJOR IN AERONAUTICS &amp; ASTRONAUTICS</td>
<td>75</td>
</tr>
<tr>
<td>PROGRAM SHEET</td>
<td>77</td>
</tr>
<tr>
<td>BIOMEDICAL COMPUTATION</td>
<td>79</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>79</td>
</tr>
<tr>
<td>SAMPLE FOUR-YEAR PLANS</td>
<td>80</td>
</tr>
<tr>
<td>PROGRAM SHEETS</td>
<td>85</td>
</tr>
<tr>
<td>CHEMICAL ENGINEERING</td>
<td>93</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>93</td>
</tr>
<tr>
<td>FLOW CHART</td>
<td>97</td>
</tr>
<tr>
<td>SAMPLE FOUR-YEAR PLANS</td>
<td>101</td>
</tr>
<tr>
<td>PROGRAM SHEET</td>
<td>105</td>
</tr>
<tr>
<td>CIVIL ENGINEERING</td>
<td>107</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>107</td>
</tr>
<tr>
<td>FLOW CHART</td>
<td>117</td>
</tr>
<tr>
<td>SAMPLE FOUR-YEAR PLANS</td>
<td>118</td>
</tr>
<tr>
<td>PROGRAM SHEET</td>
<td>123</td>
</tr>
<tr>
<td>COMPUTER SCIENCE</td>
<td>125</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>125</td>
</tr>
<tr>
<td>FLOW CHART</td>
<td>128</td>
</tr>
<tr>
<td>SAMPLE FOUR-YEAR PLANS</td>
<td>129</td>
</tr>
<tr>
<td>PROGRAM SHEET</td>
<td>133</td>
</tr>
<tr>
<td>COMPUTER SYSTEMS ENGINEERING</td>
<td>135</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>135</td>
</tr>
<tr>
<td>PROGRAM SHEET</td>
<td>137</td>
</tr>
<tr>
<td>ELECTRICAL ENGINEERING</td>
<td>139</td>
</tr>
<tr>
<td>CURRICULUM</td>
<td>139</td>
</tr>
<tr>
<td>FLOW CHART</td>
<td>145</td>
</tr>
<tr>
<td>SAMPLE FOUR-YEAR PLANS</td>
<td>146</td>
</tr>
<tr>
<td>PROGRAM SHEETS</td>
<td>153</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL ENGINEERING 165
CURRICULUM 165
FLOW CHART 174
SAMPLE FOUR-YEAR PLANS 175
PROGRAM SHEET 177

MANAGEMENT SCIENCE AND ENGINEERING 179
CURRICULUM 179
FLOW CHARTS 188
SAMPLE FOUR-YEAR PLAN 193
PROGRAM SHEET 195

MATERIALS SCIENCE AND ENGINEERING 197
CURRICULUM 197
FLOW CHART 201
PROGRAM SHEET 203

MECHANICAL ENGINEERING 205
CURRICULUM 205
FLOW CHART 208
SAMPLE FOUR-YEAR PLANS 209
PROGRAM SHEET 213
INSTRUCTIONS FOR DECLARING MECHANICAL ENGINEERING (BSME) OR PRODUCT DESIGN (BSPD) 215

PRODUCT DESIGN 217
CURRICULUM 217
FLOW CHART 219
INSTRUCTIONS FOR DECLARING MECHANICAL ENGINEERING (BSME) OR PRODUCT DESIGN (BSPD) 220
PROGRAM SHEET 221

INFORMATION FOR ADVISERS 223
SCHOOL OF ENGINEERING ADVISEE MEAL PROGRAM 225
SCHOOL OF ENGINEERING ADVISEE MEAL PROGRAM REIMBURSEMENT FORM 227
This handbook is the definitive source for undergraduate engineering requirements at Stanford. Students may graduate using the requirements listed in any one Handbook that is published while they are undergraduates. Since requirements often change from year to year, it is important for you to keep a copy of the Handbook that you intend to follow. Old editions of the Handbook are available in the engineering Library, as well as in the Office of Student Affairs, in Terman 201. The Handbook is also maintained on the web at http://ugbh.stanford.edu.

In additional to curricular requirements, this Handbook contains information about procedures for declaring an engineering major, transferring engineering coursework from another school, petitioning for waivers and substitutions for requirements, and for navigating the administrative processes to graduate. It also describes important opportunities and programs for engineering students, such as opportunities for overseas studies, summer research fellowships, diversity programs, and career placement services. We hope that you will find the Handbook informative and useful, and we are interested in any suggestions you may have for improvements. If you have any questions about engineering degree requirements or about any of the information in the Handbook, please don’t hesitate to contact your adviser or come see us in the School of Engineering’s Office Student Affairs, Terman 201. You are always welcome in the Office of Student Affairs.

Professor Brad Osgood
Senior Associate Dean, School of Engineering
Welcome to Stanford!

Just as it is for new students at any university, your first weeks here will seem overwhelming. During orientation and for the first few weeks of the quarter, you will be inundated with an endless stream of academic information along with many bits and pieces of Stanford culture. In that flood of new experiences, it is unlikely that you will be able to keep everything in your head.

At this point in your college experience, it is more important for you to have a good general conception of how to approach Stanford than it is to master the details of each possible major or the various rules you will need to follow as you move toward your undergraduate degree. The subsequent chapters in this Handbook provide a detailed explanation of administrative policies and procedures along with a comprehensive outline of the undergraduate majors in the School of Engineering. The purpose of this chapter is to provide the essential high-level overview that you need to get your academic career off on the right track.

**Getting Started at Stanford**

One of the great advantages of Stanford as an undergraduate institution is the tremendous breadth of excellence that the university offers. Some universities are strong in particular disciplines, but less so in others. Because of the faculty and students we have been able to attract over the years, Stanford is in the wonderful position of being strong across the board. Judging from the surveys conducted by the National Academies and other organizations that seek to assess the strength of academic programs, Stanford’s School of Engineering is unquestionably first-rate. Here at Stanford you will find state-of-the-art research projects in almost every discipline—projects that often include opportunities for undergraduates. This level of excellence exists throughout the university, in the sciences, humanities, and social sciences, as well as in engineering.

The upshot of all this is that Stanford offers a remarkably rich intellectual environment. As an undergraduate, you should take the time to sample as much of that wealth of academic excellence as you can. Committing yourself prematurely to one discipline or coming in with firmly fixed ideas of exactly where you’re going—comforting as that certainty may be—can
make it harder for you to discover what Stanford has to offer and to take advantage of all its
diversity.

Fortunately, Stanford does not require you to make all such decisions up front. At many
universities, students are asked to declare their intended major as part of the application process,
particularly if they are interested in engineering. Not so at Stanford. Here, the university does not
require you to declare a major until the beginning of your junior year. As a result, you have quite
a bit of time to explore different possibilities in your first few years.

At the same time, the flexibility that Stanford offers does not mean that you—as a prospective
student of engineering—can afford to spend your entire first two years taking whatever courses
strike your fancy. Engineering majors typically require more courses and units than those in
other parts of the university. Those courses, moreover, tend to be cumulative, in the sense that
more advanced courses draw heavily on the material presented in the lower-level courses that
precede them. In engineering, you need to strike a balance between taking advantage of the
freedom to explore and making sure that you are getting a reasonable start on an engineering
curriculum. The best strategy is to avoid the extremes. A first-year schedule that includes no
mathematics, science, or engineering will make it very difficult to complete an engineering
major in four years. Conversely, it is surely a recipe for disaster to insist on packing your first
year with three quarters each of calculus, physics, and chemistry along with the mandatory
Introduction to the Humanities and Program in Writing and Rhetoric. There is too much work in
each of those courses to take them all at the same time, particularly before you’ve had a chance
to acclimate to Stanford’s intensity and rapid pace.

PLANNING YOUR FIRST YEAR

In order to find an appropriate balance for your first year of study, it is important for you to begin
thinking about what you want to do. If you are interested in a particular engineering major, it
probably makes sense to take at least one course—possibly a Freshman Seminar, if one
exists—so that you can get a sense of what doing college-level work in that field is all about. If
you’re pretty sure that you want to major in some engineering field, but don’t have a real sense
as to what the different options are, you should try to take one of the courses—such as ENGR 1N
and ENGR 2 described later in this section—designed to introduce you to the various
subdisciplines of engineering. And in any case, you should probably take at least some of the
foundational courses you will need in any engineering discipline, such as mathematics and
physics.
MATHEMATICS COURSES

As a general rule, students interested in an engineering major should take some calculus sequence in their first year. Choosing which calculus sequence to take, however, requires careful thought and the assistance of your adviser. Stanford offers several different entry sequences into the calculus:

- **MATH 41 and 42** present single variable calculus. Differential calculus is covered in the first quarter and integral calculus in the second.
- **MATH 19, 20, and 21** cover the same material as MATH 41 and 42, but do so in three quarters instead of two.
- **MATH 51, 52, and 53** cover differential and integral calculus in several variables, linear algebra, and ordinary differential equations. These courses are taught in an integrated fashion, with differential calculus of several variables and linear algebra being taught in MATH 51, integral calculus with linear algebra in MATH 52, and differential equations, including matrix methods for solving systems, in MATH 53. These courses are designed for incoming freshmen with 10 units of AP credit. They are rigorous and challenging, so students who are unsure of their mathematics preparation should consult with an adviser in the mathematics department.
- **MATH 51H, 52H, and 53H** cover the same material as in 51, 52, and 53, but with more emphasis on theory and rigor. These courses are designed for students who have a strong interest in majoring in mathematics and are not for the faint-hearted.
- **ENGR 154, 155A, and 155B or 155C** cover material that is similar to that in the MATH 51-52-53 series, but do so in a different order and with a more explicit engineering focus. ENGR 154 (Introduction to Engineering Mathematics) is a new course approved for limited enrollment by the Undergraduate Council. Developed for undergraduates interested in Engineering, this course presents multivariable calculus with engineering applications. It also introduces Matlab, a computer program that integrates mathematical computing and visualization, providing a deeper, more visual understanding of the basic principles of multivariable calculus. ENGR 154 can replace MATH 51 in an engineering undergraduate’s course requirements. Students can continue on with the ENGR 155 sequence, which covers the rest of the introductory mathematics curriculum with an emphasis on the engineering applications. ENGR 155A and 155B or 155C require either MATH 51 or ENGR 154 as a prerequisite.

PHYSICS COURSES

The decision of whether to take a physics course in your first year is not nearly so simple as the decision about mathematics. Given the fact that you will also be taking required courses in writing and the humanities, taking both mathematics and physics in your first year pretty much
fills your schedule, leaving little room for seminars or other courses that spark your interest. And although all engineering majors require physics, it is often unnecessary to take physics so early in your undergraduate program. For a few departments that depend heavily on physics, such as Mechanical Engineering and Electrical Engineering, taking physics in your first year makes a great deal of sense, because physics is a prerequisite for many of the advanced courses. For most other majors, it probably makes sense to delay physics until your sophomore year, giving you more flexibility in your course schedule.

As with mathematics, there are several possible sequences that are appropriate for first-year students:

- **PHYSICS 51, 53, and 55** constitute the standard introductory sequence in physics and cover light and heat, mechanics, and electricity and magnetism, respectively. These courses are calculus-based and are generally far more intensive than typical high-school offerings, even at the advanced placement level. Even students who have taken AP physics—and therefore do not in fact need the credits for these courses—find them challenging. Because the Stanford courses cover so much more material and do so with greater depth and rigor, it often makes sense to give up the advanced placement credits and take these courses. Talk with your adviser for guidance in this area.

- **PHYSICS 61, 63, and 65** offer a more advanced sequence designed for prospective physics majors and those interested in a more rigorous introduction to the field.

- **PHYSICS 21, 23, and 25** provide a lower-level introduction to basic physics primarily intended for premedical students. If you are intending to major in a discipline that allows students to take these courses, such as Computer Science or many of the degree options in Management Science and Engineering, these courses may represent an attractive option. **Most departments in the School of Engineering, however, do not accept these courses and require students to take the 50 series or a more advanced offering.**

**Chemistry Courses**

For some engineering majors, such as Chemical Engineering and the Individually Designed Majors associated with the Department of Bioengineering, taking a chemistry course in your first year is far more important than taking physics, largely because Stanford requires students to take a year of introductory chemistry before enrolling in biology. In order to get any advanced biology courses into a four-year degree, it is critical to begin the chemistry sequence early.
There are two standard entry points for chemistry:

- **CHEM 31** provides a thorough foundation for the study of college-level chemistry and is designed for students with solid high-school backgrounds in chemistry and mathematics. While this course works well for many first-year students at Stanford, it moves quickly and presumes a level of preparation that not all students will have.

- **CHEM 30** serves as preparation for CHEM 31 and is designed for students whose backgrounds are not strong enough to allow immediate entry into the more advanced course. If you are in doubt about your level of preparation, talk with your adviser as well as the faculty teaching in the introductory chemistry courses. In general, it is better to do well in a less advanced course than to risk the possibility of finding yourself in over your head in a course for which you are not adequately prepared.

**CHOOSING A MAJOR**

Although you do not need to choose a major in your first year at Stanford, it is important for you to think about different possible majors and what your interests are likely to be. If you have a sense of what you'd like to study, try to fit at least one course from that program into your schedule. If you're unsure, you might try take one of the following courses:

- **ENGR 1N** is a 3-unit course Freshman Seminar on “The Nature of Engineering” offered in the Autumn Quarter. Its goal is to introduce students to engineering in its broadest sense—the processes, tools, activities, professions, and academic disciplines that help define what it means to be an engineer. The class includes a number of hands-on design exercises, field trips, problem sets, interviews, and written reports. High school calculus and physics are prerequisites. Because it is part of the Freshman Seminar program, however, ENGR 1N has a limited enrollment to ensure a small class size.

- **ENGR 2** provides students with an opportunity to learn what each of the departments in the School of Engineering offers in terms of undergraduate majors. This course is still under development and may be offered in the spring.

**GENERAL ADVICE**

The following notes represent general pieces of advice that come from the collective experience of the advisors within the School of Engineering:
• **Get to know your adviser and your advising associate.** Every entering student at Stanford is assigned an adviser, usually in a discipline in which the student has expressed an interest. Some advisers are faculty, others are members of the staff, and still others are recent graduates. Some know a great deal about your area of interest, while others may seem a bit less familiar with the details of particular departments and courses. What all those advisers have in common is a good general sense of Stanford and its resources. Even if your adviser doesn’t know the answer to one of your questions, it is almost certain that the adviser knows where to find that answer. Your job is to make sure that you establish a good relationship with your adviser so that you can draw on that wealth of knowledge and experience.

• **Take a course that provides real engineering experience.** Too many students spend their entire first year taking nothing beyond mathematics, physics, and the required writing and humanities courses. Such schedules make it hard to feel the excitement that comes from the quintessentially engineering activity of making something work. There are many courses—particularly in the Freshman Seminar program—that will give you an opportunity to engage in problem solving within an engineering domain.

• **Maintain flexibility.** Each year, some of you arrive at Stanford absolutely convinced about your major and career plans; far fewer of you, however, will be quite as certain at the end of your first year. Rather than commit early to a particular major or course of study, it makes sense to explore more broadly and to keep an open mind about the possibilities.

• **Get help when you need it.** As at most universities, many students who start out with an interest in engineering end up leaving the field after running into problems in their introductory courses. For some, this decision is presumably the right one. Almost all of you, however, have what it takes to succeed in engineering. The same talent and drive that got you into Stanford should enable you to pursue your passion for engineering and go out into the world with a solid foundation in your chosen discipline. Many of you, however, will need a little help along the way. Make sure your get that assistance when you need it, and not when it seems too late.

Have a wonderful year, and a successful time at Stanford.
2. AN OVERVIEW OF ENGINEERING MAJORS

Within the context of the broad, liberal-arts education that is the hallmark of all Stanford undergraduate programs, the School of Engineering strives to provide the scientific and technical education necessary for both a satisfying and productive engineering career and for a successful graduate-school experience. The curricula of the School emphasize fundamental knowledge, tools, and skills, while allowing many opportunities for engineering students to take advantage of the excellent courses and programs offered by the other schools of the University. About 10 percent of all engineering majors choose to double-major, many study overseas for a quarter or more, and most are involved in extracurricular activities. While engineering curricula are among the most demanding at the University and require careful academic planning to take full advantage of the many opportunities at Stanford, we aim to strike a balance between the technical sophistication and the social and cultural breadth demanded of engineers in modern society.

Engineering courses, however, represent only a part of a liberal-arts education. To ensure that every engineer receives a well-rounded undergraduate experience, all students must meet the general requirements of the University in addition to the disciplinary requirements for a degree in engineering. These requirements are detailed in other University publications such as the Stanford Bulletin and Approaching Stanford.

Undergraduate programs in engineering fall into three categories:

- **Departmental Majors**
- **Preapproved School of Engineering Majors**
- **Individually Designed Majors**

These categories are described in the sections that follow.

**DEPARTMENTAL MAJORS**

A Departmental Major leads to the Bachelor of Science degree in Chemical Engineering, Civil Engineering, Computer Science, Environmental Engineering, Electrical Engineering,
Management Science and Engineering, Materials Science and Engineering, or Mechanical Engineering. These majors share a common curricular structure:

- 36 units (minimum) to 45 units (maximum) of Mathematics and Science, combined. (Departments may place individual minimums for both Mathematics and Science.)
- 1 course in “Technology in Society”
- 3 courses in “Engineering Fundamentals,” at least one of which must be unspecified by the department
- “Engineering Depth” coursework within the particular engineering department such that the total units for Engineering Fundamentals and Engineering Depth coursework is at least 60 and no more than 72 units

The total number of quarter units required ranges from 100 to 119. The specific total will depend on a particular department’s Mathematics, Science and Depth requirements. For all departmental majors other than Computer Science, these units must include 8 units of “Experimentation” coursework.

Detailed program requirements for each of these Departmental Majors are provided in Appendix A at the end of this Handbook. Lists of courses that have been approved for each category of the requirements appear in later sections of this Handbook.

Preapproved School of Engineering Majors

The School of Engineering offers several interdisciplinary programs leading to the Bachelor of Science degree in Engineering. Although all such majors technically fall into the category of Individually Designed Majors (IDMs), there are several standard IDMs that have been proposed by faculty and which have been approved by the School of Engineering Undergraduate Council. At present, there are five such pre-approved majors:

- Aeronautics and Astronautics
- Biomechanical Engineering
- Biomedical Computation
- Computer Systems Engineering
- Product Design

Detailed program requirements for these pre-approved School of Engineering majors appear in Appendix A, along with the requirements for departmental majors.

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1 Although it has “Engineering” in its title, Petroleum Engineering is offered by the School of Earth Sciences rather than the School of Engineering. For details on Petroleum Engineering, please see the Stanford Bulletin.
INDIVIDUALLY DESIGNED MAJORS

Individually Designed Majors (IDMs) are intended for undergraduates interested in studying engineering in areas not covered by departmental majors or the pre-approved School of Engineering majors. Each IDM curriculum is designed by the student in consultation with at least two faculty advisers. Each student’s primary academic adviser must be a member of the Stanford Academic Council, which means that Lecturers and Visiting Professors cannot fill this role. Students must also have a secondary adviser; this faculty member can be a member of a Stanford School other than Engineering and need not necessarily be a member of the Stanford Academic Council. The purpose of requiring a second advisor is to ensure that the student receives sufficient guidance about aspects of the proposed course of study that may lie outside the field of expertise of the primary adviser. The IDM degree is designated as a “Bachelor of Science in Engineering: Approved Title.” This degree program is not accredited by ABET.

To pursue an IDM, a student must submit a written proposal to the IDM Subcommittee of the Undergraduate Council detailing her or his proposed course of study. IDM programs must meet the general minimum requirements established for School of Engineering majors:

- 21 units of mathematics
- 17 units of science
- One course on Technology in Society
- 40 units of School of Engineering courses, at least three of which must be Engineering Fundamentals courses
- Additional courses to bring the total to at least 90 but not more than 107 units

Each proposal must contain the following four elements:

1. **Rationale.** The proposal should begin with a carefully crafted statement that describes the major, characterizes the proposer’s motivation for pursuing it, justifies it intellectually, indicates the proposer’s ultimate goal and how the major relates to it, shows how the courses comprising its curriculum make sense given its purpose, and tells why this plan of study cannot be pursued in any existing School of Engineering major. A proposed title for the major, the accepted version of which will be shown on the student’s diploma and transcript, should be included. Sample proposals are available for review in the Office of Student Affairs, Terman 201.
2. **Individually Designed Major program sheet.** This form, available in this handbook (see following pages) and accessible as an Excel spreadsheet on the web at [http://ughb.stanford.edu](http://ughb.stanford.edu), should be completed in all respects, including indication of which course the student intends to take to fulfill the university’s Writing in the Major (WIM) requirement. The bottom of the second page of the IDM program sheet must be signed by two faculty members: the student’s primary adviser, who **must** be an Academic Council member of the School of Engineering faculty, and a secondary adviser. These signatures certify that the advisers endorse the major as described in the proposal and agree to serve as the student’s permanent advisers.

3. **Four-year plan sheet.** This form is also available in the following pages and on the web at [http://ughb.stanford.edu](http://ughb.stanford.edu). The courses listed as part of the plan should comprise a well-coordinated sequence that fosters mastery of the important principles and techniques in a well-defined field.

4. **Letter of support.** A letter of support from the student’s primary adviser appraising the academic value and viability of the proposed major and the student’s ability to successfully complete it must accompany the Proposal.

Students proposing to pursue an IDM must have at least four quarters of undergraduate work remaining at Stanford after the quarter in which their proposals are submitted. Any changes in a previously approved major must be endorsed by the faculty advisers and reapproved by the IDM Subcommittee of the Undergraduate Council. Proposals are reviewed and acted upon once per quarter by the IDM Subcommittee. Proposals should be submitted to Bertha Love in the Office of Student Affairs, Terman 201. Deadlines for proposal submission this year are:

- **Autumn Quarter:** October 24, 2003
- **Winter Quarter:** February 6, 2004
- **Spring Quarter:** April 30, 2004

Further information and assistance in preparing proposals are available from the Office of Student Affairs, Terman 201. **Students are strongly encouraged to read “School of Engineering/Individually Designed Majors,”** a handout prepared by the Undergraduate Council for students interested in the IDM alternative. This handout is also available from the Office of Student Affairs.
ACREDITATION

The Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET), an organization formed by the major engineering professional societies, accredits university engineering programs on a nationwide basis. An accredited program of study is usually the first step toward a professional engineering license. Advanced study in engineering at a graduate school sometimes presupposes completion of an accredited undergraduate program.

The accredited engineering programs at Stanford are Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering, all at the Bachelor of Science level. Note that programs are accredited, not students or student programs. Program accreditation, however, is based, in part, on student records, which means that all students in these five programs must meet all accreditation criteria to graduate.

Prior to the year 2000, ABET accreditation was based largely on establishing that every student had completed a minimum number of classroom hours studying particular topics central to engineering. In the last few years, however, ABET has shifted its focus so that accreditation depends on whether a program meets a clearly defined set of objectives, which are in turn judged by whether students achieve a particular set of outcomes. The objectives and outcomes for each accredited program are included along with the description of that program.

Despite the change in the overall ABET process, the School of Engineering at Stanford continues to make use of some concepts from the older ABET model because we find those guidelines helpful in terms of achieving balance in our program. In particular, we have broken down the units assigned to each engineering course to show how much of that course falls into each of the following categories: engineering science, engineering design, and experimentation. The program sheets for the ABET-accredited programs include columns for these categories to ensure that all students have sufficient exposure to each of these cornerstones of engineering education.

According to ABET the professional component must include:

- one year of a combination of college level mathematics and basic sciences (some with experimental experience) appropriate to the discipline.
- one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study.
- a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.
**UNDERGRADUATE PROGRAM SHEETS**

A student’s **Undergraduate Program Sheet** is an essential document for degree certification by the School of Engineering. In effect, it represents the student’s “contract” with the School of Engineering, because completion of all courses listed on the sheet is a requirement for receiving the B. S. or B.A.S. degree with a major in the School. **A signed copy of the Program Sheet must be submitted to the major department at the beginning of the quarter prior to the quarter in which the student intends to graduate** (Mechanical Engineering majors are **required to submit their Program Sheet by the first quarter of their junior year**). The Program Sheet also provides a convenient way to assess a program with respect to accreditation requirements, which, as explained above, are not the same as the School’s curricular requirements. Program Sheets are available on the School of Engineering Undergraduate Handbook web site (**http://ughb.stanford.edu**). A copy of the consolidated list of the engineering science and design units allocated to each course is also available on the web.

Figure 2-1 on the facing page shows a sample Program Sheet. Each department and program includes a copy of their Program Sheet in the Program Requirements section at the end of this Handbook.

**Petitions to alter graduation requirements, for transfer credit evaluation, or for course substitutions, will not be considered in the final quarter of registration** (i.e., the quarter in which a student plans to graduate). Careful planning during the senior year is advised.
### Electrical Engineering—General EE Requirements

— ABET Accreditation Criteria Apply —

<table>
<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Units</th>
<th>Grade</th>
<th>Transfer Credit Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Engineering Science Design Experiment Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mathematics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MATH 41 Calculus (req'd)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MATH 42 Calculus (req'd)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MATH 51 Calculus (req'd)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MATH 52 Calculus (req'd)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>MATH 53 Ordinary Differential Equations (req'd)</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EE 178 Intro Probabilistic Sys Analysis (req'd)</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mathematics Total</strong></td>
<td><strong>28</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHYS 51 Light and Heat (req'd)</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHYS 53 Mechanics (req'd)</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHYS 55 Electricity and Magnetism (req'd)</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Science Total</strong></td>
<td><strong>12</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mathematics + Science Total</strong></td>
<td><strong>40</strong></td>
<td></td>
<td>(45 units minimum required)</td>
</tr>
</tbody>
</table>

**NOTES**

(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.

(2) ENGR 155A may be substituted for MATH 53, STAT 116 or MATH 151 for EE178. Other substitutions require approval.

REV: 08/03

Continues on back of sheet
### Electrical Engineering—General EE Requirements

#### Engineering Topics (Engineering Science + Design)

**Engineering Fundamentals (3 courses required)**

<table>
<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Units</th>
<th>Engineering</th>
<th>Experiment</th>
<th>Grade</th>
<th>V if Transfer</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR</td>
<td>40</td>
<td>Introductory Electronics (req’d)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR</td>
<td>70X</td>
<td>Prog Meth and Abst (CS106X) (req’d)</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Fundamentals Total: 10 (three courses required)*

#### Engineering Depth

<table>
<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Units</th>
<th>Engineering</th>
<th>Experiment</th>
<th>Grade</th>
<th>V if Transfer</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td>100</td>
<td>Electrical Engineering Profession (req’d)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>41</td>
<td>Intro. to Electrical Eng (req’d) (see note 2)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>101A</td>
<td>Electronics I (req’d)</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>101B</td>
<td>Electronics II (req’d)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>102A</td>
<td>Signals and Systems I (req’d)</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>102B</td>
<td>Signals and Systems II (req’d)</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>108A</td>
<td>Digital Systems I (req’d)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>108B</td>
<td>Digital Systems II (req’d)</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE</td>
<td>122</td>
<td>Analog Laboratory (req’d)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR</td>
<td>102E</td>
<td>Tech/Prof Writing (req’d) (see note 1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Program Totals: (ABET Requirements)

- **Engineering Topics Total:** 42 (68 units minimum)
- **Experimentation Total:** 13 (8 units minimum)
- **Mathematics and Science Total:** 40 (45 units minimum)

---

**NOTES**

1. Fulfills “Writing in the Major” requirement for Freshmen and Transfer students entering Fall 1996 or later.
2. EE 41 or EE 141.
3. This form is available as an Excel file at http://ughb.stanford.edu/ The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
4. All courses listed on this form must be taken for a letter grade if offered by the instructor.
   Minimum Combined Grade Point Average for all courses in Engineering Topics is 2.0.
5. Transfer credits in Math, Science, Funds., & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.
3. **APPROVED COURSES**

Nearly all engineering majors share similar requirements in Mathematics, Science, Technology in Society, and Engineering Fundamentals. The Undergraduate Council of the School of Engineering is responsible for establishing lists of courses certified as satisfying these requirements, which appear in the tables included in this section. Other appropriate courses—such as more advanced courses, for example—may be used to satisfy these requirements, but their use must be approved by petition. Petition forms are on the Undergraduate Handbook website ([http://ughb.stanford.edu](http://ughb.stanford.edu)) and should be submitted to the Office of Student Affairs, Terman 201. **We recommend strongly that a student obtain petition approval prior to enrolling in any course she or he wishes to use in satisfying one of these requirements.** Further information is available in the Office of Student Affairs.
THE MATHEMATICS REQUIREMENT

The mathematics requirements for departmental and School of Engineering majors are delineated in the detailed “Program Requirements” section at the back of the Handbook. In general, each program requires a number of specific and elective courses from the list of approved courses shown in Figure 3-1. Individually Designed Majors must include at least 21 units from the list. All engineering students should check the “Program Requirements” pages for their major to see which mathematics courses are recommended or required.

FIGURE 3-1. COURSES APPROVED FOR THE MATHEMATICS REQUIREMENT

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 19, 20, 21</td>
<td>Calculus of a Single Variable</td>
<td>3, 3, 4</td>
</tr>
<tr>
<td>MATH 41, 42</td>
<td>Calculus of a Single Variable</td>
<td>5, 5</td>
</tr>
<tr>
<td>MATH 51, 52, 53</td>
<td>Calculus of Several Variables</td>
<td>5, 5, 5</td>
</tr>
<tr>
<td>MATH 51H, 52H, 53H</td>
<td>Honors Calculus</td>
<td>5, 5, 5</td>
</tr>
<tr>
<td>MATH 103</td>
<td>Matrix Theory and Its Applications</td>
<td>3</td>
</tr>
<tr>
<td>MATH 106</td>
<td>Functions of a Complex Variable</td>
<td>3</td>
</tr>
<tr>
<td>MATH 109</td>
<td>Applied Group Theory</td>
<td>3</td>
</tr>
<tr>
<td>MATH 113, 114</td>
<td>Linear Algebra and Matrix Theory</td>
<td>3, 3</td>
</tr>
<tr>
<td>MATH 115</td>
<td>Functions of a Real Variable</td>
<td>3</td>
</tr>
<tr>
<td>MATH 120, 121</td>
<td>Modern Algebra I, II</td>
<td>3, 3</td>
</tr>
<tr>
<td>MATH 131, 132</td>
<td>Differential Equations</td>
<td>3, 3</td>
</tr>
<tr>
<td>STATS 60/160</td>
<td>Introduction to Statistical Methods: Precalculus</td>
<td>5</td>
</tr>
<tr>
<td>STATS 110</td>
<td>Statistical Methods in Engineering</td>
<td>4-5</td>
</tr>
<tr>
<td>STATS 116</td>
<td>Theory of Probability</td>
<td>3-5</td>
</tr>
</tbody>
</table>

or more advanced Mathematics courses.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEMENG 220</td>
<td>Applied Mathematics in Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEE 101D</td>
<td>Seminar on Mathematical Lab Applications in CEE</td>
<td>2</td>
</tr>
<tr>
<td>CEE 203</td>
<td>Statistical Models in Civil Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CS 137</td>
<td>Introduction to Scientific Computing</td>
<td>4</td>
</tr>
<tr>
<td>CS 237A, B, C</td>
<td>Advanced Numerical Analysis</td>
<td>3, 3, 3</td>
</tr>
<tr>
<td>CS 260</td>
<td>Concrete Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>EE 178</td>
<td>Introduction to Probabilistic Systems Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 62</td>
<td>Introduction to Optimization</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 154</td>
<td>Introduction to Engineering Mathematics</td>
<td>5</td>
</tr>
<tr>
<td>ENGR 155A, 155B, 155C</td>
<td>Mathematical and Computational Methods for Engineers</td>
<td>5, 5, 4</td>
</tr>
<tr>
<td>ENGR 160</td>
<td>Ordinary Differential Equations and Their Applications</td>
<td>3</td>
</tr>
<tr>
<td>GES 160</td>
<td>Statistical Methods for Earth and Environmental Sciences</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 120</td>
<td>Probabilistic Analysis</td>
<td>5</td>
</tr>
<tr>
<td>MS&amp;E 121</td>
<td>Intro to Stochastic Modeling</td>
<td>4</td>
</tr>
<tr>
<td>MATSCI 191</td>
<td>Mathematical Methods in Materials Science</td>
<td>3</td>
</tr>
</tbody>
</table>
THE SCIENCE REQUIREMENT

The science requirements for departmental and School of Engineering majors are delineated in the detailed “Program Requirements” section at the back of the Handbook. In general, each program requires a number of specific and elective courses from the list of approved courses shown in Figure 3-2. Individually Designed Majors must include at least 17 units from the list. All engineering students should check the “Program Requirements” pages for their major to see which science courses are recommended or required.

FIGURE 3-2. COURSES APPROVED FOR THE SCIENCE REQUIREMENT

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Exper. Units</th>
<th>Total Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOSCI 51, 52, 53</td>
<td>Principles of Biology</td>
<td>–</td>
<td>5, 5, 5</td>
</tr>
<tr>
<td>CEE 63</td>
<td>Weather and Storms</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>CEE 64</td>
<td>Air Pollution: Urban Smog to Global Change</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 31</td>
<td>Chemical Principles</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 32</td>
<td>The Frontiers of Chemical Science</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 33</td>
<td>Structure and Reactivity</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 35</td>
<td>Organic Monofunctional Compounds</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 36</td>
<td>Chemical Separations</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 131</td>
<td>Organic Poly Compounds</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 135</td>
<td>Physical Chemical Principles</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>EARTHSYS 10</td>
<td>Introduction to Earth Systems</td>
<td>1</td>
<td>4–5</td>
</tr>
<tr>
<td>GES 1 *</td>
<td>Fundamentals of Geology</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>GES 2 *, 3 *</td>
<td>Earth History</td>
<td>0, 2</td>
<td>3, 2</td>
</tr>
<tr>
<td>PHYSICS 51</td>
<td>Light and Heat</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 52</td>
<td>Physics Lab</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>PHYSICS 53</td>
<td>Mechanics</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 55</td>
<td>Electricity, Magnetism</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>PHYSICS 61–65</td>
<td>Advanced Freshman Physics and labs</td>
<td>2</td>
<td>14</td>
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</tbody>
</table>

* A maximum of 5 units of coursework may be counted toward the Science Requirement.

THE TECHNOLOGY IN SOCIETY REQUIREMENT

It is important for the student to obtain a broad understanding of engineering as a social activity. To foster this aspect of intellectual and professional development, all engineering majors must take one course devoted to exploring issues arising from the interplay of engineering, technology, and society. Individual courses approved for the Technology in Society Requirement are listed in Figure 3-3. Note that some of the approved courses are limited-enrollment offerings, which means that you need to take this factor into account when creating your course schedule. Petitions to use other courses to fulfill the Technology in Society Requirement will be considered.
strictly on their merits and will not be approved simply because the student has left the fulfillment of this requirement until her or his last quarter at Stanford.

**Figure 3-3. Courses approved for the Technology in Society Requirement**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>STS 101/201 (ENGR 130) *†</td>
<td>Science, Technology, and Contemporary Society</td>
<td>4-5</td>
</tr>
<tr>
<td>STS 107 (ECON 113)</td>
<td>Technology and Economic Change</td>
<td>5</td>
</tr>
<tr>
<td>STS 110 (MS&amp;E 197) *†</td>
<td>Ethics and Public Policy</td>
<td>5</td>
</tr>
<tr>
<td>STS 118 (ARTHIST 141)</td>
<td>The Invention of Modern Architecture</td>
<td>4</td>
</tr>
<tr>
<td>STS 128 (EE 45)</td>
<td>Science and Technology in WWII and What Happened Afterward</td>
<td>3</td>
</tr>
<tr>
<td>STS 145</td>
<td>History of Computer Game Design</td>
<td>4</td>
</tr>
<tr>
<td>STS 150 (CASA 181) *</td>
<td>Car Culture</td>
<td>5</td>
</tr>
<tr>
<td>STS 152 (COMM 120)</td>
<td>Social Impact of Digital Media</td>
<td>5</td>
</tr>
<tr>
<td>STS 155 (CASA 132)</td>
<td>Science, Technology, and Gender</td>
<td>5</td>
</tr>
<tr>
<td>STS 162 (COMM 169) *</td>
<td>Computers and Interfaces: Psychological and Social Issues</td>
<td>3-5</td>
</tr>
<tr>
<td>STS 171 (MS&amp;E 193) *</td>
<td>Technology in National Security</td>
<td>3</td>
</tr>
<tr>
<td>STS 172 (MS&amp;E 181) *</td>
<td>Issues of Technology and Work in a Post-Industrial Economy</td>
<td>3</td>
</tr>
<tr>
<td>STS 173 (ENGR 145)</td>
<td>Introduction to High-Technology Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>STS 184 (PP 194) †</td>
<td>Technology Policy</td>
<td>5</td>
</tr>
<tr>
<td>STS 185</td>
<td>Intellectual Property and the Information Era</td>
<td>4</td>
</tr>
<tr>
<td>STS 215 (CS 201) †</td>
<td>Computers, Ethics, and Social Responsibility</td>
<td>3-4</td>
</tr>
<tr>
<td>STS 279 (MS&amp;E 298) †</td>
<td>Technology, Policy, and Management in Newly Industrializing Countries</td>
<td>3-4</td>
</tr>
</tbody>
</table>

Notes:
- * Approved STS courses for MS&E majors.
- † Approved STS courses for Environmental Engineering majors.
- † For 2003-04, will only be given at the Stanford in Florence campus.

In addition to the courses shown in Figure 3-3, you can also fulfill the Technology in Society Requirement by taking part in the Stanford Center for Technology and Innovation (SCTI) program, which is offered by Overseas Studies at the Kyoto campus.

**The Engineering Fundamentals Requirement**

The Engineering Fundamentals requirement is satisfied by a set of technically rigorous introductory courses chosen from the various engineering disciplines, as shown in Figure 3-4. These courses serve several purposes. First, they provide a breadth of knowledge about some of the major fields within engineering. Second, they furnish students with an opportunity to explore a number of engineering topics before embarking on a specific engineering major. Third, the individual classes each offer a reasonably deep insight into a contemporary technological subject for the interested non-engineer.
**Figure 3-4. Courses for the Engineering Fundamentals Requirement**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Engr. Science</th>
<th>Engr. Design</th>
<th>Exper. Units</th>
<th>Total Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 10</td>
<td>Introduction to Engineering Analysis</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>4</td>
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<tr>
<td>ENGR 14</td>
<td>Applied Mechanics: Statics</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 15</td>
<td>Dynamics</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 20</td>
<td>Introduction to Chemical Engineering</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>3</td>
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<tr>
<td>ENGR 25</td>
<td>Bioengineering</td>
<td>2</td>
<td>1</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 30</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>ENGR 50</td>
<td>Introductory Science of Materials</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 60</td>
<td>Engineering Economy</td>
<td>3</td>
<td>–</td>
<td>–</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 62</td>
<td>Introduction to Optimization</td>
<td>4</td>
<td>–</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 70A *</td>
<td>Programming Methodology</td>
<td>4</td>
<td>1</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>ENGR 70X *</td>
<td>Programming Methodology and Abstractions</td>
<td>4</td>
<td>1</td>
<td>–</td>
<td>5</td>
</tr>
</tbody>
</table>

Note:

* Enroll in CS 106A or CS 106X. Electrical Engineering majors must complete either CS 106X, or CS 106A and CS 106B. However, if a student elects to take CS 106A and CS 106B, CS 106B does not count toward the 45 units of Engineering Depth in Electrical Engineering.

Engineering majors must complete a minimum of three Engineering Fundamentals courses, at least one of which must be unspecified by the department.

**The Experimentation Requirement**

The Departmental Majors in Chemical, Civil, Electrical, Environmental, Industrial, Materials Science and Engineering, and Mechanical Engineering require 8 units of Experimentation, which is normally included within the units taken for Science, Engineering Fundamentals, and Engineering Depth. Thus, with careful planning of the courses taken in those portions of the curriculum, the Experimentation requirement should not involve additional coursework.

The experimentation content of undergraduate engineering and science courses is shown, in units, in Figure 3-5. Students may also petition to receive experimentation units for work performed in other courses (including individual research projects) or even for appropriate summer work, with the approval of their Academic Adviser.
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA 131</td>
<td>Experimentation in Aero/Astro</td>
<td>3</td>
</tr>
<tr>
<td>BIOSCI 44</td>
<td>Core Experimental Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CEE 100</td>
<td>Managing Civil Engineering Projects</td>
<td>1</td>
</tr>
<tr>
<td>CEE 101A</td>
<td>Structural Systems</td>
<td>1</td>
</tr>
<tr>
<td>CEE 101C</td>
<td>Geotechnical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>CEE 140</td>
<td>Field Surveying Lab</td>
<td>4</td>
</tr>
<tr>
<td>CEE 141</td>
<td>Concrete Canoe for ASCE Competition</td>
<td>1</td>
</tr>
<tr>
<td>CEE 147</td>
<td>Cases in Personality, Leadership, and Negotiation</td>
<td>1</td>
</tr>
<tr>
<td>CEE 148</td>
<td>Design/Construction of Affordable Housing</td>
<td>1</td>
</tr>
<tr>
<td>CEE 160</td>
<td>Mechanics of Fluids Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>CEE 161A</td>
<td>Rivers, Channels and Streams</td>
<td>1</td>
</tr>
<tr>
<td>CEE 176A,B</td>
<td>Energy Efficient Buildings</td>
<td>1, 1</td>
</tr>
<tr>
<td>CEE 178</td>
<td>Intro to Human Exposure Analysis</td>
<td>1</td>
</tr>
<tr>
<td>CEE 179A</td>
<td>Water Chemistry Lab</td>
<td>2</td>
</tr>
<tr>
<td>CEE 179B</td>
<td>Process Design for Biotechnology (alternate years)</td>
<td>3</td>
</tr>
<tr>
<td>CEE 195</td>
<td>Structural Geology and Rock Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>CEE 242</td>
<td>Organization Design for Projects and Companies</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 36</td>
<td>Chemical Separations</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 130</td>
<td>Theory and Practice of Identification</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 132</td>
<td>Qualitative Organic Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CHEMENG 185A,B</td>
<td>Chemical Engineering Laboratory</td>
<td>2, 2</td>
</tr>
<tr>
<td>CS 48N</td>
<td>The Science of Art</td>
<td>3</td>
</tr>
<tr>
<td>EE 121</td>
<td>Digital Design Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>EE 122</td>
<td>Analog Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>EE 133</td>
<td>Analog Communications Design Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>EE 144</td>
<td>Electromagnetic Waves Design Laboratory</td>
<td>1.5</td>
</tr>
<tr>
<td>EE 181</td>
<td>Computer Organization, Machine and Assembly Language</td>
<td>1</td>
</tr>
<tr>
<td>EE 182</td>
<td>Digital Computer Organization</td>
<td>2</td>
</tr>
<tr>
<td>EE 183</td>
<td>Digital Logic Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>EE 218</td>
<td>Semi-custom VLSI Systems</td>
<td>1</td>
</tr>
<tr>
<td>EE 281</td>
<td>Microcomputer-Based System Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 75</td>
<td>Intro to Small Computer Interfacing</td>
<td>3</td>
</tr>
<tr>
<td>GES 1</td>
<td>Fundamentals of Geology</td>
<td>1</td>
</tr>
<tr>
<td>GES 3</td>
<td>Earth History Laboratory</td>
<td>2</td>
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<tr>
<td>MATSCI 161,162,163</td>
<td>Experimental Methods in Materials Science</td>
<td>4, 4, 4</td>
</tr>
<tr>
<td>ME 33</td>
<td>Introductory Fluids Engineering</td>
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<tr>
<td>ME 103</td>
<td>Manufacturing and Design</td>
<td>1</td>
</tr>
<tr>
<td>ME 117</td>
<td>Introduction to Sensors</td>
<td>.5</td>
</tr>
<tr>
<td>ME 118</td>
<td>Introduction to Mechatronics</td>
<td>3</td>
</tr>
<tr>
<td>ME 130</td>
<td>Internal Combustion Engines</td>
<td>3</td>
</tr>
<tr>
<td>ME 131A</td>
<td>Heat Transfer</td>
<td>2</td>
</tr>
<tr>
<td>ME 132</td>
<td>Thermosciences Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ME 217A</td>
<td>Design for Manufacturability</td>
<td>1</td>
</tr>
<tr>
<td>MS&amp;E 108</td>
<td>Senior Project</td>
<td>3, 3, 3</td>
</tr>
<tr>
<td>MS&amp;E 160</td>
<td>Analysis of Production and Operating Systems</td>
<td>1</td>
</tr>
<tr>
<td>MS&amp;E 164</td>
<td>Work Design and Measurement</td>
<td>2</td>
</tr>
<tr>
<td>MS&amp;E 169</td>
<td>Quality Assurance and Control</td>
<td>1</td>
</tr>
<tr>
<td>MS&amp;E 180</td>
<td>Organizations: Theory and Management</td>
<td>1</td>
</tr>
<tr>
<td>MS&amp;E 265</td>
<td>Reengineering the Manufacturing Function</td>
<td>2</td>
</tr>
<tr>
<td>MS&amp;E 277</td>
<td>Creativity and Innovation in Organizations</td>
<td>1</td>
</tr>
<tr>
<td>PHYSICS 52</td>
<td>Physics Lab</td>
<td>1</td>
</tr>
</tbody>
</table>
4. Policies and Procedures

Policy on Academic Performance
The Undergraduate Council of the School of Engineering has established the following standards of academic performance for all engineering majors.

Credit/No Credit Option
All courses taken in fulfillment of the requirements for an engineering major must be taken for a letter grade if the instructor offers that option.

Grade Point Average
Engineering majors must achieve a Grade Point Average (GPA) of at least 2.00 for all courses taken in fulfillment of the Engineering Fundamentals and Engineering Depth requirements. A student’s GPA is a weighted average of numerical grade points. The calculation is based on a 4-point system, with + and – modifiers counting as 1/3 of a grade point (e.g., a C+ is counted as 2.33). The grade for each course taken to satisfy the Engineering Fundamentals and Engineering Depth requirements is weighted by the unit value of the course and an average obtained. Thus, courses in which a grade higher than a C is earned offset courses in which less than a C is earned. The GPA calculation does not include courses taken to satisfy the Math, Science, or Technology in Society requirements.

Petitions and Substitutions
Students have the right to petition for deviations from curricular requirements. If the action requested involves a requirement imposed by the University itself, such as the General Education or Foreign Language Requirements, the petition process is handled through the Registrar’s Office in Old Union. If the petition involves a Departmental Depth requirement, the major department handles the request. Each department has its own procedures, and the student is advised to consult with his or her adviser and with the student services staff within the major department (see the list of room numbers on the inside back cover of this Handbook) for guidance. A deviation from an Engineering Depth requirement must be initialed and dated by the adviser on the student’s final Program Sheet that is submitted before graduation.
If the action requested by the student involves a nondepartmental School of Engineering requirement (e.g., Math, Science, Technology in Society, or Engineering Fundamentals), the student must submit a Program Deviation petition to the Office of Student Affairs in Terman 201. The petition must be submitted on the School’s official petition form, which is at the end of this section and is available on the Undergraduate Handbook website (http://ughb.stanford.edu). Petition forms are also available on the information rack outside the Engineering Information Office, Terman 202. The petition must be accompanied by an up-to-date copy of the student’s Program Sheet that has been signed by the student’s adviser. Completed petitions should be submitted to Bertha Love in the Office of Student Affairs, Terman 201.

Petitions to alter graduation requirements, for transfer credit evaluation, or for course substitutions, will not be considered in the final quarter of registration (i.e., the quarter in which a student plans to graduate).

TRANSFER CREDIT

Many students elect to take some of their coursework at another institution. In addition, each year a small number of engineering students enter Stanford after completing one or two years at another institution. In either case, these transfer credits are subject to the guidelines below.

All units of transfer credit that are to be applied toward the University graduation requirement of 180 units must be approved by the Registrar’s Office. Students must petition for their approval subject to the provisions outlined under “Transfer Credit” in the Stanford Bulletin. Transfer courses may satisfy general University requirements or School of Engineering requirements. Such credits require specific, case-by-case approval.

Those credits which meet general University requirements will be so noted in a letter from the Registrar’s Office to the student when the units are transferred to Stanford. In addition, credits meeting engineering requirements must have School of Engineering approval prior to the final quarter. University approval is necessary, but not sufficient. Transfer credit(s) in the areas of:

- Math, Science, Technology in Society and Engineering Fundamentals require approval by the Senior Associate Dean for Student Affairs or the Assistant Director of Undergraduate Studies in Terman 201.
• **Depth** coursework requires approval by your major or departmental adviser. Departments have considerable latitude in deciding whether to approve transfer requests. Departments may require that certain courses be taken at Stanford and may establish limits on the total number of transfer courses. For example, transfer students in Computer Science and Computer Systems Engineering may apply only three courses of transfer credit towards their depth requirements.

To evaluate transfer credits in the above areas, the appropriate office—the Dean’s office or the departmental adviser depending on the course type—must receive the following:

- A completed Transfer Credit Petition form, found at the end of this section as well as on the web at [http://ughb.stanford.edu](http://ughb.stanford.edu).
- A transcript and catalog description of the course from the other institution.
- An indication of which Stanford course or courses are considered equivalent; if the equivalence is uncertain, a faculty member from the field in question should be consulted.

Approval of transfer credits is indicated by the appropriate initials and date on the student’s original Program Sheet in the **Approval** column. The course should be listed first by its equivalent Stanford course number, followed by its title, followed by the course number at the other school, followed by a check mark in the **Transfer** column. An unofficial copy of the transcript for all transferred courses must be included in a student’s file. Students who do not have a copy of their transcript from other institutions in their file must go to the Transfer Credit Evaluation Office and request that a copy be forwarded to Bertha Love in Terman 201.

**All engineering transfer students should arrange to see the Senior Associate Dean for Student Affairs in Terman 201** during their first year at Stanford for an evaluation of transfer credits toward School of Engineering requirements.

While the Office of Student Affairs and the student’s Major Adviser evaluate transfer credit requests on a case-by-case basis, the following general guidelines apply:

- Transfer courses should be substantially equivalent to those offered at Stanford.
- The number of units transferred for a given course is usually equal to the number of units taken at the other institution, adjusted for different unit values at the two schools. That is, for example, a 3 semester-unit course at another school will usually transfer as 4.5 units in Stanford’s quarter system.

**ADVANCED PLACEMENT CREDITS**

Advanced Placement (AP) credits apply toward both the university 180-unit requirement and the School of Engineering requirements in Mathematics, Science, or Computer Science. AP credits
in mathematics are accepted only if the parallel Stanford courses are skipped. Thus, a student cannot receive 10 units of AP mathematics credit and then enroll in MATH 41; to apply these AP units at Stanford, the first mathematics course taken must be beyond the MATH 40 series, typically MATH 51. AP credits in Computer Science will be accepted only if the student completes a Stanford course that is more advanced than CS 106A. AP credits in Biology, Chemistry, and Physics are accepted as satisfying the School of Engineering Science requirement.

Approval of Advanced Placement is indicated by the appropriate initials and date on the student’s original Program Sheet in the Approval column. The initials “AP” should be entered in the title column, followed by the number of units in the Total Units column.

DECLARING AN ENGINEERING MAJOR

Stanford has a long-standing policy that any student may declare any major. Hence, there are no separate “entrance” requirements for the School of Engineering. Students at Stanford also have considerable time to weigh their choice of major, and it is useful to take a variety of courses in engineering before settling on a particular major. The majors offered by the School of Engineering are demanding, but also extremely rewarding. Additional information about the decision to major in engineering, and in which field to specialize, appears in Section 1 of this Handbook (“Introduction for New Students”).

Students at Stanford must declare a major by the time they achieve junior status (85 completed units). Prospective departmental majors (Chemical Engineering, Civil Engineering, Computer Science, Electrical Engineering, Environmental Engineering, Management Science and Engineering, Materials Science and Engineering, and Mechanical Engineering) should log on to Axess, click on the “Degree Progress” link, and then follow the instructions for declaring a major. Most of these departments also include additional notes on the declaration procedure as part of the program descriptions in Appendix A.

For the preapproved School of Engineering majors (Aeronautics and Astronautics, Biomechanical Engineering, Biomedical Computation, Computer Systems Engineering, and Product Design), students must submit the Departmental Interview Form for Prospective Engineering Majors, which appears at the end of this section and in the web version of this Handbook at http://ughb.stanford.edu. Take this form and an up-to-date copy of your Stanford transcript (available from the AXESS system) to the Departmental Office that has
responsibility for the major you wish to declare. The department will set up an advising interview. This session is intended to give you an opportunity to have your questions answered and to have the department review and comment on your decision. The interviewer will sign your Departmental Interview Form which you should take to the Degree Progress Office in Old Union, Room 141. At the Graduation Office, pick up and complete an official University Declaration of Major form. Leave the white copy at the Graduation Office, take the yellow copy to your former undergraduate adviser and pick up your undergraduate file. Finally, turn in your undergraduate file along with the Declaration of Major form to the Student Services personnel in your new major department.

**GRADUATION PROCEDURES**

Four separate approvals are needed to certify completion of all requirements for conferral of the bachelor’s degree:

1) Academic adviser (and, in some cases, the Departmental Representative also)  
   Signature required on Program Sheet.

2) School of Engineering  
   Terman 201  
   For completion of School/department requirements.

3) Degree Progress Office  
   Old Union, Room 141  
   For completion of University requirements (Writing, Language, GER).

4) Degree Progress Office  
   Old Union, Room 141  
   For completion of required units and final approval for degree conferral.

Students nearing the completion of their degree programs must do the following to assure that they graduate on time:

1. **School of Engineering Program Sheet**—This form must be in the student’s academic file, complete, current, and signed by the student’s adviser at the beginning of quarter prior to the quarter that he or she intends to graduate. (Mechanical Engineering majors are required to submit their Program Sheet by the first quarter of their junior year.) The Program Sheets for each department are included in the detailed program descriptions later in this Handbook, and are also available electronically from the web version of the Handbook at [http://ughb.stanford.edu](http://ughb.stanford.edu). Computer Science, Computer Systems Engineering, Electrical Engineering, Management Science and Engineering, Materials Science and Engineering, and Mechanical Engineering majors are also required to obtain a departmental signature.
The program sheet must include all necessary approvals, each of which requires the adviser to initial and date the original program sheet in the appropriate spaces. These approvals include those for any transfer credit, the process for which is described in detail earlier in this section under the heading “Transfer Credit.”

Program deviations in an already approved program will not be made automatically. Deviations in the Math, Science, Technology in Society, and Engineering Fundamental areas need to be petitioned for approval by the Dean’s Office. Petition forms are available on the web at http://ughb.stanford.edu. The student’s departmental adviser must approve deviations in Engineering Depth. Approval of a deviation is indicated by the appropriate signature/initials and date on the original Program Sheet in the Approval column. If the student’s approved program has deviated in any way from what is on the signed Program Sheet, he or she must have the change approved to graduate.

The program sheet must also include all courses in which the student is currently enrolled. Grades in those courses will be checked at the end of the quarter.

2. At the appropriate time as listed in the University Calendar, an Intent to Graduate application should be filed through AXESS.

- Status for completion of the University’s Writing, GER, and Foreign Language requirements should be verified through AXESS. Completion of the Engineering Requirements must be verified with Bertha Love, Assistant Director for Undergraduate Studies, Office of Student Affairs, Terman 201.
Petitions to the School of Engineering should be left with Bertha Love at the Office of Student Affairs in Terman 201. They will be referred to the proper committees and final action will be communicated to the student.

If the petition is intended to alter a graduation requirement or to substitute a course not listed as fulfilling a requirement:
1. Clearly explain why you feel the alteration is justified - provide details;
2. State how the course you wish to substitute fulfills the intent of the requirement - compare the course with Stanford courses that fulfill the requirement; is there a reason why you cannot fulfill the requirement with an approved course?;
3. Provide full documentation of the effect of the change, viz., provide a revised Program Sheet and an up-to-date unofficial Stanford transcript of courses;
4. For special (IDM) programs be sure changes are consistent with your statement of purpose.

Petitions will not be processed unless all of the above are attached/included.

All petitions must be submitted with a completed program sheet and transcript before filing your application for degree conferral. This is EARLY FEBRUARY for those of you expecting to graduate in June.

Please write legibly – Thanks!

ID #: ______________________

Name: ______________________ Address: ______________________

Signature: ______________________ Phone: ______________________ Email: ______________________

Date: ___________  Expected Major: ______________________ Expected Date of Graduation: ___________ 

Enter statement of request here. Do not add an attachment.

Advisor's Concurrence or Opinion

Comments:

Advisor (Print): ______________________ Signature: ______________________ Date: ___________

Action: □ Postponed
         □ Denied
         □ Granted

Signature: ______________________ Date: ___________

REV: 8/03
Transfer credit(s) in the areas of:
1. **Math, Science, Technology in Society, and Fundamentals** courses require approval by Brad Osgood, Senior Associate Dean, or Bertha Love, Assistant Director for Undergraduate Studies. Requests should be turned in to Bertha Love in Terman 201; they are reviewed weekly.
2. **Depth** coursework requires approval by your Major or Departmental Advisor.

To evaluate transfer credit(s) or pre-approval, your advisor or the Dean's Office must be supplied with the following:
1. This form, outlining your request and which Stanford course(s) are considered equivalent. This form can also be found on the web at: http://ughb.stanford.edu.
2. A completed up-to-date original Program Sheet. *(Forms completed in pencil will not be accepted.)* The course should be listed first by its equivalent Stanford course number and title, followed by the course number at the other school, followed by a check mark in the Transfer column.
3. A transcript, if applicable, and a catalog description of the course(s) from the other institution. See Phil Spitz in the Transfer Credit Evaluation Office, Old Union 141, and ask him to forward a copy of your transcript to Bertha Love.
4. An unofficial Stanford transcript, if applicable.
5. Upon approval of your request, the Dean's Office will make copies of the above documents for their records and mail a copy to you. Original documents will be forwarded to your department and be placed in your academic file.

Name: __________________________ Address: __________________________
Signature: __________________________ Phone: _______ Email: __________________________
Date: __________________________ Expected Major: __________________________ Expected Date of Graduation: __________________________

Name of Transfer Institution(s): __________________________

Department, number, and title of transfer course(s): __________________________

Dept, number, and title of Stanford course(s): __________________________

Why did you take, or why would you like to take, these courses at another institution?

Action: □ Denied
□ Pre-Approval Granted Signature: __________________________ Date: ____________
□ Final Granted Signature: __________________________ Date: ____________

REV: 8/03 29
School of Engineering

DEPARTMENTAL INTERVIEW FORM
FOR PROSPECTIVE ENGINEERING MAJORS

Instructions for Student:

1. When you have decided to declare an engineering major, take this form and an up-to-date copy of your transcript to your intended major department. Obtain a copy of your Stanford transcript from the on-line AXESS system.

2. After consultation with and obtaining a signature from an interviewer in your intended major department, take this form to the Graduation Office, Old Union 141, and officially declare your engineering major.

3. Complete an official Declaration of Major form. Leave the white copy at the Degree Progress Office, Old Union 141, take the yellow copy to your former undergraduate advisor and pick up your undergraduate file. At this point turn in your undergraduate file along with the Declaration of Major form to the Student Services personnel in your new major department.

4. Welcome to the School of Engineering!

To: Registrar

From: ___________________________________________

(Department) talked to __________________________ on

(Student’s Name) (Departmental Interviewer)

_________________________________________ and received advice about majoring in our department.

(Date)

_________________________________________

(Departmental Interviewer’s Signature)

REV: 8/03
5. OTHER DEGREE PROGRAMS

In addition to the Bachelor of Science degree, the School of Engineering offers a variety of additional degree options, including combined degrees, multiple majors, the coterminal program that allows simultaneous study toward both bachelor’s and master’s degrees, minors, and the opportunity to engage in honors work. These opportunities are described in the individual sections that follow.

ALTERNATIVE BACHELOR’S DEGREES

BACHELOR OF ARTS AND SCIENCES
The Bachelor of Arts and Sciences (B.A.S.) is a baccalaureate degree available to those students who complete the requirements for a major leading to the B.S. degree and for a major leading to the A.B. degree. It is particularly appropriate for engineering students with a strong interest in the humanities and social sciences and allows a student to take full advantage of Stanford’s eminence in the liberal arts. Note that this degree requires a minimum of 180 units as contrasted with a Dual A.B. and B.S. Degree Program, which requires 225 units. For further information see the Stanford Bulletin.

MULTIPLE BACHELOR OF SCIENCE MAJORS
It is possible to receive a single B.S. degree with designations in two separate majors. The second major may or may not be in engineering. For example, students completing separate depth requirements for two different engineering majors may receive a degree designating both majors. For further information see the Stanford Bulletin.

COTERMINAL DEGREE PROGRAMS
Students may work simultaneously toward a bachelor’s and a master’s degree. The degrees may be granted simultaneously or at the conclusion of different quarters, though the bachelor’s degree cannot be awarded after the master’s degree has been granted. The two degrees do not have to be from the same department; for example, a B.S. in Mechanical Engineering and a M.S. in Aeronautical and Astronautical Engineering is possible.

The University minimum requirements for the coterminal bachelor’s/master’s program are 180 units for the bachelor’s degree plus 45 (or higher departmental requirement, as determined by each graduate department) unduplicated units for the master’s degree. A student may apply for
the coterminal B.S. and M.S. program after the beginning of the eighth quarter (or after 105 units are completed) and no later than the end of the eleventh quarter. Students should apply directly to the department in which they wish to receive the M.S. degree. Most departments require the Graduate Records Examination (GRE), applications for which can be obtained at the Undergraduate Advising Center. After all forms have been completed, they must be submitted, along with an up-to-date transcript, to the department in which the student wishes to obtain the M.S. degree. It is recommended that an applicant check with the proposed graduate department to learn the optimal timing for submitting an application.

MINORS

Interested students in many of the school’s departments may pursue an undergraduate minor in Engineering. The requirements for each of the available minors are listed on the pages that follow. To obtain more information, contact a department’s Undergraduate Program representative, or the Office of Student Affairs in the Terman Engineering Center, room 201.

General requirements and policies for a minor in the School of Engineering are:

1. A School of Engineering minor consists of a set of courses totaling not less than 18 and not more than 36 units, with a minimum of six courses of at least 3 units each.
2. The set of courses should be sufficiently coherent as to present a body of knowledge within a discipline or subdiscipline.
3. Prerequisite mathematics, statistics, or science courses, such as those normally used to satisfy the school’s requirements for a department major, may not be used to satisfy the requirements of the minor. Conversely, engineering courses that serve as prerequisites for subsequent courses must be included in the unit total of the minor program.
4. Departmentally based minor programs are structured at the discretion of the sponsoring department, subject only to requirements (1), (2), and (3) above.

Interdisciplinary minor programs may be submitted to the Undergraduate Council for approval and sponsorship. A “General Engineering” minor is not offered. University policy and procedures for declaring a minor, limitations on No Credit units, and so forth, may be found in the Stanford Bulletin or through the AXESS system.
**AERONAUTICS AND ASTRONAUTICS MINOR**

The Aero/Astro minor introduces undergraduates to the key elements of modern aerospace systems. Within the minor, students may focus on aircraft, spacecraft, or disciplines relevant to both. The course requirements for the minor are listed in the table below.

**COURSES FULFILLING THE MINOR IN AERONAUTICS AND ASTRONAUTICS**

<table>
<thead>
<tr>
<th>Core:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 14*</td>
<td></td>
</tr>
<tr>
<td>ENGR 15*</td>
<td></td>
</tr>
<tr>
<td>ENGR 30*</td>
<td></td>
</tr>
<tr>
<td>AA 100</td>
<td></td>
</tr>
<tr>
<td>ME 33</td>
<td></td>
</tr>
<tr>
<td>ME 131A</td>
<td></td>
</tr>
<tr>
<td><strong>Core total</strong></td>
<td><strong>12–25</strong></td>
</tr>
</tbody>
</table>

**Upper division electives:**

| 2 courses from one of the elective areas below | 6 |
| 1 course from a second area                 | 3 |
| **Program total**                           | **21–34** |

**Elective areas:**

**Dynamics and Controls:**

| ENGR 105                | Feedback Control Design | 3 |
| ENGR 205                | Introduction to Control Design Techniques | 3 |
| AA 242A                 | Classical Dynamics      | 3 |
| AA 271                  | Dynamics and Control of Spacecraft/Aircraft | 3 |
| AA 279                  | Space Mechanics         | 3 |

**Aerospace Systems Synthesis/Design:**

| AA 236A,B               | Spacecraft Design       | 6-8 |
| AA 241A,B               | Aircraft Design         | 6 |

**Fluids:**

| AA 200A                 | Applied Aerodynamics    | 3 |
| AA 210A                 | Fundamentals of Compressible Flow | 3 |
| AA 214A                 | Numerical Methods in Fluid Mechanics | 3 |
| AA 283                  | Aircraft and Rocket Propulsion | 3 |
| ME 131B                 | Fluid Mechanics         | 3 |

**Structures:**

| AA 240A                 | Analysis of Structures  | 3 |
| AA 240B                 | Analysis of Structure II | 3 |
| AA 256                  | Mechanics of Composites | 3 |

**Notes**

- ENGR 14, 15, or 30 are waived as minor requirements if already taken as part of the major.
- Courses cannot be double-counted within a major and a minor, or within multiple minors; if any of the core classes are an integral part of the student’s major or of another minor program, the Aero/Astro adviser can help select substitute courses to fulfill the Aero/Astro requirements.
**CHEMICAL ENGINEERING MINOR**

The courses required for the Chemical Engineering minor appear in the following table.

**COURSES FULFILLING THE MINOR IN CHEMICAL ENGINEERING**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 20</td>
<td>Introduction to Chemical Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CHEMENG 100</td>
<td>Chemical Process Modeling, Dynamics, and Control</td>
<td>3</td>
</tr>
<tr>
<td>CHEMENG 110</td>
<td>Equilibrium Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>CHEMENG 120A</td>
<td>Fluid Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>CHEMENG 120B</td>
<td>Energy and Mass Transport</td>
<td>4</td>
</tr>
<tr>
<td>CHEMENG 140 or CHEMENG 150 or CHEMENG 160</td>
<td>Microelectronics Processing Technology / Biochemical Engineering / Design Laboratory / Polymer Science and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CHEMENG 170</td>
<td>Kinetics and Reactor Design</td>
<td>3</td>
</tr>
<tr>
<td>CHEMENG 180</td>
<td>Chemical Engineering Plant Design</td>
<td>3</td>
</tr>
<tr>
<td>CHEMENG 185A</td>
<td>Chemical Engineering Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 171</td>
<td>Physical Chemistry - Chemical Thermodynamics</td>
<td>3</td>
</tr>
</tbody>
</table>

_Program total_ 32
CIVIL ENGINEERING MINOR

The civil engineering minor is intended to give students an in-depth introduction to one or more areas of civil engineering. Departmental expertise and undergraduate course offerings are available in the areas of Architectural Engineering, Construction Engineering and Management, and Structural/Geotechnical Engineering. (Students interested in Environmental and Water Studies should refer to the Environmental Engineering minor.) The minimum prerequisite for a civil engineering minor is MATH 42 (or MATH 21), however many courses of interest require PHYSICS 53 and/or MATH 51 as prerequisites. Students should recognize that a minor in civil engineering is not an ABET-accredited degree program.

Since civil engineering is a very broad field and undergraduates having widely varying backgrounds may be interested in obtaining a civil engineering minor, no single set of course requirements will be appropriate for all students. Instead, interested students are encouraged to propose their own set of courses within the guidelines listed below; the undergraduate minor adviser must officially approve this list for the Civil and Environmental Engineering Department. Additional information on preparing a minor program, including “example” programs focusing on each of the 3 areas of expertise listed above, is available at http://cee.stanford.edu/undergrad_CE.html#minor.

General guidelines are:

• A civil engineering minor must contain at least 24 units of coursework not taken for the major, and must conform to the School of Engineering minor requirements published in the Stanford Bulletin or this Handbook.
• Complete a Major-Minor & Multiple-Major Course Approval Form. The form is available online at http://cee.stanford.edu, in the department’s student services office (Terman M42), or at the information window in Old Union.
• Prof. Robert L. Street (Bldg. 524, Room R, 723-4969, email: street@stanford.edu) is the undergraduate minor advisor for the department of Civil and Environmental Engineering and will provide guidance and advice on the minor in civil engineering. Students must consult with him when developing their minor program and must obtain his approval of that study list using the Major-Minor & Multiple-Major Course Approval form.
• Follow the instructions attached to the form. For the minor in civil engineering, a completed and signed copy of the form must be filed with the department’s office of student services (Terman M42). As soon as this is done, step five can be executed.
• Apply for the CE minor on AXESS. The student services administrator for undergraduate study in CE will then check the Major-Minor & Multiple-Major Course Approval Form to accept the declaration. **Minors must be officially declared and all courses completed (or in progress) no later than the deadline for a student’s application to graduate.**
**COMPUTER SCIENCE MINOR**

The courses necessary to fulfill the requirements for the minor in Computer Science are shown in the table below. In addition, students must complete the standard mathematics sequence through MATH 51 as a prerequisite.

**COURSES FULFILLING THE MINOR IN COMPUTER SCIENCE**

<table>
<thead>
<tr>
<th><strong>Introductory programming:</strong></th>
<th><strong>Units</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 106A/B or CS 106X</td>
<td>Programming Methodology/Programming Abstractions 5, 5</td>
</tr>
<tr>
<td></td>
<td>Programming Methodology and Abstractions (Accelerated) 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Core:</strong></th>
<th><strong>Units</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 103A/B or CS 103X</td>
<td>Discrete Mathematics for Computer Science/Discrete Structures 3, 3</td>
</tr>
<tr>
<td></td>
<td>Discrete Structures (Accelerated) 4</td>
</tr>
<tr>
<td>CS 107</td>
<td>Programming Paradigms 5</td>
</tr>
<tr>
<td>CS 108</td>
<td>Object-Oriented Systems Design 4</td>
</tr>
<tr>
<td></td>
<td>Core total (including introductory programming) 18–25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Electives:</strong></th>
<th><strong>Units</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 courses from two different areas taken from the list below</td>
<td>24–33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Elective areas:</strong></th>
<th><strong>Units</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Systems:</strong></td>
<td></td>
</tr>
<tr>
<td>CS 140</td>
<td>Operating Systems 4</td>
</tr>
<tr>
<td>CS 143</td>
<td>Compilers 4</td>
</tr>
<tr>
<td>CS 145</td>
<td>Introduction to Databases 4</td>
</tr>
<tr>
<td>CS 148</td>
<td>Introduction to Computer Graphics 3</td>
</tr>
<tr>
<td></td>
<td><strong>Theory:</strong></td>
</tr>
<tr>
<td>CS 154</td>
<td>Automata and Complexity Theory 4</td>
</tr>
<tr>
<td>CS 157</td>
<td>Logic and Automated Reasoning 4</td>
</tr>
<tr>
<td>CS 161</td>
<td>Design and Analysis of Algorithms 4</td>
</tr>
<tr>
<td></td>
<td><strong>Artificial Intelligence:</strong></td>
</tr>
<tr>
<td>CS 121 or CS 221</td>
<td>Introduction to Artificial Intelligence 3</td>
</tr>
<tr>
<td></td>
<td>Artificial Intelligence: Principles and Techniques 4</td>
</tr>
<tr>
<td></td>
<td><strong>Numerical Computing:</strong></td>
</tr>
<tr>
<td>CS 137</td>
<td>Introduction to Scientific Computing 4</td>
</tr>
<tr>
<td></td>
<td><strong>Human-Computer Interaction:</strong></td>
</tr>
<tr>
<td>CS 147</td>
<td>Introduction to HCI Design 3–4</td>
</tr>
</tbody>
</table>

**Notes:**

1. AP units may be used to meet the introductory programming requirement.
2. All courses must be taken for a letter grade.
3. The minimum acceptable GPA is 2.0.
4. Only CS106A/B/X may be double-counted towards both major and minor requirements.
5. A maximum of one transfer credit course may be counted towards the minor requirements.
**Electrical Engineering Minor**

There are three options for completing a minor in Electrical Engineering, as outlined in the table below.

### Courses Filling the Minor in Electrical Engineering

<table>
<thead>
<tr>
<th>Option</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option I</td>
<td></td>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EE 101A</td>
<td>Signals and Systems I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EE 101B</td>
<td>Signals and Systems II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Four graded EE courses of level 100 or higher</td>
<td>13–21</td>
</tr>
<tr>
<td></td>
<td>Program total</td>
<td></td>
<td>26–34</td>
</tr>
<tr>
<td>Option II</td>
<td></td>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EE 102A</td>
<td>Electronics I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EE 102B</td>
<td>Electronics II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Four graded EE courses of level 100 or higher</td>
<td>13–21</td>
</tr>
<tr>
<td></td>
<td>Program total</td>
<td></td>
<td>28–36</td>
</tr>
<tr>
<td>Option III</td>
<td></td>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EE 108A</td>
<td>Digital Systems I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EE 108B</td>
<td>Digital Systems II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Four graded EE courses of level 100 or higher</td>
<td>13–21</td>
</tr>
<tr>
<td></td>
<td>Program total</td>
<td></td>
<td>28–36</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL ENGINEERING MINOR

The environmental engineering minor is intended to give students an in-depth introduction to one or more areas of environmental engineering. Departmental expertise and undergraduate course offerings are available in the areas of Environmental Engineering and Science, Environmental Fluid Mechanics and Hydrology, and Energy Engineering. The minimum prerequisite for an environmental engineering minor is MATH 42 (or MATH 21); however, many courses of interest require PHYSICS 53 and/or MATH 51 as prerequisites. Students should recognize that a minor in environmental engineering is not an ABET-accredited degree program.

Since undergraduates having widely varying backgrounds may be interested in obtaining an environmental engineering minor, no single set of course requirements will be appropriate for all students. Instead, interested students are encouraged to propose their own set of courses within the guidelines listed below; this list must be officially approved by the undergraduate minors adviser for the Civil and Environmental Engineering Department. Additional information, including “example” programs focusing on the three different areas of expertise listed above is available at http://cee.stanford.edu/undergrad_EnvE.html#minor.

General Guidelines

- An environmental engineering minor must contain at least 24 units of coursework not taken for the major, and must conform to the School of Engineering (SoE) minor requirements published in the Stanford Bulletin or the SoE undergraduate handbook.

- Complete a Major-Minor & Multiple-Major Course Approval Form which is available online (it can be downloaded from http://cee.stanford.edu), or in the department’s student services office (Terman M42), or at the information window at the Old Union.

- Prof. Robert L. Street (Bldg 524, Room R, 723-4969, email: street@stanford.edu) is the undergraduate minors adviser for the department of Civil and Environmental Engineering and will provide guidance and advice on the minor in Environmental Engineering. Students must consult with him in developing their minor program and must obtain his approval of that study list using the Major-Minor & Multiple-Major Course Approval form.

- Follow the instructions attached to the form. For the minor in Environmental Engineering, a completed and signed copy of the form must be filed with the department’s office of student services (Terman M42). As soon as this is done, step five can be executed.

Apply for the EnvE minor on AXESS. The student services administrator for undergraduate study in EnvE will then check the Major-Minor & Multiple-Major Course Approval Form to accept the declaration. Minors must be officially declared and all courses completed (or in progress) no later than the deadline for a student’s application to graduate.
MANAGEMENT SCIENCE AND ENGINEERING MINOR

The following courses fulfill the requirements for the minor in Management Science and Engineering. In addition, students must complete MATH 51 as a prerequisite.

COURSES FULFILLING THE MINOR IN MANAGEMENT SCIENCE AND ENGINEERING

<table>
<thead>
<tr>
<th>Core:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 60</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 62</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 120</td>
<td>5</td>
</tr>
<tr>
<td>MS&amp;E 121</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 180 or</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 181 or</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 182</td>
<td>4</td>
</tr>
<tr>
<td>MS&amp;E 242 or</td>
<td>3</td>
</tr>
<tr>
<td>MS&amp;E 245G</td>
<td>4</td>
</tr>
</tbody>
</table>

**Core total** 19–20

**Electives:**

Any 2 courses taken from the list below 6–8

| Program total       | 25–28 |

Approved elective courses:

| MS&E 107            | Interactive Management Science | 3 |
| MS&E 140            | Industrial Accounting           | 4 |
| MS&E 152            | Introduction to Decision Analysis | 4 |
| MS&E 160            | Analysis of Production and Operating Systems | 4 |
| MS&E 164            | Manufacturing Systems Design    | 5 |
| MS&E 169            | Quality Assurance and Control   | 4 |
| MS&E 181            | Issues in Technology and Work in Post-Industrial Economy | 3 |
| MS&E 182            | Work, Technology, and Society  | 4 |
| MS&E 193            | Technology in National Security | 3 |
| MS&E 197            | Ethics and Public Policy       | 3 |
**MATERIALS SCIENCE AND ENGINEERING MINOR**

A minor in the Department of Materials Science and Engineering allows interested students to explore the role of materials in modern technology and to gain understanding of the fundamental processes that govern materials behavior. The following courses fulfill the requirements.

**COURSES FULFILLING THE MINOR IN MATERIALS SCIENCE AND ENGINEERING**

<table>
<thead>
<tr>
<th>Core:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 50 Introductory Science of Materials</td>
<td>4</td>
</tr>
<tr>
<td>MATSCI 151 Microstructure and Mechanical Properties</td>
<td>4</td>
</tr>
<tr>
<td>MATSCI 152 Electronic Materials Engineering</td>
<td>3</td>
</tr>
<tr>
<td><strong>Core total</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

**Electives:**

<table>
<thead>
<tr>
<th>Electives:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any 4 courses taken from the list below</td>
<td>16</td>
</tr>
<tr>
<td><strong>Program total</strong></td>
<td><strong>27</strong></td>
</tr>
</tbody>
</table>

**Approved elective courses:**

| MATSCI 190 Organic Materials | 4 |
| MATSCI 191 Mathematical and Computational Methods in Materials Science | 4 |
| MATSCI 192 Solid State Thermodynamics | 4 |
| MATSCI 193 Atomic Arrangements in Solids | 4 |
| MATSCI 194 Phase Equilibria | 4 |
| MATSCI 195 Waves and Diffraction in Solids | 4 |
| MATSCI 196 Imperfections in Crystalline Solids | 4 |
| MATSCI 197 Rate Processes in Materials | 4 |
| MATSCI 198 Mechanical Properties of Materials | 4 |
| MATSCI 199 Electronic and Optical Properties of Solids | 4 |
MECHANICAL ENGINEERING MINOR

There are three options for students interested in minoring in Mechanical Engineering: a general minor that aims to expose students to the breadth of the field and two more specialized minors—Thermosciences and Mechanical Design—that allow students to pursue a particular area in more depth. The requirements for each of these minors are listed below.

GENERAL MINOR IN MECHANICAL ENGINEERING

This minor aims to expose students to the breadth of Mechanical Engineering in terms of topics and of analytic and design activities. Students interested in this minor must take the following courses as prerequisites: MATH 41, MATH 42, PHYSICS 53.

<table>
<thead>
<tr>
<th>Core:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 14</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 15</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 30</td>
<td>3</td>
</tr>
<tr>
<td>ME 70</td>
<td>4</td>
</tr>
<tr>
<td>ME 101</td>
<td>3</td>
</tr>
<tr>
<td>Plus any two of the following electives:</td>
<td></td>
</tr>
<tr>
<td>ME 80</td>
<td>3</td>
</tr>
<tr>
<td>ME 131A</td>
<td>4</td>
</tr>
<tr>
<td>ME 161</td>
<td>4</td>
</tr>
<tr>
<td>ME 203</td>
<td>4</td>
</tr>
<tr>
<td><strong>Program total</strong></td>
<td><strong>25–27</strong></td>
</tr>
</tbody>
</table>

THERMOSCIENCES MINOR

Students interested in this minor must take the following courses as prerequisites: MATH 41, MATH 42, MATH 51 (or ENGR 154), PHYSICS 53.

<table>
<thead>
<tr>
<th>Core:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 14</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 30</td>
<td>3</td>
</tr>
<tr>
<td>ME 70</td>
<td>4</td>
</tr>
<tr>
<td>ME 131A</td>
<td>4</td>
</tr>
<tr>
<td>ME 131B</td>
<td>3</td>
</tr>
<tr>
<td>ME 140</td>
<td>3</td>
</tr>
<tr>
<td><strong>Program total</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>
**MECHANICAL DESIGN MINOR**

This minor aims to expose students to design activities, supported by analysis. Students interested in this minor must take the following courses as prerequisites: MATH 41, MATH 42, PHYSICS 53.

<table>
<thead>
<tr>
<th>Core:</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 14: Applied Mechanics:Statics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 15: Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 80: Stress, Strain, Strength</td>
<td>3</td>
</tr>
<tr>
<td>ME 112: Mechanical Systems</td>
<td>4</td>
</tr>
</tbody>
</table>

*Plus any two of the following:*

<table>
<thead>
<tr>
<th>Plus any two of the following:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 99: Mechanical Dissection</td>
<td>3</td>
</tr>
<tr>
<td>ME 101: Visual Thinking</td>
<td>3</td>
</tr>
<tr>
<td>ME 203: Manufacturing and Design</td>
<td>4</td>
</tr>
</tbody>
</table>

*Plus one of the following:*

<table>
<thead>
<tr>
<th>Plus one of the following:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 113: Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>ME 210: Introduction to Mechatronics</td>
<td>4</td>
</tr>
<tr>
<td>ME 220: Introduction to Sensors</td>
<td>3</td>
</tr>
</tbody>
</table>

*Program total* 23–25
HONORS PROGRAMS

The departmental honors programs are designed to allow undergraduates with strong academic records and enthusiasm for independent research to engage in a significant project leading to a degree with departmental honors. This option is particularly valuable for students who intend to pursue a Ph.D. after college, because it provides research experience that helps prepare a student for doctoral-level work. Typically, these programs are competitive in terms of their admission, and also require that the student find a faculty member to supervise the work. Honors programs currently exist only in Civil Engineering, Computer Science, Electrical Engineering, Environmental Engineering, and Science, Technology and Society, although the School is encouraging other departments to establish honors programs as well. These programs are described in the remainder of this section.

CIVIL ENGINEERING

Highly qualified students in an engineering major can receive a B.S. with Honors in Civil Engineering by undertaking a more intensive course of study that includes an in-depth research project. To apply, you must find a faculty member in the CEE department who is willing to act as supervisor for your undergraduate honors thesis, and the two of you must agree upon a topic for the thesis project.

In the fourth quarter before graduation, you must submit for approval a written proposal describing the research to be undertaken. At the time of submittal you must have a GPA of at least 3.3 for coursework at Stanford and this GPA must be maintained until graduation. You must complete a written thesis of high quality, obtaining input from the School of Engineering Writing Program via ENGR 102S or its equivalent. Up to 10 units of CE 199H may be taken to support the research efforts. The ENGR 102S and CE 199H units are beyond the normal undergraduate program requirements. The thesis adviser must approve your written thesis. In addition to a written thesis, you are strongly encouraged to present your research results in a seminar.

COMPUTER SCIENCE

Selected computer science undergraduates whose academic records and personal initiative indicate that they have the necessary skills to undertake high-quality research in computer science may apply to the honors program. Applicants must be majoring in Computer Science, must have a GPA of at least 3.6 in courses that count toward the major, and must achieve senior standing (135 or more units) by the end of the academic year in which they apply. Coterminal
MS students are eligible to apply as long as they have not already received their undergraduate degrees. Beyond these requirements, students who apply for the honors program must also find a faculty member who agrees to serve as the thesis adviser for the project. Thesis advisers must be members of Stanford’s Academic Council.

Students who meet the eligibility requirements and wish to be considered for the honors program must submit a written application to the Computer Science undergraduate program office by May 1 of the year preceding the honors work. The application must include a letter describing the research project, a letter of endorsement from the faculty sponsor, and a transcript of courses taken at Stanford. Each year, a faculty review committee will select the successful candidates for honors from the pool of qualified applicants.

In order to receive departmental honors, students admitted to the honors program must do the following, in addition to satisfying the standard requirements for the undergraduate degree:

1. Complete at least 9 units of CS191 or 191W under the direction of their project sponsor.
2. Attend a weekly honors seminar in spring quarter.
3. Complete an honors thesis deemed acceptable by a committee consisting of the thesis adviser and at east one additional faculty member.
4. Present the thesis at a public colloquium sponsored by the department.
5. Maintain the 3.6 GPA required for admission to the honors program.

**ELECTRICAL ENGINEERING**

The Electrical Engineering Department offers a program leading to a Bachelor of Science in Electrical Engineering with Honors. This program offers a unique opportunity for qualified undergraduate majors to conduct independent study and research at an advanced level with a faculty mentor, graduate students, and fellow undergraduates. To qualify, students must complete following requirements:

1. Submit an application, including the thesis proposal, by Autumn Quarter of senior year signed by the thesis adviser and second reader (one must be a member of the Electrical Engineering faculty).
2. Maintain a grade point average of at least 3.5 in Electrical Engineering courses.
3. Take up to 10 units of EE 191. These units must be letter graded.
4. Submit two final copies of the honors thesis approved by your adviser and second reader.
5. Attend the Electrical Engineering Honors Symposium at the end of Spring Quarter and give a poster or oral presentation.
ENVIRONMENTAL ENGINEERING

Highly qualified students in an engineering major can receive a BS with Honors in Environmental Engineering by undertaking a more intensive course of study that includes an in-depth research project. To apply, you must find a faculty member in the CEE department who is willing to act as supervisor for your undergraduate honors thesis and the two of you must agree upon a topic for the thesis project.

In the fourth quarter before graduation, you must submit for approval a written proposal describing the research to be undertaken. At the time of submittal you must have a GPA of at least 3.3 for coursework at Stanford, and this GPA must be maintained until graduation. You must complete a written thesis of high quality, obtaining input from the School of Engineering Writing Program via ENGR 102S or its equivalent. Up to 10 units of CEE 199H may be taken to support the research efforts. The ENGR 102S and CEE 199H units are beyond the normal undergraduate program requirements. The thesis adviser must approve your written thesis. In addition to a written thesis, you are strongly encouraged to present your research results in a seminar.

SCIENCE, TECHNOLOGY, AND SOCIETY

Undergraduate engineering majors in all fields are encouraged to consider the STS Honors Program in the School of Humanities and Sciences. Earning "Honors in Science, Technology, and Society" requires completion of STS 101, three other STS courses (one offering ethical perspective, one historical perspective, and one social scientific perspective on STS phenomena), and an original senior honors thesis on a topic involving science or technology in society. In recent years, the STS Program has made substantial grants to undergraduate engineering majors in support of honors thesis research trips, to countries such as India, Kenya, and South Africa. For details on the STS Honors Program see the STS section of the 2003-04 Stanford Bulletin, contact the STS Office (3-2565), or e-mail STS Director Professor Robert McGinn (mcginn@stanford.edu). A number of past STS honors theses written by engineering students are on file in the STS Office and are available for inspection on request. At present, STS honors theses being written by engineering majors include a study of the role of the Internet in the process of social change in Iran, and the design of software for tele-diagnosis of health problems in rural India.
6. SPECIAL PROGRAMS AND ORGANIZATIONS

ENGINEERING DIVERSITY PROGRAMS (EDP)

The School of Engineering believes strongly in encouraging all students to succeed in engineering. Moreover, one of the great strengths of any educational system lies in having a student body that is both highly qualified and diverse in terms of culture, class, race, ethnicity, gender, background, work and life experiences, skills, and interests. Because of its strong belief in the value of diversity, the School especially encourages women, African Americans, Mexican Americans, Native Americans, Puerto Ricans and other Latinos, as well as others whose backgrounds and experience provide additional dimensions that enhance learning and equity to utilize the Engineering Diversity Program services and resources.

To underscore its dual commitment to excellence and the value of diversity, the School of Engineering provides a wide range of resources and services through the Engineering Diversity Programs (EDP), which are available to all Stanford students:

- Tutorial and Learning Programs, with an emphasis on 1:1 tutoring, test-taking strategies, learning styles, planning, and other communication skills (http://emp.stanford.edu/TP)
- Academic and general advising for undergraduate and graduate students, which includes academic skills development, creating four-year undergraduate plans, Ph.D. academic and professional development support and study groups
- Accelerated Calculus for Engineers (ACE) introductory mathematics series for additional credit units and added rigor
- Outreach to and recruitment of graduate EDP students
- Fellowships, teaching and research assistantships for Ph.D. EDP students and selected M.S. students
- Support and sponsorship of Society of Women Engineers (SWE), Society of Black Engineers and Scientists (SBSE), American Indian Science and Engineering Society (AISES), and Stanford Society of Chicano/Latino Scientists and Engineers (SSCLES)
- Stanford Summer Undergraduate Research Fellowships (SURF), research opportunities on campus that provide students access to faculty, research labs, local company visits, and workshops on graduate education
- Stanford Summer Engineering Academy (SSEA), a one-month residential program for entering freshmen that allows them to explore various engineering
and science fields. Taught by faculty, students are involved in hands-on and minds-on learning.

- Recruiting students for corporate EDP scholarships
- Engineering and Science Opportunity Job Fair, and diversity job and internship search support, which supplements that offered by the Career Development Center
- Graduate Environmental Support Seminar, Graduate Seminar on Teaching and Advising Methods, Graduate EDP Orientation, and Graduate Diversity Admit Weekend
- Graduate Peer Adviser Program, which matches interested undergraduate students with graduate students, faculty, alumni, deans, and corporate representatives in specific engineering fields.
TECHNICAL COMMUNICATIONS PROGRAM

The Technical Communications Program offers a variety of courses and tutorial services designed to help engineering students improve their writing and speaking skills and to prepare them to communicate effectively when they become professionals.

Each quarter the program offers several electives in technical/professional writing and public speaking/presentation development. These courses are specially designed for engineering students and stress regular individual tutorial instruction.

- **E102W—Technical/Professional Writing** (3 units). Consists of lectures, discussions, and weekly one-on-one tutorials. Writing assignments are designed individually to give students practice with the particular kinds of writing they will do as professionals and to help them overcome special writing problems.

- **E102S—Writing: Special Projects** (1 to 5 units depending on the amount of writing completed successfully). Designed to help students who are working on non-course-related material (journal articles, dissertations, theses, and so on) to improve their writing. The course consists of weekly one-on-one tutorials.

- **E103—Public Speaking** (3 units). Introduces students to the full range of speaking activities, from impromptu talks to carefully rehearsed formal presentations. This practical course helps students develop confidence in their speaking ability through weekly practice in class, rehearsals in individual tutorials, and videotaped feedback.

In addition to these courses, the Technical Communications Program also provides non-credit **Drop-In Speech and Writing Tutorial Services**. Students can meet with speech tutors who will help them plan presentations, design visual aids, or rehearse using videotape. Engineering students who wish to improve their writing can arrange to meet with trained, experienced tutors who will help them draft or revise reports or papers, concentrating not on technical content, but on organization, style, and mechanics.

For further information on courses or services, contact Dave Lougee in Terman 105 (telephone: 723-2573; e-mail: dlougee@stanford.edu).
STANFORD TECHNOLOGY VENTURES PROGRAM

The Stanford Technology Ventures Program (STVP) is the entrepreneurship center within the Stanford University School of Engineering, hosted by the department of Management Science and Engineering. STVP’s mission is to build a world-class center dedicated to accelerating high technology entrepreneurship research and education for engineers and scientists worldwide. STVP’s believes that engineers and scientists need entrepreneurial skills to be successful at all levels within organizations, and prepares students for leadership positions in industry, universities, and society. STVP consists of courses, conferences, on-line resources, and scholarly research on high technology entrepreneurship. More information can be found at the program’s web site at http://stvp.stanford.edu.

MAYFIELD FELLOWS PROGRAM

The Mayfield Fellows Program (MFP) is a key component of the Stanford Technology Ventures Program. MFP provides juniors, seniors and co-terminal masters students in engineering and the sciences with a nine-month work/study program focusing on entrepreneurship. This includes all three courses in the “Management of Technology Ventures” series (ENGR140A, ENGR140B, and ENGR140C). These courses use a multidisciplinary approach to teaching entrepreneurship, including small seminar-style classes, a paid summer internship at a start-up company, and off-site meetings with leaders in the entrepreneurial community. In addition, each student is matched with three mentors including their summer employer, a venture capitalist, and a MFP alumnus.

MFP runs from March through December of each year. Completed applications are due by February 1. A dozen students are admitted each year. Additional information is available at the program’s web site at http://stvp.stanford.edu/teaching/mayfield.html.
STANFORD CENTER FOR PROFESSIONAL DEVELOPMENT

The Stanford Center for Professional Development (SCPD) collaborates with School of Engineering faculty and other Stanford University departments to provide graduate education and short courses for engineers, scientists, technology professionals and managers in industry. SCPD offers Graduate Degrees through the Honors Cooperative Program, certificate programs, and individual courses for academic credit or audit. Courses are delivered via distance learning technologies including television broadcast, videotape instruction and Stanford Online. Professional Education programs help participants expand their professional networks and advance in their fields through a wide range of on-campus, online or on-site short courses. Additional information is available by calling 725-3016.

THE HONORS COOPERATIVE PROGRAM

The Honors Cooperative Program (HCP) enables students who are employed full-time to pursue graduate degree study on a part-time basis through the Stanford Center for Professional Development. HCP students must be admitted as official Stanford University graduate students, receive the same course materials and assignments, and are held accountable to the same standards as on-campus students. Call 725-3016 for more information.
ENGINEERS AND OVERSEAS STUDIES

*I think it is important to emphasize that an overseas study experience is a process and a challenge rather than a lecture or unit, that only by living with native citizens, subject to the same conditions under which they operate, can real insight into a foreign (or even one’s own) culture come. Studying abroad can add wonderful depth to an education, but only if it is approached with an appreciation for that foreign nation, its people, and its problems.* —OSP Moscow Alum

For many years the School of Engineering and the Overseas Studies Program (OSP) have worked together to provide outstanding opportunities for engineering majors to study, work and experience life in other countries. Careers in engineering frequently have an international component—whether through working as a consultant in another culture, transferring for a period of time to another country, or establishing an enterprise and developing contacts in other areas of the world. Achieving cultural literacy in another country provokes reflection on the differences and similarities among societies and prepares students to work in an international context.

With careful planning, most engineering students can fit study at one of Stanford’s overseas centers into their plans. OSP encourages students to talk with their advisers early on, as early as freshman year, about planning one or more quarters abroad. By starting early, students can plan for required engineering courses and language acquisition and then be able to study and work abroad while making progress toward their Stanford degrees. Several programs require minimal language study prior to enrollment. Most programs include courses that satisfy the University General Education Requirement in Area 3: Humanities and Social Sciences, so prospective engineering majors could plan to fulfill one or two GERs abroad. In addition, two of the engineering fundamentals courses, ENGR 40 and ENGR 50, are now offered as tutored video courses by some overseas centers; courses fulfilling the Technology in Society requirement are offered at some centers; and participation in the Kyoto-SCTI program itself fulfills the TIS requirement.

The Associate Dean for Student Affairs in Engineering as well as the staff and student advisers in Overseas Studies can help students understand how to integrate coursework taken overseas into overall academic planning.
Information about Stanford’s programs, including courses offered, is available on the Web: [http://osp.stanford.edu/](http://osp.stanford.edu/). Students are also encouraged to stop by the Overseas Studies Office on the first floor of Sweet Hall. The following program information highlights opportunities that might be of special interest to engineers.

**AUSTRALIA**

Beginning in fall of 2003, OSP will be offering our newest program, which sends students along the eastern coastline of Australia emphasizing topics on Australian Coastal Studies. This program has been established in collaboration with the Centre for Marine Studies at the University of Queensland. Up to 48 students are enrolled in four required academic modules. The four modules are Coral Reef Ecosystems, Coastal Zone Management, Coastal Forest Ecosystems, and Australian Studies. Civil and Environmental Engineering has approved credit for the first three of these four courses. In addition, students will complete Targeted Research Projects, under the supervision of University of Queensland instructors, on topics of their own choosing. The opportunity to do hands-on research will greatly enhance students’ research skills.

**BERLIN**

*My internship experience in Berlin really complemented what I’d learned in my engineering classes. In fact, I felt that I received two educations for the price of one. I did a long internship, and it was worth it. Doing a long internship means you can learn more, show more effort, and the company gets a better feel for you. They might even hire you back. I’m a very obvious example of staying longer. I’m back in Germany now working for the same company as a permanent employee.*

—OSP Berlin Alum

Since 1982 the Stanford Program in Berlin, with support from the Krupp Foundation, has offered paid internships in Germany to engineering students and others. Internships are available in virtually all engineering fields.

The Berlin Center is open for study in autumn, winter, and spring quarters. Students planning to do an internship may study for one or more quarters and stop out in the succeeding quarter(s) to participate in a full-time paid internship. The Internship Coordinator works to place students in internships closely related to their academic and career interests. Internship placements can be in private companies and public institutions and pay a modest salary that covers living expenses.
Internships last at least three months, and in many cases may be extended to six months or longer.

Students can take a minimum of two quarters of German prior to arrival in spring quarter or they can enroll in beginning intensive German in Berlin during fall and winter quarters. The equivalent of three quarters of German is required before beginning an internship. More advanced German skills broaden possible internship opportunities. Internships tend to be more rewarding for those engineering students – advanced junior, senior, and co-term – who have already taken a number of engineering courses. Past internship hosts have included: BMW, Mercedes-Benz and Fraunhofer Institutes for Mechanical Engineers; Hewlett-Packard, Siemens, and Yahoo for Computer Science students, Bayer and BASF for Chemical Engineers; Gesellschaft für Strahlen und Umweltforschung (environmental work), Hochtief, and the Wasserwirtschaftsamt for Civil Engineers, and Deutsche Bank and Bosch for Management Science and Engineering students. After returning to campus students can work with the Department of German Studies to reflect on their experiences while maintaining their German skills and earning academic credit.

In some quarters, a Stanford engineering professor will teach at the Berlin Center. During these quarters, one or more engineering-oriented courses are taught in addition to the regular course offerings in German history, culture and economics. ENGR 40 and ENGR 50 are offered as tutored video courses every quarter. Courses satisfying the School of Engineering’s Technology in Society requirement are also offered. During the 2003-04 year, courses with credit in Science, Technology, and Society include, Architecture and the City, 1871-1990: Berlin as a Nucleus of Modernity (STS 119V) and Industry, Technology and Culture, 1780-1945 (STS 120V).

FLORENCE

It was the most integrated academic experience I've ever had; I truly felt like I was learning every moment of the day. My classes, almost all about modern Italy, dovetailed with each other, but also dealt with issues I was confronting every day in the newspapers, with my Italian "family," with Italian friends and in movies and music.

—OSP Florence Alum

Home to Galileo, Leonardo da Vinci, Marconi, and Brunelleschi’s Dome, Florence provides unique intellectual and visual resources of the city for students studying Renaissance History and Art, as well as Contemporary Italian and European Studies. Moreover, the program is structured to help integrate students as fully as possible into Italian culture through-homestays, language
partners, and volunteer work. A minimum of one year of Italian is required; a second year is recommended for participation in courses through Florence University. ENGR 50 is offered as a tutored videotaped course autumn, winter, and spring quarters. Students studying in Florence during Winter Quarter can elect to participate in a Spring Quarter academic internship program. Product Design students have found Florence a particularly well-matched location of study due to its flourishing arts and architectural innovations.

KYOTO — STANFORD CENTER FOR TECHNOLOGY AND INNOVATION (SCTI)

My mentor was the only female engineer and she was terrific. She is still a source of inspiration to me, and we have kept in contact since. I learned more about Japanese companies by being there than you can ever learn in books... during everyday experiences like the morning group meeting to the relatively rare like the group “off-site” sleepover party at a hot spring spa. —Kyoto-SCTI Alum

Kyoto SCTI introduces students to the organization of the scientific and advanced industrial sectors of contemporary Japan through a quarter of study followed by a paid internship. It is designed for students with intellectual interests in the production, management, and politics of advanced economic and technological systems, including engineering majors in all fields of study whose career prospects will be enhanced by knowledge of Japan. During Spring Quarter the academic program focuses on the ways in which culture, institutions, and technology issues are organized in modern Japan. In most years, a member of the Stanford engineering faculty is resident at SCTI in the spring. ENGR 40 and ENGR 50 are also offered as tutored video courses. To be eligible to study at SCTI, engineering students must have completed at least two quarters of Japanese Language, Culture, and Communication B (JLCC). Students majoring in Management Science and Engineering are strongly encouraged to complete five quarters in the B track of JLCC, since internships in this area generally require stronger language skills. Returned students and alumni encourage all participants to gain as much language background as possible before entering the academic program and the internship.

The Internship Coordinator in Kyoto works to place all students in paid internships closely related to their academic and career interests. All students are expected to participate in an internship in Japan from July to mid-September. Placements have included internships with Argo 21, Fuji Soft, Hitachi, Horiba, IBM, Intel, Kawasaki, NTT, Obayashi, Omron, Panasonic, Sanyo, Seiko Epson, and others.
OXFORD

My academic work at Oxford reached a level of intensity that was difficult to attain at Stanford because the one on one tutorials forced me to focus my research interest into a coherent investigation of a single question. I have never been so excited to do research in my life because Oxford gave me a brilliant and energetic teacher that met with me individually for two to three hours per week. It was the first time that I ever felt like I had a part in the learning process because the classes were driven solely by my input and interest.

—OSP Oxford Alum

The Stanford program in Oxford offers tutorials as a regular part of the curriculum in autumn, winter, and spring quarters. As the characteristic pedagogical method for undergraduates at Oxford, the tutorial is a highly personalized, demanding, and rewarding form of instruction that involves weekly meetings between a student (or, occasionally, two students) and a member of the Oxford academic community. Tutorials on selected topics in Engineering are possible. The OSP office in Sweet Hall has binders with past tutorial logs which students can review to see the range and specifics of past tutorials. In winter 2003-04, STS 128V: British Technology and the Second World War will be offered.

PARIS

Studying in Paris was incredible and I think impossible to completely understand unless experienced. Not only was having classes in French in a French university setting interesting, but it seemed like the entire city acted like a classroom. All academic, artistic, social, and cultural experiences are part of the program.

—OSP Paris Alum

The Overseas Studies Program, the School of Engineering, and the Department of French and Italian are working together to provide opportunities for engineering students studying in Paris. The Stanford Program in Paris is located in the Institut Supérieur d’électronique de Paris (ISEP). ENGR 40 (Autumn, Spring) and ENGR 50 (Autumn, Winter, Spring) are offered as video courses with weekly tutoring by a member of the ISEP faculty. One year of college-level French is required and students with two years of college-level French will have access to additional engineering courses taught in French. Internship arrangements are continuously being expanded in France. One of the newest internship offerings involves participation in an Electronic Engineering Lab during the winter, spring, or summer (excluding August) quarters. Students are expected to have some background in electronics or microelectronics.
**Stanford University/Ecole Central Paris Program**

Although it is not formally part of the Overseas Studies Program, Stanford engineering students can receive credit for study abroad at Ecole Centrale Paris and earn a prestigious French engineering degree along with their BS/MS at Stanford. This program is particularly well suited to undergraduates who intend to apply for a coterminal degree at Stanford.

Ecole Centrale Paris is one of the best-known science and engineering schools in France and Europe. From its foundation in 1829, its vocation has been to educate engineers for industry. Well-known industrialists and engineers who have graduated from the school include Eiffel, Michelin and Peugeot.

The Stanford/ECP Program leads to the awarding of three degrees: BS/MS from Stanford, Diplôme d’Ingénieur from Ecole Centrale Paris.

The Program involves two years of study at junior/senior level at Ecole Centrale Paris with credit transfer from ECP to Stanford and the completion of a BS/MS at Stanford.

Requirements for the program include:
- Basic knowledge of French (2 years at college level) Students may register for intensive summer language courses in French, if necessary.
- Excellent academic background.

For updated information, visit the EE Web site at: [http://ee.stanford.edu/](http://ee.stanford.edu/) or contact Prof. Robert M. Gray, Vice Chairman, Electrical Engineering Department.

**Overseas Seminars**

For those students who want to get an initial taste of being overseas, OSP now offers Overseas Seminars. Theses seminars provide the opportunity for 12-15 students to go abroad for intensive, three-week courses taught by Stanford faculty. The seminars focus on locally relevant topics and include local travel to supplement class work. The seminars are offered for two units of autumn quarter credit and will conclude before the start of autumn quarter, allowing students to return to campus before classes begin. Sophomores, juniors, and seniors are eligible to participate. Seminar locations for 2003-04 are in the Alps, Belgium, Great Britain, India, Korea, Mexico, and South Africa. Each year, there will be a changing array of seminars offered in a variety of locations.
ALL LOCATIONS

In any quarter of study, Stanford Engineering faculty members may be Faculty in Residence at one of the Stanford Centers, thus providing additional opportunities for engineering students. A more complete and up-to-date description of the range of academic options offered by the Overseas Studies Program may be found at: http://osp.stanford.edu.
STUDENT ENGINEERING SOCIETIES

TAU BETA PI

Tau Beta Pi is the only engineering honor society that represents the entire engineering profession. It is the nation’s second oldest honor society and was founded at Lehigh University in 1885 to recognize students of exemplary character and distinguished scholarship. There are now collegiate chapters at 221 US colleges and universities, active alumni chapters in 16 regions across the United States, and a total initiated membership of 429,000.

The California Gamma chapter of Tau Beta Pi at Stanford serves the Stanford community by providing valuable engineering resources. For example, the online Engineering Course Guide, which was recently merged with the ASSU course guide (http://assu.stanford.edu/guide), provides useful feedback and information about the various engineering classes offered at Stanford. Peer tutoring services, conducted regularly at the Engineering Consulting Center (Terman 151), help increase both understanding and interest in science, mathematics, and engineering. The newest addition to our list of services is the Engineering E-Advising program (http://www.stanford.edu/group/tbp/advising), which provides an online forum for undergraduates to ask upperclassmen questions regarding different majors, careers, and research opportunities in the engineering field. TBP members are also involved in selecting the recipient of the Tau Beta Pi Teaching Award for Excellence in Undergraduate Engineering Teaching, as well as organizing engineering panels, industry banquets, and community service events.

To be officially elected as a member of Tau Beta Pi, you must fulfill the candidacy requirements of the Gamma Chapter through participation in service and fellowship activities. In addition, you must be a declared engineering major and have placed within the top one-eighth of your class as a sophomore or the top one-fifth of your class as a junior. While it is considered an honor to be elected into Tau Beta Pi, one does not need to be an official member to participate in the activities organized by the society. For more information, please visit our website at http://www.stanford.edu/group/tbp, stop by the Office of Student Affairs in Terman 201, or send an e-mail to president@taubetapi.stanford.edu.

STANFORD ENGINEERING ASSOCIATION

The Stanford Engineering Association (SEA) is a board of students whose primary aim is to help unite students, faculty, staff, and administrators within the School of Engineering and related departments. SEA also strives to enhance the academic, social, and cultural life of the Stanford engineering community. SEA receives a portion of the profits from the food concession located
on the bottom floor of Terman. The association awards grants to individuals and groups in support of projects realizing SEA’s objectives. Please see http://www.stanford.edu/group/SEA for more information and proposal criteria.

**Institute of Electrical and Electronics Engineers**

The Stanford Institute of Electrical and Electronics Engineers (IEEE, pronounced “eye-triple-E”) is the EE-department-backed academic, professional and networking society for computer science and electrical engineering students. IEEE is a professional association of over 350,000 engineers in 150 countries, and focuses on intellectual curiosity, career development and direction of the technology community. At Stanford, the organization provides access to peers, more advanced students, professors and industry engineers to foster a more complete engineering education experience beyond just the classroom. IEEE sponsors opportunities in programming and electronic design competitions, community service, mentorship, research, and scholarship grants. Please visit the website at http://www.stanford.edu/group/ieee for more information.

**Business Association of Stanford Engineering Students**

The Business Association of Stanford Engineering Students (BASES) is the primary extra-curricular vehicle for engineering students who are interested in technology and entrepreneurship. Their goal is to develop the next generation of entrepreneurial leaders. BASES hosts a collection of programs on campus, including an annual business plan competition, a weekly lecture series with talks by technology and business leaders, a start-up job fair, a research showcase, and many networking activities. For more information about BASES, visit their website at http://bases.stanford.edu.

**Stanford Undergraduate Research Journal**

In September of 2001, the Stanford Undergraduate Research Journal (SURJ) was created as a forum for undergraduates to share their research with the entire Stanford community. Today, SURJ is an established force on campus promoting intellectual curiosity and multi-disciplinary literacy. With an annual publication that accepts around 12% of original research submissions through the peer-review process, SURJ is Stanford’s first and only academic journal that features all disciplines, including Natural Sciences & Engineering, Humanities, and Social Sciences. Interested authors should join surj-infoline@lists.stanford.edu and have an original research manuscript ready by early February. Staff and editor positions are also available if you wish to engage in the peer-review process as part of the Editorial Board, help develop the
financial platform for sustaining a major publication, or join the design team that creates the look and feel of the Journal. For more information about how to join or contribute research to SURJ, and to view past editions of the Journal, please visit our website at http://surj.stanford.edu.

**Technology Assist by Students**

Blending technology with community service, Technology Assist by Students (TABS) encourages the socially conscious side of engineering and other tech-savvy students. TABS provides free computer and information technology consulting for Bay Area non-profit organizations and schools. In Autumn 2002, TABS launched an internship program through which students have the opportunity to design and create technologies that can dramatically improve the workflow and administrative efficiency of local nonprofit organizations. Interns work on projects that range from networking to graphic design, tech support to website development, desktop publishing to database-driven web applications. Through TABS, students apply their technical skills toward volunteerism and know that their work truly makes a difference. Visit [http://tabs.stanford.edu](http://tabs.stanford.edu) to find out how you can join TABS or apply for an internship position.
RESEARCH PROGRAMS FOR UNDERGRADUATES

Engaging in independent research under the direction of a faculty member can be one of the most exciting and rewarding experiences of your undergraduate career. The Research Experience for Undergraduates (REU) Program is designed to give undergraduates the chance to work with faculty and their research groups on advanced research projects. The program runs ten weeks, from June (beginning shortly after commencement) through August. The program is coordinated jointly by the Office of the Vice Provost for Undergraduate Education, the Office of Student Affairs in the School of Engineering, and the individual engineering departments.

Students who are accepted into the program will receive a summer stipend. On-campus housing in the Summer Research College and a meal plan will also be provided. Whether you are well into your major or still testing the waters, all engineering students are strongly encouraged to consider taking advantage of what the REU program can offer. To find out more about the opportunities and how to apply, contact the Director of Student Services in your major department. The application deadline is typically in early April.
7. SUMMER EMPLOYMENT AND CAREER PLANNING

Stanford’s School of Engineering is fortunate to be part of a major university with strengths in the humanities and sciences as well as engineering. Our curriculum has been designed to encourage engineering students to take maximum advantage of Stanford’s liberal arts by requiring a practical minimum of technical courses in the engineering major. This broader education does not handicap Stanford’s engineering students once in the profession, because they are well trained in fundamentals and have broad skills required for leadership. However, one way to extend one’s engineering training is through summer work experience. The School recommends that each student have a summer work experience or technical internship before graduation. Generally this can be arranged through the Career Development Center (CDC) if planning is started in the Fall Quarter. Some overseas work experiences are also available through the Overseas Resource Center of Bechtel International Center or through internships linked with the Overseas Studies Program in Berlin.

CAREER DEVELOPMENT CENTER

The Career Development Center (CDC) is eager to assist undergraduate and graduate engineering students in locating full-time employment, internships and summer employment experiences. Our Web page, http://www.stanford.edu/dept/CDC will provide you with an overview of our services and programs.

The following is a listing of key CDC resources/programs that you will find helpful:

- **Stanford Job/Internship Listings on the Web**: Unlike other Web sites, only Stanford students and alumni have access to Cardinal Careers, the CDC’s jobs database. To access the database, please register with the CDC and Cardinal Careers at http://cardinalcareers.stanford.edu/register.htm.

- **On-Campus Jobs/Work Study**: If you need a job during the school year, the jobs database also lists on-campus jobs including Federal Work Study opportunities.

- **Cardinal Recruiting**: This service allows students to interview with companies on-campus. To find out more information about the types of companies that participate, how to register, and the relevant policies and procedures, please check out the CDC Cardinal Recruiting web page at http://cardinalrecruiting.stanford.edu/recruiting.
• **Career Fairs:** The CDC hosts a number of career fairs throughout the year. The first fair of the year will be held on Tuesday, October 7, 2003. This is typically the largest career fair of the academic year. For more information about this year’s fair, go to [http://cardinalcareers.stanford.edu/recruiting/job_fairs.html](http://cardinalcareers.stanford.edu/recruiting/job_fairs.html).

• **Resume Writing, Interviewing, and Job Hunting Strategies:** The CDC supports all aspects of the job search process. We have handouts, web pages, workshops, an extensive career resource library, and career counselors available to assist you with your job search. For information about our resources and services, please go to [http://www.stanford.edu/dept/CDC/students](http://www.stanford.edu/dept/CDC/students).

• **Professional Assistance:** Students may meet with Career Counselors to discuss their career-related concerns. Call 725-1789 to schedule an appointment.

• **Calendar of Events:** For a comprehensive schedule of the CDC’s programs and activities, go to [http://cardinalcareers.stanford.edu/calendar](http://cardinalcareers.stanford.edu/calendar).

• **Reference File Service:** Opening a reference file is a convenient way of having your letters of reference forwarded directly to prospective employers and/or graduate admissions offices. You must be a senior within three quarters of graduation, a graduate student, or alum to establish a file. However, freshmen, sophomores, and juniors may store letters in the Records Department to be used later. Go to [http://rfs.stanford.edu/reference/RRlogin.jsp](http://rfs.stanford.edu/reference/RRlogin.jsp).

### OVERSEAS RESOURCE CENTER

The Overseas Resource Center (ORC), located on the second floor of the Bechtel International Center, provides information and advising on international opportunities to students and community members. There are numerous opportunities for technical students who wish to pursue overseas study, research, or work opportunities. Visit the ORC or consult our website at [http://www.stanford.edu/dept/icenter/orc](http://www.stanford.edu/dept/icenter/orc) to find out what’s available!

• **Study Abroad.** Information and advising on thousands of study opportunities all over the world—direct enrollment and programs sponsored by U.S. institutions, summer and multi-semester/year programs, language schools, and research opportunities. Talk to study abroad returnees by consulting the Global Mentorship Network at the ORC.

• **Work Abroad.** Information on short-term work, internships, volunteer and teaching abroad opportunities for technical and non-technical students. Resources include: Opportunity listings, *International Internships, Directory of American Firms Operating in Foreign Countries, Transitions Abroad* magazine, and other helpful publications. Many resources can be found on the ORC website and listed here are three of the most popular work abroad programs for Stanford students.

• **IAESTE TRAINING PROGRAM**

The International Association for the Exchange of Students for Technical Experience (IAESTE) is an exchange program that provides opportunities for on-the-job practical training for students in engineering, architecture, agriculture,
mathematics, computer science, natural and physical sciences in 70 member countries. Participants must have completed their sophomore year. Trainees are paid a maintenance allowance adequate to cover living costs while in training. Fluency in the language is required for some countries. For more information, please visit the IAESTE website at http://www.iaeste.org.

- **COUNCIL ON INTERNATIONAL EDUCATIONAL EXCHANGE (CIEE)**
  CIEE coordinates programs in Ireland, Germany, France, Australia, New Zealand, Costa Rica and Canada that allow U. S. students to obtain a work visa. If you are interested in arranging an internship or work experience in any of the above countries, please see the Council website: http://www.councilexchanges.org/work/index.htm.

- **BUNAC**
  Coordinates work programs in Britain and Australia. Please see the BUNAC website at http://www.bunac.org.

- **Scholarships for Study and Research Abroad.** Information on several hundred scholarships—from travel grants to one/multi-year, fully-funded study and research opportunities can be found in the ORC. The ORC also serves as the campus administrator for the following scholarships:

  Rhodes, Marshall, Churchill, Mitchell, Fulbright, DAAD, Bundeskanzler, IIE Asia/Pacific Travel Grant, the Adventure Travel Network-Stanford Worldwide Travel Grant, The National Security Education Program and the American University in Cairo Internship.

  For details on these scholarships, please see the International Center’s web site at http://www.stanford.edu/dept/icenter/orc/scholarships/scholarships.html.

- **Travel Services** include: Passport Photos (Black & White or Color), International Student Identity Cards, and Youth Hostel Membership Cards. General travel information, visa/passport requirements, and U.S. State Department Travel Advisories and Reports are also available.

- **ORC-News.** An electronic newsletter published and distributed by the Overseas Resource Center at Stanford University. ORC-News provides information on overseas study, work, scholarship, and travel opportunities available through the Overseas Resource Center. ORC-News is distributed weekly during the academic year. To subscribe, please send an e-mail message to majordomo@lists.stanford.edu with the following command in the body of the message: SUBSCRIBE ORC-NEWS. This will automatically enter your subscription to ORC-News and you will receive a confirmation/welcome notice.

**FUNDAMENTALS OF ENGINEERING EXAM**

Many engineers, especially those in Civil and Environmental Engineering and Mechanical Engineering, will find it an important step in their careers to become Registered Professional
Engineers in the state in which they intend to practice. The first step in becoming registered is to take and pass the Fundamentals of Engineering (FE) examination (formally the Engineering-In-Training, or EIT, exam). All engineering students should consider taking the FE exam, whether or not they currently envision becoming licensed engineers. The exam is broadly based, takes eight hours, and covers basic topics such as calculus, physics, chemistry, statics, thermodynamics, circuits, and so forth. It is much easier to pass the exam while these basic subjects are still relatively fresh, and hence it is highly recommended that the exam be taken toward the end of the senior year or shortly thereafter. For more information, visit http://www.dca.ca.gov/pels.

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<th>Date</th>
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<td>FE/EIT:</td>
<td>April 17, 2004</td>
<td>February 13, 2004</td>
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<td>October 30, 2004</td>
<td>August 20, 2004</td>
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<tr>
<td>Special Civil:</td>
<td>April 17, 2004</td>
<td>January 2, 2004</td>
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<td>October 30, 2004</td>
<td>July 23, 2004</td>
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<td>April 16, 2005</td>
<td>January 7, 2005</td>
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<tr>
<td>ChE/Civil/EE/ME:</td>
<td>April 16, 2004</td>
<td>January 2, 2004</td>
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<td>October 29, 2004</td>
<td>July 23, 2004</td>
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<td>April 15, 2005</td>
<td>January 7, 2005</td>
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APPENDIX A
PROGRAM REQUIREMENTS FOR ENGINEERING MAJORS

AERONAUTICS AND ASTRONAUTICS
BIOMEDICAL COMPUTATION
CHEMICAL ENGINEERING
CIVIL ENGINEERING
COMPUTER SCIENCE
COMPUTER SYSTEMS ENGINEERING
ELECTRICAL ENGINEERING
ENVIRONMENTAL ENGINEERING
MANAGEMENT SCIENCE AND ENGINEERING
MATERIALS SCIENCE AND ENGINEERING
MECHANICAL ENGINEERING
PRODUCT DESIGN
AERONAUTICS AND ASTRONAUTICS

The principal purpose of the undergraduate Interdisciplinary Major in Aeronautics and Astronautics is to prepare students who are strongly interested in aerospace for subsequent graduate study in the field. In particular, it is expected that students completing this undergraduate curriculum can then satisfy the requirements for the degree of Master of Science in Aeronautics and Astronautics at Stanford University in one additional academic year or, alternatively, complete the B.S. in General Engineering and the M.S. in Aeronautics and Astronautics as a co-terminal program in five years.

Another objective of the program is, of course, to provide an opportunity for interested undergraduates to become acquainted with the challenges of the aerospace field, with aeronautical and astronautical principles, and with the faculty who teach and do research in aeronautics and astronautics.

(Students interested in aerospace are also encouraged to consider the undergraduate minor in Aeronautics and Astronautics, which is described in the "Minors" section of this Handbook.)

The departmental requirements of this Major include a core set of courses required of every Aeronautics and Astronautics major, a set of depth areas from which two areas (four courses) must be chosen, and an engineering elective. Students are expected to consult closely with an advisor about how best to satisfy these and all the other requirements of the major, to submit a program planning sheet when declaring the major, and to have a final program planning sheet approved by the advisor and department at least one quarter prior to graduation.

Requirements
Mathematics: 24 units (Fr, So, Jr)
Mathematics through ordinary differential equations is required by depth courses. Some statistics is desirable. For a list of acceptable courses, see the Mathematics Requirement section of this handbook. Required: Ordinary Differential Equations (MATH 53, or ENGR 155A).

Science: 18 units (Fr, So)
For a list of courses approved by the School, see the Science Requirement section of this handbook. Aero/Astro depth courses rely on a strong foundation in classical physics, particularly mechanics. Chemistry is needed for students without high school chemistry and is recommended for others. Required: Physics 53 and either 23 or 55, plus one further physics course.
Technology in Society: 1 course
See the Technology in Society Requirement section of this handbook for a list of courses that fulfill this requirement.

Engineering Fundamentals: 3 courses minimum, at least one of which must be unspecified by the department

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>UNITS</th>
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<tbody>
<tr>
<td>ENGR 14</td>
<td>Statics (req’d)</td>
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<tr>
<td>ENGR 30</td>
<td>Engineering Thermodynamics (req’d)</td>
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<tr>
<td>ENGR 70A or 70X</td>
<td>Programming Methodology</td>
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Departmental Requirements: 39 units

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<th>COURSE</th>
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<tr>
<td>AA 100</td>
<td>Introduction to Aeronautics &amp; Astronautics</td>
<td>3</td>
</tr>
<tr>
<td>ME 70</td>
<td>Introductory Fluids Engineering</td>
<td>4</td>
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<tr>
<td>ME 131A</td>
<td>Heat Transfer</td>
<td>5</td>
</tr>
<tr>
<td>ENGR 15</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 161 or PHYSICS 110</td>
<td>Dynamic Systems or Intermediate Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>CEE 101A or ME 80</td>
<td>Introduction to Structural Analysis or Stress Strain and Strength</td>
<td>3</td>
</tr>
<tr>
<td>AA 190</td>
<td>Directed Research &amp; Writing in Aero/Astro *</td>
<td>3</td>
</tr>
<tr>
<td>Depth Area I</td>
<td>two courses from a department Depth Area (see Depth Area lists below)</td>
<td>6</td>
</tr>
<tr>
<td>Depth Area II</td>
<td>two courses from a second Depth Area</td>
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</tr>
<tr>
<td>One engineering elective</td>
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<td>3</td>
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</table>

* Students should discuss their AA190 (WIM) with advisor & Student Services Manager during junior year.
**Depth Areas**

Students should select four courses from the list below, two from each of two areas. One additional engineering elective (at least 3 units) should also be selected; this may an additional course from any of the depth areas below, another course in Aeronautics and Astronautics, or an appropriate elective from another Engineering department. In any case, the choice of depth areas and engineering elective should be determined in consultation with the Aeronautics and Astronautics major advisor.

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>UNITS</th>
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<tbody>
<tr>
<td><strong>Dynamics and Controls</strong></td>
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<tr>
<td>ENGR 105</td>
<td>Feedback Control Design</td>
<td>3</td>
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<tr>
<td>ENGR 205</td>
<td>Intro to Control Design Techniques</td>
<td>3</td>
</tr>
<tr>
<td>AA 242A</td>
<td>Classical Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>AA 279</td>
<td>Spacecraft Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>AA 271A</td>
<td>Dynamics and Control of Aircraft and Spacecraft</td>
<td>3</td>
</tr>
<tr>
<td><strong>Systems Design</strong></td>
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<tr>
<td>AA 241A,B</td>
<td>Aircraft Design</td>
<td>3, 3</td>
</tr>
<tr>
<td>AA 236A,B</td>
<td>Spacecraft Design</td>
<td>3-5, 3</td>
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<tr>
<td><strong>Fluids and CFD</strong></td>
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<tr>
<td>AA 200A</td>
<td>Applied Aerodynamics</td>
<td>3</td>
</tr>
<tr>
<td>AA 210A</td>
<td>Compressible Flow</td>
<td>3</td>
</tr>
<tr>
<td>AA 214A</td>
<td>Computational Fluid Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>AA 283</td>
<td>Aircraft &amp; Rocket Propulsion</td>
<td>3</td>
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<tr>
<td>ME 131B</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td><strong>Structures</strong></td>
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<tr>
<td>AA 240A</td>
<td>Analysis of Structures I</td>
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</tr>
<tr>
<td>AA 240B</td>
<td>Analysis of Structures II</td>
<td>3</td>
</tr>
<tr>
<td>AA 256</td>
<td>Mechanics of Composites</td>
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</table>

*It is recommended that students review prerequisites for all courses.

**Free Electives**

To bring total to 180 units
Aeronautics and Astronautics
Typical Sequence of Courses

**Freshman**

- **MATH 41 (A)**
- **MATH 42 (A,W)**
- **MATH 51 (A,W, S)**
- **PHYS 51 (A)**
- **PHYS 53 (W)**
- **PHYS 55 (S)**

**Sophomore**

- **MATH 52 (A,W,S)**
- **ENGR 15 (A, S)**
- **ENGR 14 (A, S)**
- **ENGR 15 (A, S)**
- **ENGR 40 (A, W)**
- **ENGR 40 (A, W)**
- **ENGR 70 (A,W,S)**

**Junior and Senior Years**

- **AA 100 (A)**
- **ME 131 A (A)**
- **ME 131 B (W)**
- **ME 131 B (W)**
- **ME 161 (A)**
- **ME 161 (A)**
- **AA 190 (A,W, S)**

**Depth Areas:**
Select two depth areas below and two classes from each (four classes total)

- **Fluids**
  - AA 200A (W)
  - AA 210A (A)
  - AA 214A (A)
  - AA283 (W)
  - ME 131B (W)

- **Structures and Composites**
  - AA 240A (A)
  - AA 240B (W)
  - AA 256 (W)

- **Controls and Dynamics**
  - ENGR 105 (W)
  - ENGR 205 (A)
  - AA 242A (A)
  - AA 279 (S)
  - AA 271A (S)

- **Systems Design (One Sequence)**
  - AA241A,B (W, S)
  - AA236A,B (A, W)

*Plus one engineering elective and additional free electives to bring the total to 180 units*
INSTRUCTIONS FOR DECLARING MAJOR IN ENGINEERING: AERONAUTICS & ASTRONAUTICS

1. Obtain your Stanford transcript (with your name printed on it) from the AXESS system and take it along with this form to the AA Student Services Office (Durand Building Rm 250).

2. You will be assigned to a faculty member who will serve as your academic advisor. Make an appointment with your advisor to discuss the Aero/Astro program. During that appointment, or soon thereafter, fill out a program sheet indicating how you plan to fulfill the major requirements, and obtain your advisor’s signature. (Your interests may change as you gain experience, of course, and you may revise your degree plan in consultation with your advisor. You will submit a final program sheet two quarters before you graduate. It is important, however, that you begin planning now for your degree requirements.)

3. Bring your signed program sheet & this form to the A/A Student Services office for signature.

4. Take this signed form to the Registrar’s Office at the Old Union. They will give you a Declaration of Undergraduate Major form. Fill out the form and turn in the white copy to the Registrar’s Office.

5. Take the yellow copy of the Declaration of Undergraduate Major form to your former undergraduate advisor and pick up your undergraduate file.

6. Turn in your undergraduate file along with the yellow copy of the Declaration of Undergraduate Major form, your transcript and this memo to the A/A Student Services Office.

Date:

To: Registrar

________________________________________ talked to Professor __________________________

on __________________ and received advice about majoring in our department.

(date)

Please assist him/her in declaring an interdisciplinary major in Aeronautics and Astronautics.

________________________________________

Student Services Manager, Aeronautics and Astronautics
# Stanford University School of Engineering
## 2002-03 Sample Program Sheet
### Aeronautics and Astronautics

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<th>ID#</th>
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<th>E-mail:</th>
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<th>Grade</th>
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<th>Transfer Credit</th>
<th>Course #/School</th>
<th>Approval Date</th>
<th>Approval Initial</th>
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**Mathematics (24 units minimum required; must include differential equations, eg ENGR155A or Math 53)**

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<td>155A</td>
<td>Differential Equations (or Math 53/130) (req'd)</td>
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Mathematics Total (24 units minimum required)

**Science (18 units minimum required)**

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Science Total (18 units minimum required)

**Engineering Fundamentals (3 courses required)**

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Fundamentals Total

**Technology in Society (1 course required)**

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Totals This Page

Continues on back of sheet ↓↓
## Aeronautics and Astronautics Sample Program Sheet

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### Depth Area I
- Fluid [ ]
- Struct [ ]
- Dyn/CTRL [ ]
- Dsgn [ ]

**Depth Course:** 3 units

### Depth Area II
- Fluid [ ]
- Struct [ ]
- Dyn/CTRL [ ]
- Dsgn [ ]

**Depth Course:** 3 units

### Engineering Elective
3 units

### Engineering Depth Total
(39 units minimum required)

---

### Advisor Approval
- **Printed Name:**
- **Signature:**
- **Date:**

### Department Approval
- **Printed Name:**
- **Signature:**
- **Date:**

### School of Engineering Approval
- **Printed Name:**
- **Signature:**
- **Date:**

### NOTES
1. Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 96 or later.
2. This form is available as an Excel file at ughb.stanford.edu. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
3. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is a 2.0.
4. All transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.

**REV:** 8/03
The Biomedical Computation major allows students to focus on a particularly exciting area of biotechnology—the use of advanced computational techniques in biology and medicine.

Biomedical Computation spans many different fields of study. To provide some structure to the major, the faculty members who are involved in the project have proposed the following organizational chart to illustrate the breadth of the field. Along the top is an axis that indicates the biological scale that serves as the focus of the work. Research in the world of microbiology lies on the left, while the larger-scale systems fall on the right. The axis labeled along the left side shows two core technologies on the computation side. The first is a focus on managing and manipulating data derived from biological systems; the second concerns using computers to simulate those systems.

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<tr>
<td>Simulation</td>
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Majors in Biomedical Computation do not occupy a single cell in this matrix, but rather a complete axis, either horizontal or vertical. If, for example, a student chooses “Molecular and Cellular” as their primary axis, they will take courses on both the informatics and simulation side. Similarly, a student focusing on “Simulation” will work at both biological scales.

Developing a program plan in Biomedical Computation will require you to get the advice of faculty on the committee that oversees the program. Admission to this concentration is limited by the availability of faculty, and you must work with those faculty to ensure that there are adequate resources to support you in the program.
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**Total Math & Science Units:** 63  
**Total Engineering Units:** 47  
**Total Other Units:** 3  
**Total Units:** 113
# BMC - Organs/Organisms (early)

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**Total Math & Science Units:** 66  
**Total Engineering Units:** 47  
**Total Other Units:** 0  
**Total Units:** 113
## BMC - Simulation (early)

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**Total Math & Science Units:** 56  
**Total Engineering Units:** 54  
**Total Other Units:** 0  
**Total Units:** 110
## BioMedical Computation - Informatics (early)

### Fall

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**Total**: 6

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**Total Math & Science Units**: 58

**Total Engineering Units**: 54

**Total Other Units**: 0

**Total Units**: 112
### BMC - Informatics (late)

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Total Math & Science Units: 58
Total Engineering Units: 56
Total Other Units: 0
Total Units: 114
# Cell/Molecular Track

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Local Address: ___________________  Local Phone: ___________________
E-mail: __________________________
Date B.S. expected: _______________

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**Mathematics (21 units minimum required)**

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*Plus one of the following courses:*

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**Mathematics Total**  (21 units minimum)

**Science Core (17 units minimum required)**

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**Science Total**  (17 units minimum)

**Engineering Fundamentals (2 different courses required)**

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**Fundamentals Total**

**Technology in Society (1 course required, 3-5 units, see list in School of Engineering Handbook)**

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**Totals This Page**  3

**NOTES**

(1) One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.
(2) The simulation electives must be chosen from the following set: ENGR 14, ENGR 15, ENGR 30, ME 33, ME 80, ME 180, ME 181, ME 284, CS 223A, CS 248, CS 326A, SBIO 228, CHEM 171.
(3) The informatics electives must be chosen from the following set: CS161, CS145, CS121, CS221, CS147, CS 222, CS 228, CS 229, CS 262, BMI 211, BMI 214, BIOC 218, MGTSC 252, STAT 206, STAT 315A, GENE 211.
(4) The additional elective must be chosen from the lists in notes (2) or (3), or within the following set: BIO 118, BIO 133, SBIO 228, BIO 214, CS 262, BMI 214, BIOC 218, GENE 211, GENE 344.
(5) A total of 40 engineering units must be taken. The core classes only provide 27 engineering units, so the remaining units must be taken from within the electives.
## BMC - Cellular/Molecular

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### BMC Depth (46 units minimum required)

**Programming (1 course)**

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**Biology Depth (21 units minimum)**

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**Biology Depth Total**

### BMC Core Depth:

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### Research (6 units)

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**Simulation Electives (2 courses; see notes 2, 5 on the previous page)**

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**Informatics Electives (2 courses, see notes 3, 5 on the previous page)**

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**General Elective (1 course, see notes 4, 5 on the previous page)**

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**Totals This Page**

**Totals Previous Page**

**Program Totals**

### Departmental Approval

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### School of Engineering Approval

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### NOTES

1. CS 191W, ME 191 W, and CS201 will fulfill the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later.

2. This form is available as an Excel file at ughb.stanford.edu. The printed form must be submitted to the CS department representative in Gates 182. Changes must be initialed in ink.

3. Transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs in Terman 201. Transfer credits in Computer Science Depth must be approved by the departmental representative.

4. Courses may be listed under only one category.

5. All courses listed on this form must be taken for a letter grade if offered by the instructor.

6. Minimum Grade Point Average (GPA) for all courses in the major (combined) is 2.0.

REV: 8/03
### BioMedical Computation (Preapproved IDM)
#### Organs & Organisms Track

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#### Mathematics (21 units minimum required)

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**Plus one of the following courses:**

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**Mathematics Total** (21 units minimum)

#### Science Core (17 units minimum required)

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**Science Total** (17 units minimum)

#### Engineering Fundamentals (2 different courses required)

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**Fundamentals Total**

#### Technology in Society (1 course required, 3-5 units, see list in School of Engineering Handbook)

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<th>Total Units</th>
<th>Grade</th>
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</thead>
</table>

**Totals This Page** 3

### NOTES

1. One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.
2. The simulation electives must be chosen from the following set: ENGR 14, ENGR 15, ENGR 30, ME 33, ME 80, ME 180, ME 181, ME 284, CS 223A, CS 248, CS 326A, SBIO 228, CHEM 171.
3. The informatics electives must be chosen from the following set: CS 161, CS 145, CS 121, CS 221, CS 147, CS 222, CS 228, CS 229, CS 262, BMI 211, BMI 214, BIOC 218, MGTSC 252, STAT 206, STAT 315A, GENE 211.
4. The additional electives must be chosen from the lists in notes (2) or (3), or within the following set: SURG 101, BIO 158, BIO 214, BIO 230, BIO 283, ME 180, ME 181, ME 284, DBIO 210.
5. A total of 40 engineering units must be taken. The core classes only provide 27 engineering units, so the remaining units must be taken from within the electives.
# BMC - Organs/Organisms

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<td>BIOC 200 Biochemistry</td>
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</tr>
</tbody>
</table>

**Departmental Approval**
Printed Name: ____________________ Date: ____________________
Signature: _____________________

**School of Engineering Approval**
Printed Name: ____________________ Date: ____________________
Signature: _____________________

**NOTES**

1. CS 191W, ME 191W, and CS201 will fulfill the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later.
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3. Transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs in Terman 201. Transfer credits in Computer Science Depth must be approved by the departmental representative.
4. Courses may be listed under only one category.
5. All courses listed on this form must be taken for a letter grade if offered by the instructor.
6. Minimum Grade Point Average (GPA) for all courses in the major (combined) is 2.0.

REV: 8/03
### BioMedical Computation (Preapproved IDM)
#### Simulation Track

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<td></td>
<td><strong>Technology in Society (1 course required, 3-5 units, see list in School of Engineering Handbook)</strong></td>
<td></td>
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</tbody>
</table>

### NOTES
1. One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.
2. The simulation core courses must be chosen from: E 14, E 15, ME 33, ME 80. Note that different subsets of these courses are required for different continuation courses in the track.
3. The simulation electives must be chosen from the following set: ME180, ME 181, ME 284, CS223A, CS248, CS326A, SBIO 228, CHEM 171.
4. The cellular electives must be chosen from the following set: BIO 126, BIO 129, BIOC 200, BIO 203, BIO 118, BIO 133, SBIO 228, BIO 214, CS 262, BMI 214, BIOC 218, GENE 211, GENE 344.
5. The organs electives must be chosen from the following set: BIO 122, BIOCHEM 200, SBIO 211, SURG 101, BIO 158, BIO 214, BIO 230, BIO 283, ME 180, ME 181, ME 284, DBIO 210.
### BMC Depth (46 units minimum required)

**Programming (1 course)**

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<th>Total Units</th>
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<td>Programming Paradigms</td>
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**Simulation Core (2 courses, see note 2 on the previous page)**

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**BMI Core Depth:**

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**Research (6 units)**

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**Simulation Electives (2 courses, see note 3 on the previous page)**

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<th>Course #/School</th>
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<th>Initial</th>
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<tbody>
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**Cellular Electives (3 units, see note 4 on the previous page)**

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**Organs Electives (3 units, see note 5 on the previous page)**

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**Totals This Page**

**Totals Previous Page**

**Program Totals**

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**NOTES**

1. ME 191W and CS201 fulfill the "Writing in the Major" requirement for Freshman and Transfer students entering Fall 1996 or later.
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6. Minimum Grade Point Average (GPA) for all courses in the major (combined) is 2.0.

REV: 8/03
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NOTES

1. One course required, 3 to 5 units. See Engineering Fundamentals list in School of Engineering Handbook.
2. The informatics electives must be chosen from the following set: CS147, CS 222, CS 228, CS 229, CS 262, BMI 211, BMI 214, BIOC 218, MGTSC 252, STAT 206, STAT 315A, GENE 211.
3. The cellular electives must be chosen from the following set: BIO 126, BIO 129, BIOC 200, BIO 203, BIO 118, BIO 133, SBO 228, BIO 214, CS 262, BMI 214, BIOC 218, GENE 211, GENE 344.
4. The organs electives must be chosen from the following set: BIO 122, BIOC 200, SBO 211, SURG 101, BIO 158, BIO 214, BIO 230, BIO 283, ME 180, ME 181, ME 284, DBIO 210.
### BMC - Informatics Track

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**Totals This Page**

**Totals Previous Page**

**Program Totals**

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**Departmental Approval**

Printed Name: ___________________________ Date: ___________________________

Signature: ___________________________

**School of Engineering Approval**

Printed Name: ___________________________ Date: ___________________________

Signature: ___________________________

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REV: 8/03
Chemical Engineering
— ABET ACCREDITATION CRITERIA APPLY —

Chemical Engineering is a discipline that relates to numerous areas of technology. In broad terms, chemical engineers are responsible for the conception and design of processes for the purpose of production, transformation, and transport of materials. This activity begins with experimentation in the laboratory and is followed by implementation of the technology to full-scale production. The mission of the Chemical Engineering department at Stanford is to provide professional training, development, and education for the next generation of leaders in the chemical sciences and engineering.

The large number of industries that depend on the synthesis and processing of chemicals and materials place the chemical engineer in great demand. In addition to traditional examples such as the chemical, energy and oil industries, opportunities in biotechnology, pharmaceuticals, electronic device fabrication and materials, and environmental engineering are increasing. The unique training of the chemical engineer becomes essential in these areas whenever processes involve the chemical or physical transformation of matter. For example, chemical engineers working in the chemical industry investigate the creation of new polymeric materials with important electrical, optical or mechanical properties. This requires attention not only to the synthesis of the polymer, but also to the flow and forming processes necessary to create a final product. In biotechnology, chemical engineers have responsibilities in the design of production facilities to use microorganisms and enzymes to synthesize new drugs. Problems in environmental engineering that engage chemical engineers include the development of processes (catalytic converters, effluent treatment facilities) to minimize the release of or deactivate products harmful to the environment.

To carry out these activities, the chemical engineer requires a complete and quantitative understanding of both the engineering and scientific principles underlying these technological processes. This is reflected in the curriculum of the chemical engineering department, which includes the study of applied mathematics, material and energy balances, thermodynamics, fluid mechanics, energy and mass transfer, separations technologies, chemical reaction kinetics and reactor design, biochemical engineering and process design. Courses are built on a foundation in the sciences of chemistry, physics, and biology.

The individual student’s mathematics and science course preparation for the chemical engineering major depends on his or her previous background in these areas. Following are four
sequences or 4-year plans. Each starts at a different point but all four plans conclude with the same in-the-major depth requirements.

**OBJECTIVES AND OUTCOMES FOR CHEMICAL ENGINEERING**

**Objectives:**

1. *Principles and Skills:* Provide a basic understanding of chemical engineering principles along with analytical problem-solving and communication skills to continue succeeding and learning in diverse careers, including chemical engineering practice and academic research.

2. *Preparation for Changing and Diverse Practice:* Prepare students for successful practice in a field whose focus is constantly changing and growing with a long-term perspective that takes into account new tools, new means of dispersing and controlling information, new focus areas such as biotechnology and molecular engineering, and increasingly complex professional and societal expectations.

3. *Preparation for Graduate Study:* Prepare students for graduate study coupled with short-term and/or long-term career research in the chemical sciences and chemical engineering.

4. *Preparation for Service:* Prepare and develop students’ skills, awareness, and background to become responsible citizens, employees, and leaders in our communities and in the field of chemical science.

**Outcomes:**

(a) A proficiency in and ability to apply knowledge of engineering, mathematics through differential equations, probability and statistics, and science including physics and chemistry

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs

(d) An ability to function on multi-disciplinary teams

(e) An ability to identify, formulate, and solve engineering problems

(f) An understanding of professional and ethical responsibility

(g) An ability to communicate effectively

(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context

(i) A recognition of the need for, and an ability to engage in life-long learning

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(l) Background for admission to engineering or other professional graduate programs
INSTRUCTIONS FOR DECLARING CHEMICAL ENGINEERING

1. Log on to Axess and request to major in Chemical Engineering.
2. Obtain your Stanford transcript; an unofficial one from Axess is fine.
3. Download to your desktop a Chemical Engineering Program Sheet, from the School of Engineering web site: http://ughb.stanford.edu. Fill in courses already taken or in progress. Print out your Program Sheet. Indicate any courses waived because of AP credit.
4. Bring these documents with you and go see Jeanne Cosby, Student Services Manager, Keck Science Building, Room 189, for further instructions.

Our departmental website is at http://chemeng.stanford.edu/ and that of our student chapter of the American Institute of Chemical Engineers is at http://www.stanford.edu/group/aiche/. Our faculty and students would be glad to talk with you about majoring in Chemical Engineering. If you would like more information about this major, please contact our Student Services Manager, Jeanne Cosby at 723-1302 or cosby@stanford.edu.
## CHEMICAL ENGINEERING PROGRAM

<table>
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<tr>
<th>COURSE TITLE</th>
<th>ENGR. ENGR. SCI.</th>
<th>DSGN. EXP.</th>
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<td><strong>Engineering Fundamentals (3 courses minimum)</strong></td>
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<td>CHEME 10 The Chemical Engineering Profession</td>
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<td>CHEME 100 Chem. Process Modeling, Dynamics &amp; Control</td>
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<td>CHEM 173 Chemical Engineering - Quantum Chemistry</td>
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<td>CHEM 175 Physical Chemistry - Kinetic Theory &amp; Statistical Mechanics</td>
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Chemical Engineering
Sequence of Courses #1
Starting with MATH 40 Series

**Freshman**
- MATH 41 (A)
- MATH 42 (A,W)
- ENGR 154 (S)

**Sophomore**
- ENGR 25 (A)
- ENGR 20 (S)
- ENGR 155A (W, S)
- BIOSCI 41 (A)
- PHYS 53 (W)
- PHYS 55 (S)

**Junior**
- MATH Elective (1 of 2)
- ENGR 155B (S)
- ENGR 155C(W)
- CHEMENG 100 (A)
- CHEMENG 110 (W)
- CHEMENG 130 (S)
- CHEMENG 120A (W)
- CHEMENG 120B (S)
- CHEMENG 171 (A)
- CHEM 171 (A)
- CHEM 173 (W)
- CHEM 175 (S)

**Senior**
- CHEMENG 10 (A)
- CHEMENG 170 (A)
- CHEMENG 180 (S)
- CHEMENG 185 A, B (A,W)
- CHEMENG Electives (2 of 3)
- CHEMENG 140 (S)
- CHEMENG 150 (A)
- CHEMENG 160 (W)
- CHEM 131 (A, W)
- CHEM 132 (A)
Chemical Engineering
Sequence of Courses #2
Starting with ENGR 154, 155A, and MATH Elective

**Freshman**
- ENGR 154 (A, S)
  - ENGR 155A (W, S)

**Sophomore**
- ENGR 25 (A)
  - MATH Elective (1 of 2)
    - ENGR 155B (S)
    - ENGR 155C (W)
  - ENGR 20 (S)
  - BIOSCI 41 (A)
  - PHYS 53 (W)
  - PHYS 55 (S)

**Junior**
- CHEMENG 100 (A)
  - CHEMENG 110 (W)
  - CHEMENG 120A (W)
  - CHEMENG 120B (S)

**Senior**
- CHEMENG 10 (A)
  - CHEMENG 170 (A)
  - CHEMENG 180 (S)
  - CHEMENG 185 A, B (A, W)

**Recommended Electives**
- CHEMENG Electives (2 of 3)
- CHEM 171 (A)
- CHEM 173 (W)
- CHEM 175 (S)
- CHEM 131 (A, W)
- CHEM 132 (A)
Chemical Engineering
Sequence of Courses #3
Using MATH 40 and 50 Series
and MATH Elective

**Freshman**
- MATH 41 (A)
- MATH 42 (A, W)
- MATH 51 (A, W, S)

**Sophomore**
- ENGR 25 (A)
- ENGR 20 (S)
- MATH 52 (A, W, S)
- MATH 53 (A, W, S)
- BIOSCI 41 (A)
- PHYS 53 (W)
- PHYS 55 (S)

**Junior**
- MATH Elective (1 of 2)
- CHEMENG 100 (A)
- CHEMENG 110 (W)
- CHEMENG 120A (W)
- CHEMENG 130 (S)
- CHEMENG 120B (S)
- CHEM 171 (A)
- CHEM 173 (W)
- CHEM 175 (S)

**Senior**
- CHEMENG 185 A, B (A, W)
- CHEMENG 170 (A)
- CHEMENG 170 (A)
- CHEMENG 180 (S)
- CHEMENG Electives (2 of 3)
- CHEMENG 140 (S)
- CHEMENG 150 (A)
- CHEMENG 160 (W)
- CHEM 131 (A, W)
- CHEM 132 (A)
Chemical Engineering
Sequence of Courses #4
Using MATH 50 Series and Math Elective

**Freshman**
- MATH 51 (A, W, S)
- MATH 52 (A, W, S)
- MATH 53 (A, W, S)

**Sophomore**
- ENGR 20 (S)
- MATH Elective (1 of 2)
- ENGR 155B (S)
- ENGR 155C (W)
- BIOSCI 41 (A)
- PHYS 53 (W)
- PHYS 55 (S)
- Engineering Fundamental
- TIS Requirement

**Junior**
- CHEMENG 100 (A)
- CHEMENG 110 (W)
- CHEMENG 130 (S)
- CHEMENG 120A (W)
- CHEMENG 120B (S)
- CHEMENG 185 A, B (A, W)

**Senior**
- CHEMENG 10 (A)
- CHEMENG 170 (A)
- CHEMENG 180 (S)
- CHEMENG Electives (2 of 3)
- CHEMENG 140 (S)
- CHEMENG 150 (A)
- CHEMENG 160 (W)
- CHEM 131 (A, W)
- CHEM 132 (A)

Courses:
- CHEM 31 (A, W, Sum)
- CHEM 33 (W, S, Sum)
- CHEM 35 (A, S, Sum)
- CHEM 36 (S, Sum)
- CHEM 171 (A)
- CHEM 173 (W)
- CHEM 175 (S)
- CHEM 175 (S)
## CHEMICAL ENGINEERING

### 4-Year Plan # 1

**MATH 40 series, then ENGR 154, 155A and MATH Elective**  
*(instead of Math 50 series)*

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**Notes:**

Math elective, one of two: ENGR 155B (5 units) or 155C (4 units).
ChE elective, two of three: CHEMENG 140, 150, 160.
Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other electives.

09/03

**Recommended**
## CHEMICAL ENGINEERING

### 4-Year Plan #2

**ENGR 154 & 155A, then ENGR 155B or 155C**

(instead of Math 50 series; AP credit for MATH 40 series)

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**Notes:**

- Engr. Math elective, one of two: ENGR 155B (5 units) or 155C (4 units).
- ChE elective, two of three: CHEMENG 140, 150, 160.
- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other electives.

AP Math Units: 10
UG Math & Science Units: 37
Total Engineering Units: 67
Total Other Units: 66
Total Units: 180

09/03
# CHEMICAL ENGINEERING

## 4-Year Plan # 3

**MATH 40 series, then MATH 50 series and ENGR 155B or 155C**

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| **Total**     | **15**          | **17**        | **17**       |
| **Subtotals** | **9**           | **0**         | **8**        |
| **Total**     | **17**          | **15**        | **17**       |

| **Total Units**: 185 |

**Notes:**
- Engr. Math elective, one of two: ENGR 155B (5 units) or 155C (4 units).
- ChE elective, two of three: CHEMENG 140, 150, 160.
- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other electives.
## CHEMICAL ENGINEERING

### 4-Year Plan # 4

**MATH 50 series and ENGR 155B or 155C**

*(AP credit for Math 40 series)*

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**Notes:**

- Engr. Math elective, one of two: ENGR 155B (5 units) or 155C (4 units).
- ChE elective, two of three: CHEMENG 140, 150, 160.
- Students' choices for Math elective, 3rd Engineering Fundamental, and CHEMENG electives affect choices, units, and scheduling of GER courses and other electives.

09/03
## STANFORD UNIVERSITY
### SCHOOL OF ENGINEERING

#### 2003-04

**Chemical Engineering**  
— ABET Accreditation Criteria Apply —

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### Course Requirements

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<tr>
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<td>and MATH</td>
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<td>Ordinary Differential Equations</td>
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<td>Organic Mono Compounds (req'd)</td>
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### Technology in Society (1 course required)

| | |
| | |

### NOTES

1. Engineering Science, Design, and Experimentation units do not apply to shaded areas.
2. Substitutions require approval.

---

**Continues on back of sheet**

↓
### Department Requirements

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<tr>
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<th>Title</th>
<th>Units</th>
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<td>ENGR</td>
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<td>Equilibrium Thermodynamics</td>
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<td>120A</td>
<td>Fluid Mechanics</td>
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<td>185B</td>
<td>Chemical Engineering Laboratory</td>
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<td>Organic Poly Compounds</td>
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<td>CHEM</td>
<td>132</td>
<td>Qualitative Organic Analysis</td>
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<td>Physical Chemistry - Chem. Thermo.</td>
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<td>Physical Chemistry - Quantum Chem.</td>
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<tr>
<td>Experimentation Total</td>
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<td>Mathematics and Science Total</td>
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### Advisor Approval

Printed Name: ____________________________  Date: ____________________________
Signature: ____________________________

### Departmental Approval

Printed Name: ____________________________  Date: ____________________________
Signature: ____________________________

### School of Engineering Approval

Printed Name: ____________________________  Date: ____________________________
Signature: ____________________________

### NOTES

1. CHEMENG 140, 150, 160 — 2 of these 3 courses required.
2. Fulfills “Writing in the Major” req. for Freshmen and Transfer students entering Fall 96 or later.
3. This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
4. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is 2.0.
5. Transfer credits in Math, Science, Fundamentals, & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.

REV: 9SEP03
The civil engineering profession is concerned with the built environment. Civil engineers plan, design, and construct major facilities including highways, transit systems, dams, tunnels, energy facilities, harbors, canals, buildings, and bridges. Civil engineers help manage our air, water, and energy resources and help protect society from natural catastrophes, such as earthquakes, as well as dealing with the hazards society itself generates in the form of toxic wastes.

Because these functions are often crucial to the day-to-day lives of most people and the facilities involved are physically substantial, civil engineers bear an important responsibility to the public. Their role is often more than just technical, requiring also a high degree of communicative skills and an ability to deal with people.

Civil engineering is a profession with a long and respected history. We marvel today at the works of our ingenious predecessors and the impact they had on their societies. The irrigation systems of Egypt and China, the Inca and Mayan temples and cities, the water supply tunnels of the Greeks, and the roads and aqueducts of Rome are examples. Through these many years, civil engineering has evolved into a broadly based discipline that deals with the technical as well as the social and economic aspects of our built environment.

The mission of the Civil and Environmental Engineering department is to educate the next generation of societal, industrial, and academic leaders and discover knowledge that advances the state of the profession.

**The Curriculum**

The undergraduate civil engineering curriculum includes a core, to be taken by all declared majors, that provides a broad introduction to the major areas of civil engineering. Two tracks then allow students to take additional specialized course work in either *Environmental and Water Studies* or *Structures and Construction.*
# OBJECTIVES AND OUTCOMES FOR CIVIL ENGINEERING

**Objectives:**

1. **Principles and Skills:** Provide an understanding of engineering principles along with analytical, problem-solving, design, and communication skills to continue succeeding and learning in diverse careers.

2. **Preparation for Practice:** Prepare for successful engineering practice with a longer-term perspective that takes into account new tools, such as advanced information technology and biotechnology, and increasingly complex professional and societal expectations.

3. **Preparation for Graduate Study:** Prepare for possible graduate study in engineering or other fields.

4. **Preparation for Service:** Develop the awareness, background, and skills to become responsible citizens and leaders in service to society.

**Outcomes:**

(a) A proficiency in and ability to apply knowledge of engineering, mathematics through differential equations, probability and statistics, and science including physics and chemistry

(b) An ability to design and conduct experiments, as well as to analyze and interpret data

(c) An ability to design a system, component, or process to meet desired needs

(d) An ability to function on multi-disciplinary teams

(e) An ability to identify, formulate, and solve engineering problems

(f) An understanding of professional and ethical responsibility

(g) An ability to communicate effectively

(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context

(i) A recognition of the need for, and an ability to engage in life-long learning

(j) A knowledge of contemporary issues

(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(l) Background for admission to engineering or other professional graduate programs

Those undergraduates potentially interested in the *Environmental and Water Studies* specialization of the Civil Engineering major may want to examine the Environmental Engineering major as a possible alternative; a comparison of these two alternative majors is presented in the section on the Environmental Engineering degree.

If you would like more information on civil engineering, contact Marie Ochi-Jacobs in Room M-42 of the Terman Engineering Center.
EXPLORING CIVIL ENGINEERING AS A MAJOR

Attention, underclassmen! Are you thinking about an engineering major, or wondering whether a Civil Engineering major is for you? If so, here is some advice on courses accessible early in your undergraduate career that will help you assess your interest in our major. If you end up joining our program, this early start on fulfilling requirements will pay off by giving you more flexibility in class scheduling for your junior and senior years.

1. For an introduction to Civil Engineering, classes required for all of our declared majors which are readily accessible to you are:
   CEE 70: Environmental Science & Technology (A)
   CEE100: Managing Civil Engineering Projects (A)(WIM)

2. For electives providing additional exposure to the two tracks within our major, look at:
   **FOR STRUCTURES AND CONSTRUCTION TRACK:**
   CEE 31Q: Accessing Architecture through Drawing (A; soph seminar)
   CEE 45Q: Social Entrepreneurship Startup (W; soph seminar)
   CEE 46Q: Fail Your Way to Success (S; soph. seminar)
   CEE 80N: The Art of Structural Engineering (A; fresh. seminar)
   **FOR ENVIRONMENTAL AND WATER STUDIES TRACK:**
   CEE 61Q: Big Dams, City Hall, and the Sierra Club (given 04-05; soph. seminar)
   CEE 63: Weather and Storms (A)
   CEE 64: Air Pollution: from Urban Smog to Global Change (S)
   CEE 99: Environmental Issues Seminar (A, W)
   CEE173A: Energy Resources (W)

3. For any Engineering major, 3 Engineering Fundamentals must be taken out of the 8 courses offered. Early on, you should consider taking:
   ENGR 60: Engineering Economy (A, W, Su; req'd for both CE tracks)
   ENGR 50: Introductory Science of Materials (W, S; req'd for Structures/Constr. track)
   ENGR 30: Engineering Thermodynamics (A,W; req'd for Environ./Water track)

4. You should make sure you take the following Science/Math classes, which are required for almost all majors within the School of Engineering:
   CHEM 31: Chemical Principles (A, W, Su)
   PHYSICS 53: Mechanics (W) [co-requisite: MATH 41]
   MATH 51: Linear Algebra and Differential Calculus (A,W,S,Su) [prerequisite: MATH 21, 42]

5. Finally, there are additional Science/Math classes required for students majoring in Civil Engineering which can readily be taken early on:
   GES 1: Fundamentals of Geology (A, W, S; req'd for both CE tracks)
   STAT 110 (or STAT60 or GES160): Statistics (A, W, S; req'd for both CE tracks)
2003-04 Civil Engineering Major Requirements

Mathematics and Science (45 Units Minimum), Including:

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<th>Units</th>
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<td>Math/Computational Methods for Engineers (or Math 53)</td>
<td>5</td>
<td>W,S</td>
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<td>PHYSICS. 53</td>
<td>Mechanics (or equivalent)</td>
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<td>W</td>
</tr>
<tr>
<td>CHEM. 31</td>
<td>Chemical Principles</td>
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<td>A.W,Su</td>
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<td>GES 1</td>
<td>Fundamentals of Geology</td>
<td>5</td>
<td>A.W,S</td>
</tr>
<tr>
<td>STAT 110</td>
<td>Statistical Methods in Engineering and the Physical Sciences</td>
<td>4-5</td>
<td>A.Su</td>
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<tr>
<td>(or STAT 60 or GES 160 or CEE 203 or ENGR 155C)</td>
<td>(4-5) (A.W.S)</td>
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<td>Two addl. quarters of chemistry or two addl. quarters of physics*</td>
<td>7-8</td>
<td>A.W,S</td>
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*For the Environmental and Water Studies track, CHEM 33 and either CHEM 35 or 135 are required.

Engineering Fundamentals (3 Courses Minimum, At Least One of Which Must Be Unspecified by the Department), Including:

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<td>A, S</td>
</tr>
<tr>
<td>ENGR. 60</td>
<td>Engineering Economy</td>
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<td>A.W, Sum</td>
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Technology in Society: (1 Course Required)
See “Approved Courses” section of this Handbook for courses that fulfill the TIS requirement.

Experimentation:
At least eight units of experimentation are required. With careful planning, no additional courses beyond those taken to meet the science, fundamentals, and depth requirements will be necessary.

Civil Engineering Depth: (Fundamentals + Depth = 68 Units Min.)
Core: (19 Units)

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<tr>
<td>CEE 100</td>
<td>Managing Civil Engineering Projects</td>
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<tr>
<td>CEE 101A</td>
<td>Mechanics of Materials</td>
<td>4</td>
<td>W</td>
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<tr>
<td>CEE 101B</td>
<td>Mechanics of Fluids</td>
<td>4</td>
<td>S</td>
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<tr>
<td>CEE 101C</td>
<td>Geotechnical Engineering</td>
<td>4</td>
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Specialty Courses
Students will choose a specialty in (1) Structures and Construction or (2) Environmental and Water Studies, described on the following pages.
CE Specialty in Structures and Construction

The structures and construction option provides students with courses in structural analysis and design, construction, building systems, and other courses related to structural engineering and construction management. A specific requirement of an ABET-accredited Civil Engineering major is participation in a major engineering design experience. This is fulfilled by taking CEE156, 181, and 182, along with CEE156A, 181A and 182A. These courses contain project components, which in combination form an integrated design experience.

Required Specialty Courses: (25 units)

<table>
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<tr>
<td>ENGR 50*</td>
<td>Introductory Science of Materials</td>
<td>4</td>
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<tr>
<td>CEE 102</td>
<td>Legal Context of Civil Engineering</td>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td>CEE 156</td>
<td>Building Systems Design</td>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td>CEE 156A</td>
<td>Building Systems Design Experience</td>
<td>1</td>
<td>W</td>
</tr>
<tr>
<td>CEE 180</td>
<td>Structural Analysis</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>CEE 181</td>
<td>Design of Steel Structures</td>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td>CEE 181A</td>
<td>Building Design Experience-Steel Structures</td>
<td>1</td>
<td>W</td>
</tr>
<tr>
<td>CEE 182</td>
<td>Design of Reinforced Concrete Structures</td>
<td>3</td>
<td>S</td>
</tr>
<tr>
<td>CEE 182A</td>
<td>Building Design Experience-Reinforced Concrete</td>
<td>1</td>
<td>S</td>
</tr>
<tr>
<td>CEE 183</td>
<td>Introduction to Building Design</td>
<td>2</td>
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+ Can count as a required Engineering Fundamental instead, if desired.

Specialty Elective Courses: (at least 12 units)

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<tr>
<td>ENGR 15</td>
<td>Dynamics</td>
<td>3</td>
<td>A,S</td>
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<tr>
<td>ENGR155B</td>
<td>Mathematical &amp; Computational Methods for Engineers</td>
<td>5</td>
<td>S</td>
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<tr>
<td>CEE 101D*</td>
<td>Seminar on Math. Lab. Applications in CEE</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>CEE 111</td>
<td>3D Modeling of Civil Engineering Projects</td>
<td>3</td>
<td>S</td>
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<tr>
<td>One of:</td>
<td>CEE130, 131, 134 or 138</td>
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<tr>
<td>CEE 122A/B</td>
<td>Computer Integrated Architecture/Engineering/Construction</td>
<td>2</td>
<td>W,S</td>
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<tr>
<td>CEE 140</td>
<td>Field Surveying laboratory</td>
<td>4</td>
<td>S</td>
</tr>
<tr>
<td>CEE 147</td>
<td>Cases in Personality, Leadership, &amp; Negotiation</td>
<td>3</td>
<td>S</td>
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<tr>
<td>CEE 148</td>
<td>Design &amp; Construction of Affordable Housing</td>
<td>4</td>
<td>W</td>
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<tr>
<td>CEE 151</td>
<td>Negotiation</td>
<td>3</td>
<td>A,S</td>
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<tr>
<td>CEE 154</td>
<td>Cases in Estimating Cost</td>
<td>3</td>
<td>A</td>
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<tr>
<td>CEE 155</td>
<td>Building Construction Technical Issues</td>
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Continues on next page… ↓
### Specialty Elective Courses, Cont.

<table>
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<tr>
<td>CEE 160</td>
<td>Mechanics of Fluids Laboratory</td>
<td>2</td>
<td>S</td>
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<tr>
<td>CEE 161A</td>
<td>Rivers, Streams, and Canals (formerly Open Channel Flow)</td>
<td>3-4</td>
<td>A</td>
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<tr>
<td>CEE 171</td>
<td>Environmental Planning Methods</td>
<td>3</td>
<td>W</td>
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<tr>
<td>CEE 176A</td>
<td>Energy Efficient Buildings (alt. years)</td>
<td>4</td>
<td>A</td>
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<tr>
<td>CEE 176B</td>
<td>Electric Power: Renewables and Efficiency (alt. years)</td>
<td>4</td>
<td>A</td>
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<tr>
<td>CEE 179</td>
<td>Adv. Structural Geology &amp; Rock Mechanics</td>
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<tr>
<td>CEE 196</td>
<td>Engineering Geology Practice (alt. years)</td>
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<tr>
<td>CEE 199</td>
<td>Undergrad. Research in Civil and Environmental Engineering</td>
<td>2-3</td>
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<tr>
<td>CEE 203*</td>
<td>Probabilistic Models in Civil Engineering</td>
<td>3-4</td>
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</table>

* Can count either towards the Math+Science requirement, or as elective engineering units.

**Other Elective Courses:**

Choose additional courses from within the School of Engineering to reach a total of 68 units of Science+Design. Depending on which Engineering Fundamentals and Breadth classes are taken, up to 6 additional units may be required. Students may need up to 4 more experimentation units. **Total Science+Design units for engineering fundamentals plus core, required courses, and electives must be at least 68 units.**
CE SPECIALTY IN ENVIRONMENTAL AND WATER STUDIES

The environmental and water studies option focuses on environmental engineering and science, water resources, and environmental planning. This option consists of a group of required classes that provide a broad introduction to the field, including substantial exposure to engineering design, along with some elective courses. A specific requirement of an ABET-accredited Civil Engineering major is participation in a major engineering design experience. This is fulfilled by taking either CEE169 or CEE179B.

REQUIRED SPECIALTY COURSES: (34 UNITS)

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<tr>
<td>ENGR.30+</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
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<td>CEE101D*</td>
<td>Math. Lab Applications in CEE</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>CEE160*</td>
<td>Mechanics of Fluids Laboratory</td>
<td>2</td>
<td>S</td>
</tr>
<tr>
<td>CEE161A</td>
<td>Rivers, Streams and Canals (formerly Open Channel Flow)</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>CEE166A</td>
<td>Watersheds and Wetlands</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>CEE166B</td>
<td>Floods and Droughts, Dams and Aqueducts (formerly Water Resources)</td>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td>CEE171</td>
<td>Environmental Planning Methods</td>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td>CEE172</td>
<td>Air Quality Management</td>
<td>3</td>
<td>W</td>
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<tr>
<td>CEE177</td>
<td>Aquatic Chemistry and Biology</td>
<td>4</td>
<td>A</td>
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<tr>
<td>CEE179A</td>
<td>Water Chemistry Laboratory</td>
<td>2</td>
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<tr>
<td></td>
<td>Design Experience: either CEE169 or CEE179B</td>
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SPECIALTY ELECTIVE COURSES: (at least 6 additional units from the following list)

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<tbody>
<tr>
<td>CEE 63*</td>
<td>Weather and Storms</td>
<td>3</td>
<td>A</td>
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<tr>
<td>CEE 64*</td>
<td>Air Pollution: From Urban Smog to Global Change</td>
<td>3</td>
<td>S</td>
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<tr>
<td>CEE164</td>
<td>Introduction to Physical Oceanography</td>
<td>4</td>
<td>W</td>
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<tr>
<td>CEE169</td>
<td>Environmental and Water Studies: Design (alternate years)</td>
<td>5</td>
<td>S</td>
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<tr>
<td>CEE173A</td>
<td>Energy Resources (alternate years)</td>
<td>4-5</td>
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<tr>
<td>CEE173B</td>
<td>Seminar: The Coming Energy Revolution (alternate, years)</td>
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<tr>
<td>CEE176A</td>
<td>Energy Efficient Buildings (alt. years)</td>
<td>4</td>
<td>W</td>
</tr>
<tr>
<td>CEE176B</td>
<td>Electric Power: Renewables and Efficiency (alternate years)</td>
<td>4</td>
<td>A</td>
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<tr>
<td>CEE178</td>
<td>Introduction to Human Exposure Analysis</td>
<td>3</td>
<td>S</td>
</tr>
<tr>
<td>CEE179B</td>
<td>Process Design for Environ. Biotechnology (alternate years)</td>
<td>5</td>
<td>S</td>
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<tr>
<td>CEE199</td>
<td>Undergrad. Research in Civil &amp; Environmental Engineering</td>
<td>2-3</td>
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</table>

OTHER ELECTIVE COURSES:

Choose additional courses from within the School of Engineering to reach a total of 68 units of Science+Design. Depending on which Engineering Fundamentals and Breadth classes are taken, up to 5 additional units may be required.

+ Can count as a required Engineering Fundamental instead, if desired.

* Can count either towards the Math+Science requirement, or as engineering units.
Total Science+Design units for engineering fundamentals plus core, required courses, and electives must be at least 68 units.

**ENGINEERING SCIENCE, DESIGN, AND EXPERIMENTATION UNITS**

### SCHOOL OF ENGINEERING COURSES

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
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<th>ENGR DSGN</th>
<th>EXPR</th>
<th>TOTAL</th>
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<td>Introduction to Engineering Analysis</td>
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<td>Dynamics</td>
<td>2</td>
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<td>Introduction to Chemical Engineering</td>
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<td>Engineering Thermodynamics</td>
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<td>ENGR 40</td>
<td>Introductory Electronics</td>
<td>3</td>
<td>2</td>
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<tr>
<td>ENGR 50</td>
<td>Introductory Science of Materials</td>
<td>4</td>
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<td>ENGR 60</td>
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<tr>
<td>ENGR 70</td>
<td>Programming Methodology</td>
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<td>1</td>
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### DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING COURSES

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<th>ENGR DSGN</th>
<th>EXPR</th>
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<td>CEE 31Q</td>
<td>Accessing Architecture through Drawing</td>
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<td>3</td>
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<td>Fail Your Way to Success</td>
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<td>CEE 47Q</td>
<td>Micro-Organiz. Theory for Project Teams</td>
<td>3</td>
<td>1</td>
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<tr>
<td>CEE 61Q</td>
<td>Big Dams, City Hall, and the Sierra Club</td>
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<td>CEE 62Q</td>
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<tr>
<td>CEE 63</td>
<td>Weather &amp; Storms</td>
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<td>Structures -- Where Form is Function</td>
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<td>CEE 99</td>
<td>Environmental Issues Seminar</td>
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### ENGINEERING SCIENCE, DESIGN, AND EXPERIMENTATION UNITS, CONT.

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<td>Managing Civil Engineering Projects</td>
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<td>CEE 101A</td>
<td>Mechanics of Materials</td>
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<td>CEE 101B</td>
<td>Mechanics of Fluids</td>
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<td>CEE 101D</td>
<td>Math Lab Applications in CEE</td>
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<td>CEE 102</td>
<td>Legal Context of Civil Engineering</td>
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<td>CEE 112</td>
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<td>CEE 131</td>
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<td>CEE 133</td>
<td>Archit., Urban Planning &amp; 1st Amendment</td>
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<td>CEE 136</td>
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<td>Arch. Design Studio: Individual Bldgs.</td>
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<td>Arch. Design Studio: Bldgs. / Urban Context</td>
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<td>CEE 139</td>
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<td>Field Surveying Laboratory</td>
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<td>CEE 141</td>
<td>Concrete Canoe for ASCE Competition</td>
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<td>CEE 148</td>
<td>Design/Construction of Affordable Housing</td>
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<td>CEE 151</td>
<td>Negotiation</td>
<td>3</td>
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<tr>
<td>CEE 153</td>
<td>Con Equip &amp; Methods (last given 2001-02)</td>
<td>2</td>
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<tr>
<td>CEE 154</td>
<td>Cases in Estimating Cost</td>
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<td>CEE 155</td>
<td>Bldg. Construction Technical Issues</td>
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<td>CEE 156</td>
<td>Building Systems Design</td>
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<td>Building System Design Experience</td>
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<td>Mechanics of Fluids Laboratory</td>
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## Civil Engineering
### Typical Sequence of Courses

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**Structures & Construction Track**

- Frosh: ENGR 50 (W,S)
- Soph: CEE102
- Junior: CEE180 & 183
- Senior: CEE181 & 182A

* Plus an additional 12+ units of Structures/Construction Electives

**Core Coursework (Both Tracks)**

- Frosh: MATH 41 (A)
- Soph: ENGR 14
- Junior: ENGR 155A

* Plus Statistics and an STS course

**Environmental & Water Studies Track**

- Frosh: CHEM 33 (W,S,Su)
- Soph: CEE 101A
- Junior: CEE 171
- Senior: CEE 169 or 179B

* Plus an additional 6+ units of Environmental/Water Studies Electives

- Frosh: CHEM 33 (W,S,Su)
- Soph: CHEM 31 (A,W,Su)
- Junior: CHEM 135 (W) or 35 (A,S,Su)
- Senior: CHEM 160

*Plus an additional 6+ units of Environmental/Water Studies Electives

- Frosh: ENGR 30 (A,W)
- Soph: ENGR 60 (A,W)
- Junior: ENGR 14
- Senior: ENGR 155A
CIVIL ENGINEERING

Typical 4 Year Plan
Environmental (Wet) Track, Early Start Program

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Total Math & Science Units: 46
Total Engineering Units: 68
Total Other Units: 66
Total Units: 180

\(^\) Students should explore majors of interest to them using these unrestricted electives. Courses in the School Of Engineering can count towards the CE major; see description of "Other Elective Courses" for details.

* These classes all are typically offered MWF10.

** In alternate years, when CEE169 is not offered, take CEE179B in the spring to fulfill design experience.

+ Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Design Units; see description of "Other Elective Courses" for details.

*** Additional 4-year programs for students interested in going abroad are available at http://ughb.stanford.edu
# CIVIL ENGINEERING

**Typical 4 Year Plan**  
*Environmental (Wet) Track, Regular Program*

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**Total Math & Science Units:** 46  
**Total Engineering Units:** 68  
**Total Other Units:** 66  
**Total Units:** 180

* These classes all are typically offered MWF10.
** In alternate years, when CEE169 is not offered, take CEE179B in the spring to fulfill design experience.
+ Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Design Units; see description of “Other Elective Courses” for details.
*** Additional 4-year programs for students interested in going abroad are available at [http://ugbh.stanford.edu](http://ugbh.stanford.edu)
## CIVIL ENGINEERING

### Typical 4 Year Plan

**Structures/Construction (Dry) Track, Early Start Program**

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* Students should explore majors of interest to them using unrestricted electives. Courses offered within the School of Engineering can count towards the CE major; see description of "Other Elective Courses" for details.

+ Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Design Units; see description of "Other Elective Courses" for details.

*** Additional 4-year programs for students interested in going abroad are available at http://ughb.stanford.edu

- Total Math & Science Units: 45
- Total Engineering Units: 68
- Total Other Units: 67
- **Total Units:** 180
## CIVIL ENGINEERING

Typical 4 Year Plan  
Structures/Construction (Dry) Track, Regular Program

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Subtotals: 5 0 10

Total: 15

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Subtotals: 5 0 11

Total: 16

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Subtotals: 5 0 10

Total: 16

### Subtotals

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</table>

Total Math & Science Units: 45  
Total Engineering Units: 68  
Total Other Units: 67  
Total Units: 180

* Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Science+Design Units; see description of "Other Elective Courses" for details.

*** Additional 4-year programs for students interested in going abroad are available at http://ughb.stanford.edu
## CIVIL ENGINEERING

**Structures/Construction (Dry) Track, Autumn Quarter Abroad (Berlin, Florence, Paris)** *

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**Total Math & Science Units:** 45  
**Total Engineering Units:** 68  
**Total Other Units:** 67  
**Total Units:** 180

+ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units; see description of “Other Elective Courses” for details.

* NOTES:

1) At the overseas campuses listed, you should be able to take E50 (via videotape), one GER 3, and either an STS class or a second GER 3 course. Save your GER 3 and E50 requirements to fulfill abroad!

2) It is essential to take E14 during Soph. year; this program also assumes you take CEE100 during Soph. year (or some other class you would otherwise take Autumn of Sr year), plus at least 3 units (and preferably 6 units, as shown) of engineering electives.

3) To the extent your schedule allows, take some of the following prior to your Junior year:

GES 1 (A,W,S), E60 (A,W), PHYS 51 (A), CEE70 (A), and/or other CE/Dry electives.
CIVIL ENGINEERING
Environmental (Wet) Track, Autumn Qtr Abroad (Berlin, Florence, Paris) **

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Total MATH & Science Units: 46
Total Engineering Units: 68
Total Other Units: 67
Total Units: 181

* These classes are typically offered MWF10.
+ In alternate years, when CEE 169 is not offered, take CEE 179B in the spring to fulfill the design experience.
^ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units;
see description of "Other Elective Courses" for details.

** NOTES:
1) At the overseas campuses listed, you should be able to take an Engineering Fundamental (either E40 or E50),
   one GER 3, and either an STS class or a second GER 3 course. So save your GER 3 reqmts to fulfill abroad!
2) It is essential to take E14 and CEE100 during your sophomore year; this program assumes as well that you take
   CEE 70 during your sophomore year (or some other class you would otherwise take in Autumn of Sr year).
3) To the extent your schedule allows, take some of the following prior to your Junior year:
   GES 1 (A,W,S), CEE101D (A), E30 or E60, and/or other CE/Wet electives.
# CIVIL ENGINEERING

**Structures/Construction (Dry) Track, Winter Quarter Abroad (Berlin, Florence, Paris)**

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Total MATH & Science Units: 45
Total Engineering Units: 68
Total Other Units: 67
Total Units: 180

+ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units; see description of "Other Elective Courses" for details.

* NOTES:
1) At the overseas campuses listed, you should be able to take E50 (via videotape), one GER 3, and either an STS class or a second GER 3 course. Save your GER 3 requirements to fulfill abroad!
2) It is essential to take E14 in Autumn and CEE101A in Winter of Soph. year; this program also assumes you take 3 units of Engineering Electives Autumn of your Soph. year.
3) To the extent your schedule allows, take some of the following prior to your Junior year:
   - GES 1 (A,W,S), E60 (A,W), PHYS 51 (A), CEE70 (A), and/or other CE/Dry electives.
## CIVIL ENGINEERING

**Environmental (Wet) Track, Winter Quarter Abroad (Berlin, Florence, Paris)**

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**Subtotals:** 5 0 10

**Total:** 15

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**Subtotals:** 0 3 9

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**Subtotals:** 0 15 0

**Total:** 15

**Subtotals:** 5 5 4

**Total:** 14

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**Subtotals:** 0 15 0

**Total:** 14

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**Total MATH & Science Units:** 46

**Total Engineering Units:** 68

**Total Other Units:** 66

**Total Units:** 180

---

* These classes are typically offered MWF10.

* In alternate years, when CEE 169 is not offered, take CEE 179B in the spring to fulfill the design experience.

^ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units; see description of "Other Elective Courses" for details.

---

**NOTES:**

1. At the overseas campuses listed, you should be able to take an Engineering Fundamental (either E40 or E50), one GER 3, and either an STS class or a second GER 3 course. Save your GER 3 reqmts to fulfill abroad!

2. It is essential to take E30 during Sophomore year (as it conflicts with CEE161A and 172); this program also assumes you take CEE 70 during Sophomore year (or some other class you would otherwise take Autumn of Jr or Sr year), and one other Engineering Elective.

3. To the extent your schedule allows, take some of the following prior to your Junior year:

GES 1 (A,W,S), CEE101D (A), CEE172 (W), CEE100 (A), and/or other CE/Wet electives.
# CIVIL ENGINEERING

Structures/Construction (Dry) Track, Spring Quarter Abroad (Berlin, Florence, Kyoto) *

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Total MATH & Science Units: 45
Total Engineering Units: 68
Total Other Units: 67
Total Units: 180

+ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units; see description of “Other Elective Courses” for details.

* NOTES:
1) At the overseas campuses listed, you should be able to take E50 (via videotape), one GER 3, and either an STS class or a second GER 3 course. Save your GER 3 requirements to fulfill abroad!
2) To avoid scheduling conflicts, take CEE101B in Spring of Sophomore year. It is essential to take at least 7 (and preferably 10) units of other required courses (in CEE, MATH, or Science) during Sophomore year. Courses easily taken early include E60, and CEE70, 100, and 102.
3) To the extent your schedule allows, take some of the following prior to your Junior year:
   GES 1 (A,W,S), E60 (A,W), PHYS 51, CEE70, a statistics class, and/or other CE/Dry electives.
## CIVIL ENGINEERING

### Environmental (Wet) Track, Spring Quarter Abroad (Berlin, Florence, Paris, Kyoto)**

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### Total:

- **Total MATH & Science Units:** 46
- **Total Engineering Units:** 69
- **Total Other Units:** 65
- **Total Units:** 180

---

* These classes are typically offered MWF10.

+ In alternate years, when CEE 169 is not offered, take CEE 179B in Spring to fulfill the design experience.

^ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units; see description of “Other Elective Courses” for details.

** Notes:

1. At the overseas campuses listed, you should be able to take an Engineering Fundamental (either E40 or E50), one GER 3, and either an STS class or a second GER 3 course. Save your GER 3 reqmts to fulfill abroad!
2. It is essential to take CEE101B and CEE160 during Sophomore year; this program also assumes you take CEE70 during Sophomore year (or some other class you would otherwise take Spring of Jr/Sr year).
3. To the extent your schedule allows, take some of the following prior to your Junior year:
   - GES 1 (A,W,S), CEE101D (A), CEE100 (A), ENGR 30 (A,W), and/or other CE/Wet electives.
### Mathematics

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**Mathematics Total**

**Science Total**

**Mathematics + Science Total** (45 units minimum required)

### Technology in Society (1 course required)

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**NOTES**

1. Engineering Science, Design, and Experimentation units do not apply to shaded areas.
2. MATH 53 may be substituted for ENGR 155A. Other substitutions require approval.

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### Engineering Topics (Engineering Science + Design)

**Engineering Fundamentals (3 courses required)**

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<th>Grade</th>
<th>Transfer Credit Approval Date Initials</th>
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<td>60</td>
<td>Engineering Economy (req'd)</td>
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</table>


### Engineering Depth

| CEE  | 70  | Environ. Science & Technology (req'd)      | 2     | 1     | 0                                     |
| CEE  | 100 | Managing CE Projects (req'd) see note 1    | 2.5   | 1.5   | 1                                     |
| CEE  | 101A| Mechanics of Materials (req'd)             | 3     | 1     | 1                                     |
| CEE  | 101B| Mechanics of Fluids (req'd)                | 3     | 1     | 0                                     |
| CEE  | 101C| Geotechnical Engineering (req'd)           | 3     | 1     | 1                                     |

**Fundamentals Total**

### Program Totals: (ABET Requirements)

- Engineering Science+Engineering Design Total: (68 units minimum)
- Experimentation Total: (8 units minimum)
- Mathematics and Science Total: (45 units minimum)

**Advisor Approval**

Printed Name: ____________________________ Date: ____________________________

Signature: ________________________________

**Departmental Approval**

Printed Name: ____________________________ Date: ____________________________

Signature: ________________________________

**School of Engineering Approval**

Printed Name: ____________________________ Date: ____________________________

Signature: ________________________________

**NOTES**

1. Fulfills "Writing in the Major" req. for Freshmen and Transfer students entering Fall 1996 or later.
2. This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
3. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is 2.0.
4. Transfer credits in Math, Science, Fundamentals, & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.

REV: 08/03
If you look at technology today, it is hard to believe that the first computers were developed only half a century ago. Computers are everywhere, and much of modern engineering involves application of computer technology. The undergraduate major in computer science offers a broad and rigorous training for students interested in the science of computing.

Many students obtaining a BS in CS will go on to do graduate work in a branch of CS such as artificial intelligence, robotics, software design, graphics, theory, or hardware design. But CS is not just for future computer scientists. There is an increasing demand for people trained in CS and some other field. If you are interested in working as a manager of a high-tech company, a BS in CS along with an MBA is a great combination. If you want to work on court cases involving software piracy, you will be well served by a BS in CS combined with a JD. Similar opportunities exist for those who combine a BS in CS with an MD or other graduate degree.

The minimum major in computer science consists of 95 units, including 25 units of math, 11 units of science, 13 units of engineering fundamentals, one course in TIS (Technology in Society), and 43 units of depth. After learning essential programming techniques in CS106 (taken either as the two-quarter sequence CS106A/B or as the intensive CS106X) and the mathematical foundations of computer science in CS103 (also offered in both a standard and an intensive form), the computer science major consists of coursework in areas such as programming techniques, automata and complexity theory, systems programming, computer architecture, analysis of algorithms, artificial intelligence, and applications.

The Computer Science Department also participates in three interdisciplinary majors: Computer Systems Engineering, Mathematical and Computational Sciences, and Symbolic Systems.
## Computer Science Requirements

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<th>UNITS</th>
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<td>MATH 41</td>
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<td>STAT 116 or</td>
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<td>CS 103X or</td>
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<td>CS 103A and</td>
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<td>CS 103B</td>
<td>Discrete Structures</td>
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<td>Plus any two of the following courses:</td>
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<tr>
<td>MATH 51</td>
<td>Linear Algebra and Differential Calculus of Several Variables</td>
<td>5</td>
<td>AWS</td>
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<td>MATH 103 or</td>
<td>Matrix Theory and its Applications</td>
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<td>MATH 113</td>
<td>Linear Algebra and Matrix Theory (see note 2)</td>
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<td>MATH 109</td>
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<tr>
<td>CS 157 or</td>
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<td>PHIL 160A</td>
<td>First Order Logic</td>
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<td>Engineering Fundamentals (13 units minimum)</td>
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<td>CS 106X or</td>
<td>Programming Methodology and Abstractions (Accelerated)</td>
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<td>Fundamentals Elective (see list of approved courses earlier in Handbook)</td>
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<tr>
<td>Technology in Society (1 course, 3-5 units)</td>
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<td>Writing in the Major (1 course)</td>
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<td>CS191W, CS194, and CS201 fulfill the “Writing in the Major” requirement.</td>
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<td>Depth (43 units minimum)</td>
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<td>Design and Analysis of Algorithms</td>
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<td>Systems (3 courses)</td>
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### COMPUTER SCIENCE COURSES, CONT.

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<td>Applications (2 courses)</td>
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<td>Artificial Intelligence</td>
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<td>CS 121 or 221</td>
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<tr>
<td>Applications Elective (see note 5)</td>
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<tr>
<td>Senior Project - At least 3 units of CS 191, 191W, or 194 (see note 6)</td>
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<tr>
<td>Restricted Electives (2-3 courses; see note 7)</td>
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**Notes:**

1. MATH 19, 20 and 21 may be taken instead of MATH 41 and 42, as long as at least 23 math units are taken.
2. Completion of MATH 52 and 53 satisfies the MATH 103/113 requirement.
3. Any course of 3 or more units from the School of Engineering list of “Courses Approved for the Science Requirement”, plus PSYCH 30, 40, or AP Biology or Chemistry credit may be used. Either of the physics sequences 61/63 or 21/23 may be substituted for 53/55 as long as at least 11 science units are taken.
4. The two systems electives must be chosen from the following: CS 140, 143, 242 and 244A. This section of the program must include at least one course with a large software project; either CS 140 or 143 currently satisfies this requirement.
5. The applications elective must be chosen from the following: CS 145, 147, 148, 223A, 223B, or 248.
6. CS 191 and 191W independent study projects require faculty sponsorship and must be approved, in advance, by the advisor, faculty sponsor, and the CS program advisor. A form bearing these signatures, along with a brief description of the project, should be filed with the department representative in Gates room 182 the quarter before work on the project is begun.
Computer Science
Typical Sequence of Courses

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<td>CS 140 (A,W)</td>
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<td>EE108B (W,S)</td>
<td>CS 194 (W,S)</td>
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<td>CS 107 (A,S)</td>
<td>CS 143 (A,S)</td>
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<td>CS 103A (A,W)</td>
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<td>STAT 116 (A,S)</td>
<td>CS 161 (A,W)</td>
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# COMPUTER SCIENCE

*Early Start (satisfies many requirements in first two years)*

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Total Math & Science Units: 32  
Total Engineering Units: 70  
Total Other Units: 78  
Total Units: 180
## COMPUTER SCIENCE

**Late Start** (no CS classes until sophomore year)

### Fall

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### Total

- Total Math & Science Units: 34
- Total Engineering Units: 65
- Total Other Units: 81
- Total Units: 180
# COMPUTER SCIENCE

**Even Progression**  (Major requirements are more evenly spread through the four years)

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| **Sophomore** |               |       |       |               |       |       |               |       |       |
| CS 108     | -        | 4     | -     | CS 103A     | -     | 3     | CS 103B     | -     | 3     |
| Fund Elect | -        | 3     | -     | Math Elect  | 3      | -     | TIS         | -      | -     |
| Language   | -        | -     | 5     | Language    | -      | -     | ENGR 40     | -      | 5     |
| GER        | -        | -     | 5     | GER         | 5      |       | Language    | -      | -     |
| **Subtotals** | 0     | 7     | 10    | **Subtotals** | 3   | 3     | 10    | **Subtotals** | 0 | 8     | 9     |
| **Total** | 17 |       |       | **Total** | 16   |       | **Total** | 17   |       |

| **Junior** |               |       |       |               |       |       |               |       |       |
| CS 140     | -        | 4     | -     | CS 161      | -     | 4     | CS 154      | -     | 4     |
| GER        | -        | 5     | -     | CS Elective | -     | 3     | CS Elective | -     | 4     |
| Elective   | -        | -     | 4     | GER         | -      | 5     | STAT 116    | 5      | -     |
| **Subtotals** | 0     | 4     | 9     | **Subtotals** | 0   | 7     | 5     | **Subtotals** | 5 | 8     | 0     |
| **Total** | 13 |       |       | **Total** | 12   |       | **Total** | 12   |       |

| **Senior** |               |       |       |               |       |       |               |       |       |
| CS 143     | -        | 4     | -     | CS 121      | -     | 3     | CS 194      | -     | 3     |
| Math Elect | 3        | -     | -     | CS 223A     | -     | 3     | Elective    | -      | -     |
| Sci Elective | 3    | -   | EE 108B | -    | 4     | Elective  | -      | -     |
| Elective   | 3        |       | -     | Elective    | -      | -     | Elective    | -      | -     |
| **Subtotals** | 6     | 4     | 3     | **Subtotals** | 0   | 10    | 3     | **Subtotals** | 0 | 3     | 9     |
| **Total** | 13 |       |       | **Total** | 13   |       | **Total** | 12   |       |

**Total Math & Science Units:** 32  
**Total Engineering Units:** 69  
**Total Other Units:** 79  
**Total Units:** 180
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Plus any two of the following courses:

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Mathematics Total (23 units minimum)

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Science Total (11 units minimum)

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Fundamentals Total (13 units minimum)

NOTES

1. Math 19, 20 and 21 may be taken instead of Math 41 and 42 as long as at least 23 math units are taken.
2. Completion of Math 52 and 53 satisfies the Math 103/113 requirement.
3. The Science elective may be any course of 3 or more units from the School of Engineering Science List plus Psych 30 or 40. AP Biology or Chemistry also meet this requirement. Either of the physics sequences 61/63 or 21/23 may be substituted for 53/55 as long as at least 11 science units are taken.
4. One course required, 3 to 5 units. See Engineering Fundamentals list earlier in Handbook.
5. The two systems electives must be chosen from the following set: CS140, 143, 242 and 244A. The systems electives must include a course with a large software project, currently satisfied by either CS140 or 143.
6. The applications elective must be chosen from the following set: CS145, 147, 148, 223A, 223B or 248.
7. Students who take CS103A/B must complete two electives; students who opt for CS103X must complete three.
## Computer Science

### Computer Science Depth (43 units minimum required)

#### Programming (2 courses)

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#### Theory (2 courses)

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#### Systems (3 courses-see note 5 on the previous page)

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#### Applications (2 courses-see note 6 on the previous page)

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#### Project (1 course)

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#### Restricted Electives (2-3 courses; see note 7 on the previous page)

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### Totals

- This Page
- Previous Page
- Program totals

### Departmental Approval

Printed Name: ___________________________ Date: ________________

Signature: ___________________________

### School of Engineering Approval

Printed Name: ___________________________ Date: ________________

Signature: ___________________________

### NOTES

1. CS 191W, 194 or 201 will fulfill the "Writing in the Major" requirement for students entering Fall 1996 or later.
2. This form is available as an Excel file at ughb.stanford.edu. The printed form must be signed by the department representative. Changes must be initialed in ink.
3. Transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs in Terman 201. Transfer credits in Computer Science Depth must be approved by the department representative.
4. Courses may be listed under only one category.
5. All courses listed on this form must be taken for a letter grade if offered by the instructor.
6. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Computer Science Depth (combined) is 2.0.

REV: 8/03
Computer Systems Engineering

Computer Systems Engineering is an interdisciplinary program between the Electrical Engineering Department and the Computer Science Department. It is a School of Engineering major that leads to a Bachelor of Science in Engineering degree. The program is targeted for undergraduates with interest in implementation and application of computers and computer-based systems. Through course and laboratory experiences, students will learn the essential principles required to define, design, and build both general purpose and application-specific computer systems. Coursework emphasizes fundamental elements of electrical engineering and computer science as well as underlying circuit and logic technologies. A senior project caps the program and provides a special hands-on experience.

Requirements

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>UNITS</th>
<th>QUARTER</th>
<th>YEAR</th>
</tr>
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<tbody>
<tr>
<td>Mathematics (23 units minimum)</td>
<td></td>
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</tr>
<tr>
<td>MATH 41</td>
<td>Single Variable Calculus</td>
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<tr>
<td>MATH 42</td>
<td>Single Variable Calculus</td>
<td>5</td>
<td>A,W</td>
<td>Fr</td>
</tr>
<tr>
<td>MATH 51</td>
<td>Linear Alg and Differential Calculus of Several Variables</td>
<td>5</td>
<td>A,W,S</td>
<td>Fr</td>
</tr>
<tr>
<td>MATH 52 or 53</td>
<td>Integral Calc of Several Variables/ Linear Algebra</td>
<td>5</td>
<td>A,W,S</td>
<td>Fr</td>
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<tr>
<td>MATH 103 or MATH 113</td>
<td>Matrix Theory and its Applications (see note 1)</td>
<td>3</td>
<td>A,W,S</td>
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<tr>
<td>MATH 113</td>
<td>Linear Algebra and Matrix Theory</td>
<td>A,W</td>
<td>So</td>
<td></td>
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<tr>
<td>Science (12 units minimum)</td>
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</tr>
<tr>
<td>PHYSICS 51</td>
<td>Light and Heat</td>
<td>4</td>
<td>A</td>
<td>Fr</td>
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<tr>
<td>PHYSICS 53</td>
<td>Mechanics</td>
<td>4</td>
<td>W</td>
<td>Fr</td>
</tr>
<tr>
<td>PHYSICS 55</td>
<td>Electricity and Magnetism</td>
<td>4</td>
<td>S</td>
<td>Fr</td>
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<tr>
<td>Engineering Fundamentals (13 units)</td>
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<tr>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
<td>5</td>
<td>A,S</td>
<td>So</td>
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<tr>
<td>CS 106X or CS 106A and CS 106B</td>
<td>Programming Methodology and Abstractions</td>
<td>5</td>
<td>A,W</td>
<td>Fr/So</td>
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<tr>
<td>(Accelerated)</td>
<td>Programming Abstractions</td>
<td>A,W, S</td>
<td>Fr/So</td>
<td></td>
</tr>
<tr>
<td>Elective</td>
<td>(see list of approved Engr Fundamentals courses)</td>
<td>3-5</td>
<td>S</td>
<td>So/Jr</td>
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<tr>
<td>Technology in Society (1 course, 3-5 units)</td>
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<tr>
<td>See list of approved courses in front of Handbook.</td>
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<td>Writing in the Major (1 course)</td>
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<tr>
<td>CS191W, CS194, and CS201 fulfill the “Writing in the Major” requirement.</td>
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CSE COURSES, CONTINUED

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<thead>
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<th>COURSE</th>
<th>UNITS</th>
<th>QUARTER</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (53 units minimum)</td>
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<tr>
<td>CS 103X or Discrete Structures (Accelerated)</td>
<td>4-6</td>
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<td>CS 103A and Discrete Mathematics for Computer Science</td>
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<td>CS 103B Discrete Structures</td>
<td>W, S</td>
<td>So</td>
<td></td>
</tr>
<tr>
<td>CS 107 Programming Paradigms</td>
<td>5</td>
<td>A, S</td>
<td>So/Jr</td>
</tr>
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<td>CS 108 Object-Oriented Systems Design</td>
<td>4</td>
<td>A, W</td>
<td>So/Jr</td>
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<tr>
<td>CS 140 or Operating Systems and Systems Programming</td>
<td>4</td>
<td>A, W</td>
<td>Jr/Sr</td>
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<tr>
<td>CS 143 Compilers</td>
<td>A, S</td>
<td>Jr/Sr</td>
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<tr>
<td>EE 101 Introduction to Circuits</td>
<td>3</td>
<td>W</td>
<td>So</td>
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<tr>
<td>EE 111 Electronics I</td>
<td>4</td>
<td>A</td>
<td>Jr/Sr</td>
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<tr>
<td>EE 112 Electronics II</td>
<td>4</td>
<td>W</td>
<td>Jr/Sr</td>
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<tr>
<td>EE 121 Digital Design Laboratory</td>
<td>4</td>
<td>A, W, S</td>
<td>Jr/Sr</td>
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<td>EE 182 Computer Organization and Design</td>
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<td>A, S</td>
<td>Jr/Sr</td>
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<td>EE 183 Advanced Logic Design Laboratory</td>
<td>3</td>
<td>W, S</td>
<td>Jr/Sr</td>
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<tr>
<td>EE 271 Introduction to VLSI Systems</td>
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<td>A, S</td>
<td>Jr/Sr</td>
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<td>Sr</td>
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<tr>
<td>Electives (see note 3)</td>
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<td>Jr/Sr</td>
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Please Note: Significant changes to the Depth Area are coming this year. Contact the Undergraduate Course Advisor (ug-advisor@cs.stanford.edu) or check the CS web page (http://cse.stanford.edu/resources/CourseAdvisor.index.html) for updates.

Notes:

1. Completion of MATH 52 AND 53 will satisfy the MATH 103/113 requirement.

2. CS191 and 191W independent study projects require faculty sponsorship and must be approved, in advance, by the advisor, faculty sponsor, and the CSE program advisor. A form bearing these signatures, along with a brief description of the project, should be filed with the department representative in Gates Room 182 the quarter before work on the project is begun.

### Mathematics (23 units minimum required)

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<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Total Units</th>
<th>Grade</th>
<th>Transfer Credit</th>
<th>Course #/School Approval</th>
<th>Date</th>
<th>Initial</th>
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<tr>
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<td>MATH</td>
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<td>MATH</td>
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<td>Calculus (52 or 53)</td>
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<tr>
<td>MATH</td>
<td></td>
<td>Linear Algebra (103 or 113) (see note 1)</td>
<td>3</td>
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</table>

**Mathematics Total** (23 units minimum)

### Science (12 units minimum required)

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<th>Grade</th>
<th>Transfer Credit</th>
<th>Course #/School Approval</th>
<th>Date</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYSICS</td>
<td>51</td>
<td>Light and Heat</td>
<td>4</td>
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<td>Mechanics</td>
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<td>PHYSICS</td>
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<td>Electricity and Magnetism</td>
<td>4</td>
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</table>

**Science Total** (12 units minimum)

### Engineering Fundamentals (13 units minimum required)

<table>
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<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
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<th>Transfer Credit</th>
<th>Course #/School Approval</th>
<th>Date</th>
<th>Initial</th>
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</thead>
<tbody>
<tr>
<td>CS</td>
<td>106</td>
<td>Programming Abstract (A and B, or X)</td>
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<td>ENGR</td>
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<td>Introductory Electronics</td>
<td>5</td>
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<td></td>
</tr>
</tbody>
</table>

**Fundamentals Total** (13 units minimum)

### Technology in Society (1 course required, 3-5 units, see list in Technology in Society section of Handbook)

**Totals This Page (51-53)**

### NOTES

1. Completion of MATH 52 AND 53 will satisfy the MATH 103/113 requirement.
2. One course required, 3 to 5 units. See list of "Courses Approved for the Engineering Fundamentals Requirement" in front of Handbook.
3. Students who take CS103A/B must complete two electives; students who opt for CS103X must complete three.
   The list of approved electives is reviewed annually by the CS Undergraduate Program Committee. The current list consists of CS110, CS121 or 221, CS137, CS140, CS143, CS145, CS147, CS148 or 248, CS154, CS155, CS157, CS161, CS205, CS206, CS222, CS223A, CS223B, CS224M, CS224N, CS225A, CS225B, CS226, CS227, CS228, CS229, CS240, CS241, CS242, CS243, CS244A, CS245, CS246, CS247A, CS247B, CS249, CS255, CS256, CS257, CS258, CS261, CS270, CS271, CS272, CS274, EE212, EE216, EE247, EE264, EE278, EE282.
Computer Systems Engineering Depth (53 units minimum required)

Please Note: Significant changes to the CSE Depth area are coming this year. Contact the Undergraduate Course Advisor (ug-advisor@cs.stanford.edu), or check the CS web page (http://cse.stanford.edu/resources/CourseAdvisor/index.html) for updates.

<table>
<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Total Units</th>
<th>Grade</th>
<th>Transfer?</th>
<th>Transfer Credit</th>
</tr>
</thead>
<tbody>
<tr>
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<td>103</td>
<td>Discrete Structures (X, or A and B)</td>
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<tr>
<td>CS</td>
<td>107</td>
<td>Programming Paradigms</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>108</td>
<td>Object-Oriented Systems Design</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td></td>
<td>Compilers (143) or OpSys (140)</td>
<td>4</td>
<td></td>
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<tr>
<td>EE</td>
<td>101</td>
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<td>EE</td>
<td>111</td>
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<td>EE</td>
<td>121</td>
<td>Digital Design Laboratory</td>
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<td></td>
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<td>EE</td>
<td>182</td>
<td>Computer Organization</td>
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<tr>
<td>EE</td>
<td>183</td>
<td>Advanced Logic Laboratory</td>
<td>3</td>
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<tr>
<td>EE</td>
<td>271</td>
<td>Intro to VLSI Systems</td>
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</table>

(44 units minimum)

Restricted Electives (see note 3 on previous page)

(6 units minimum)

Project (1 course)

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<tr>
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<th>Title</th>
<th>Total Units</th>
<th>Grade</th>
<th>Transfer?</th>
<th>Transfer Credit</th>
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<td>CS</td>
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<td>At least 3 units of 191, 191W or 194</td>
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</table>

(3 units minimum)

Totals This Page: 53

Totals Previous Page (51-53): 53

Program Totals (104-106): 106

Departmental Approval

Printed Name: ____________________________ Date: ____________________________

Signature: ____________________________

School of Engineering Approval

Printed Name: ____________________________ Date: ____________________________

Signature: ____________________________

NOTES

(1) CS191, 194, or 201 will fulfill the "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 1996 or later.

(2) This form is available as an Excel file at ughb.stanford.edu. The printed form must be signed by the department representative. Changes must be initialed in ink.

(3) Transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs in Terman 201. Transfer credits in Computer Science Depth must be approved by the department representative.

(4) Courses may be listed under only one category.

(5) All courses listed on this form must be taken for a letter grade if offered by the instructor.

(6) Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Computer Science Depth (combined) is 2.0.

REV: 8/03
The mission of the Department of Electrical Engineering is to offer an EE undergraduate program that augments the liberal education expected of all Stanford undergraduates and imparts a basic understanding of electrical engineering built on a foundation of physical science, mathematics, computing, and technology.

Graduates of the undergraduate program should possess knowledge of electrical engineering fundamentals and at least one specialty area. They are expected to have the basic experimental, design, and communication skills to be prepared for continued study at the graduate level or entry level positions that require basic knowledge of electrical engineering, science, and technology.

The educational objectives and student outcomes for the Department of Electrical Engineering are shown in the table at the top of the following page.

The Departmental Requirements for a BS degree in Electrical Engineering include a core set of courses required of every major and a set of specialty areas from which one sequence must be chosen. Each program of study is also expected to include physics as part of science, and calculus, linear algebra, and ordinary differential equations as part of mathematics. The requirements also include a course in basic probability and statistics, which counts towards satisfaction of the Mathematics Requirement. Specific math and science requirements for EEs are listed below. Program requirements detailed below include Technology in Society (one course) and one and one half years of Engineering Topics, which include Engineering Fundamentals and Depth, which in turn includes Electrical Engineering Core Courses, a Specialty Sequence, electrical engineering electives, and a design course from an approved list. The design course is intended to culminate the substantial design experience distributed throughout the curriculum. Students are required to pass a writing-intensive course within their major. Those who double-major will have to take two such courses. The writing-intensive course for the Electrical Engineering Major is EE 108A combined with ENGR 102E.

Students are required to have a program planning sheet approved by their advisor and the department prior to the end of the quarter following the quarter they declare their major and at least one year prior to graduation. Programs may be changed at anytime except during the final quarter before graduation by submitting and having approved a new program sheet.
OBJECTIVES AND OUTCOMES FOR ELECTRICAL ENGINEERING

Objectives:
1. *Technical Knowledge:* Provide a basic knowledge of electrical engineering principles along with the required supporting knowledge of mathematics, science, computing, and engineering fundamentals. The program must include depth in at least one specialty area, currently including Computer Hardware, Computer Software, Controls, Electronics, Fields and Waves, and Communication and Signal Processing.
2. *Laboratory and Design Skills:* Develop the basic skills needed to perform and design experimental projects. Develop the ability to formulate problems and projects and to plan a process for solution taking advantage of diverse technical knowledge and skills.
3. *Communications skills:* Develop the ability to organize and present information and to write and speak effective English.
4. *Preparation for Further Study:* Provide sufficient breadth and depth for successful subsequent graduate study, post-graduate study, or lifelong learning programs.
5. *Preparation for the Profession:* Provide an appreciation for the broad spectrum of issues arising in professional practice, including teamwork, leadership, safety, ethics, service, economics, and professional organizations.

Outcomes:
(a) An ability to apply knowledge of mathematics, science, and engineering
(b) An ability to design and conduct experiments, as well as to analyze and interpret data
(c) An ability to design a system, component, or process to meet desired needs
(d) An ability to function on multi-disciplinary teams
(e) An ability to identify, formulate, and solve engineering problems
(f) An understanding of professional and ethical responsibility
(g) An ability to communicate effectively
(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) A recognition of the need for, and an ability to engage in life-long learning
(j) A knowledge of contemporary issues
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
(l) Background for admission to engineering or other professional graduate programs

Sheets for the general EE requirements and for each of the EE specialty sequences may be found at [http://ughb.stanford.edu](http://ughb.stanford.edu).

To place the requirements in context, sample programs of study are given which satisfy all requirements for the BS degree in EE. Students with advanced placement will have greater freedom in course selection than is shown on the example program. Those considering studying at one of the foreign centers should consult the Overseas Study Office as soon as possible for this will add constraints in program planning. All students are expected to consult their faculty advisor, are encouraged to consult the Electrical Engineering Undergraduate Advising Center, and they may find it useful to consult other students when designing their program.

For updated information, visit the EE website at: [http://ee.stanford.edu/](http://ee.stanford.edu/)
Math and Science Requirements:
A minimum of 45 units of mathematics and science combined are required, including the following required courses:
Math: MATH 41, 42, 51, 52, 53 or ENGR 155A, EE178 or STAT 116 or MATH 151 or ENGR 155C
Science: PHYSICS 51, 53, 55 (or 61, 63, 65)
Substitutions require approval of Advisor, Department, and School.

Technology in Society:
See the “Approved Courses” section of this handbook for courses that fulfill the TIS requirement.

Engineering Topics:
A minimum of 68 units (approximately 1.5 years) of Engineering Topics is required by ABET and by the Department. Engineering Topics include both Engineering Fundamentals and Engineering Depth. Engineering Fundamentals consist of two required courses (E40 and E70X) and a third fundamental from outside EE and CS chosen from the School list of approved courses. Electrical Engineering Depth comprises Core courses, a Specialty Sequence, and Electrical Engineering Electives.

Engineering Fundamentals:
Introductory Electronics ENGR 40
Programming Methodology ENGR 70X (CS 106X) or CS 106B
1 from approved list (not an EE or CS course)

Core Courses Required of All Majors:
Electronics EE 101A,B
Signals and Systems EE 102A,B
Digital Systems EE 108A,B
Analog Laboratory EE 122
Technical Writing ENGR 102E (joint with EE 108A)
Physics in Electrical Engineering EE 41 or EE 141
The Electrical Engineering Profession EE 100

Three Courses from One of the Specialty Areas Listed Below:
Computer Hardware EE 184(CS 107), EE 271, EE 273, EE 275, EE 281, EE 282
Computer Software EE 184(CS 107), EE 189A (CS 108), EE 189B (CS 194), (EE 284 or CS 244A)
Controls EE 105 (ENGR 105), EE 205 (ENGR 205), EE 206 (ENGR 206), EE 209A, (ENGR 209A), EE 263
Electronics EE 116, EE 133, EE 212, EE 214, EE 216
Fields and Waves EE 142, EE 144, EE 241, EE 246, EE 247, EE 252
Signal Processing EE 133, EE 168, EE 179, EE 261, EE 263, (EE 264 or EE 265), EE 278, and Communications EE 279
**DESIGN COURSE:**
At least one of the following design projects must be included in each program:
EE 118, EE 133, EE 144, EE 189B (CS 194), EE 206 (ENGR 206), EE 281.

**ELECTIVES:**
A total of 68 Engineering Topics Units consisting of any graded EE courses, any CS 193 courses, or a maximum of two additional Engineering Fundamentals. EE 100 and ENGR 102E do not count toward the 68 units.

**Total Engineering Topics Units: 68 units**
(Fundamental + Core + EE Specialty + Electives)

It is a School of Engineering requirement that all courses counting toward the major must be taken for a letter grade if the instructor offers that option.

A sample program fulfilling the EE undergraduate major requirements is provided for each of the specialties. These examples are given to assist in planning a complete program. They are only guidelines. In general, however, scheduling is easier if engineering classes are taken as early as possible. Variations that appear in the first two years of the different sample schedules simply illustrate different options available to students before they specialize (except that MATH 113 may be needed for the Controls specialty).

The School of Engineering Undergraduate Program Sheet follows the sample programs for Electrical Engineering. Sample forms are appended to illustrate how one might fill out the form in each specialty. For updated information, visit the web site at [http://ughb.stanford.edu](http://ughb.stanford.edu).
The following two tables provide the total units, the division of engineering science and engineering design units, and the experimentation units. The experimentation units are counted separately and are used only for the ABET Laboratory units requirement.

Following these tables a generic sample or typical program is provided. Sample programs follow the general program for each of the EE undergraduate specialty sequences. These examples are provided to assist in planning a complete program. The complete programs are followed by examples of partial or complete School of Engineering Undergraduate Program Sheets. The first shows only the courses required for all EE undergraduates, and the remaining examples show sample programs for each of the EE undergraduate specialty sequences.
# Engineering Science, Design and Experimentation Units

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Engr. Sci</th>
<th>Engr. Dsgn</th>
<th>Expr.</th>
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<tbody>
<tr>
<td><strong>Fundamentals</strong></td>
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</tr>
<tr>
<td>ENGR 40</td>
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* The use of "or" means that only one of the two courses may be used to fulfill a fundamental.
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Electrical Engineering
Typical Sequence of Courses

Freshman
- MATH 41 (A)
- MATH 42 (AW)
- MATH 51 (AWS)
- PHYS 51 (A)
- PHYS 53 (W)
- PHYS 55 (S)

Sophomore
- MATH 52 (AWS)
- MATH 53 (AWS)
- ENGR 40 (A)
- EE 100 (A)
- CS 106X (AWS)
- E. Fundamental
- EE 102A (W)
- EE 102B (S)
- EE 108A (A,W)
- EE 108B (A,W)
- EE 178 (W) or STAT 116 (AWS)

Junior
- EE 101A (W)
- EE 101B (S)
- EE 122 (A,S)
- EE 108B (W,S)
- EE 41 (W) or EE 141 (A)

Junior/Senior Year: Choose one track below

Computer Hardware
- STS class
- CS 107
- EE 273
- EE 271
- EE 282
- EE Elective
- EE Elective
- EE Elective

Computer Software
- STS class
- CS 107
- EE 273
- EE 271
- EE Elective
- EE Elective
- EE Elective

Controls
- STS class
- ENGR 105
- ENGR 205
- ENGR 206
- EE Elective
- EE Elective
- EE Elective

Electronics
- STS class
- EE 116
- EE 133
- EE 212
- EE Elective
- EE Elective
- EE Elective

Fields & Waves
- STS class
- EE 142
- EE 241
- EE 212
- EE Elective
- EE Elective
- EE Elective

- STS class
- EE 133
- EE 179
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- EE Elective
## TYPICAL FOUR-YEAR SCHEDULE FOR THE
**COMPUTER HARDWARE SPECIALTY**

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| **Total Math & Science Units**: 46  
**Total Engineering Units**: 71  
**Total Other Units**: 68  
**Total Units**: 185
### TYPICAL FOUR-YEAR SCHEDULE FOR THE SIGNAL PROCESSING AND COMMUNICATIONS SPECIALTY

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|               | Total Math & Science Units: 46 |
|               | Total Engineering Units: 69   |
|               | Total Other Units: 67         |
|               | Total Units: 182              |
### Electrical Engineering—General EE Requirements

**ABET Accreditation Criteria Apply**

- **Name:** 
- **ID #:** 
- **Local Address:** 
- **Local Phone:** 
- **E-mail:** 
- **Date B.S. expected:** 

#### Units

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**Mathematics Total**

#### Mathematics + Science Total (45 units minimum required)

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**Science Total**

**Technology in Society (1 course required)**

**NOTES**

1. Engineering Science, Design, and Experimentation units do not apply to shaded areas.
2. ENGR 155A may be substituted for MATH 53, STAT 116 or MATH 151 for EE178. Other substitutions require approval.

**REV:** 08/03

Continues on back of sheet ↓
### Electrical Engineering—General EE Requirements

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**Engineering Topics (Engineering Science + Design)**

**Engineering Fundamentals** (3 courses required)

- ENGR 40 Introductory Electronics (req’d) 3 2 2 5
- ENGR 70X Prog Meth and Abst (CS106X) (req’d) 4 1 0 5

**Fundamentals Total** (three courses required)

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**Program Totals: (ABET Requirements)**

- Engineering Topics Total (68 units minimum)
- Experimentation Total (8 units minimum)
- Mathematics and Science Total (45 units minimum)

### Advisor Approval

Printed Name: ____________________________ Date: ______________________

Signature: ______________________________

### Departmental Approval

Printed Name: ____________________________ Date: ______________________

Signature: ______________________________

### School of Engineering Approval

Printed Name: ____________________________ Date: ______________________

Signature: ______________________________

### NOTES

1. Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 96 or later.
2. EE 41 or EE 141.
3. This form is available as an Excel file at http://ughb.stanford.edu/ The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
4. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Combined Grade Point Average for all courses in Engineering Topics is 2.0.
5. Transfer credits in Math, Science, Funds., & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.
SCHOOL OF ENGINEERING
2003-04 Sample Program Sheet
Electrical Engineering—Computer Hardware Example
— ABET Accreditation Criteria Apply —

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Local Address: ___________________________ Local Phone: ___________________________
E-mail: ___________________________ Date B.S. expected: ___________________________

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Mathematics

- MATH 41 Calculus (req'd) 5
- MATH 42 Calculus (req'd) 5
- MATH 51 Calculus (req'd) 5
- MATH 52 Calculus (req'd) 5
- MATH 53 Ordinary Differential Equations (req'd) 5
- STAT 116 Theory of Probability (req'd) 5

Mathematics Total

Science

- PHYS 51 Light and Heat (req'd) 0 4
- PHYS 53 Mechanics (req'd) 0 4
- PHYS 55 Electricity and Magnetism (req'd) 0 4
- CHEM 31 Chemical Principles 0 4

Science Total

Mathematics + Science Total (45 units minimum required)

Technology in Society (1 course required)

- STS 110 Ethics and Public Policy 5

NOTES

(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.
(2) ENGR 155A may be substituted for MATH 53, STAT 116 or MATH 151 for EE178. Other substitutions require approval.

REV: 08/03  Continues on back of sheet ↓
# Electrical Engineering—Computer Hardware Example

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## Engineering Topics (Engineering Science + Design)

*Engineering Fundamentals (3 courses required)*

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**Fundamentals Total**

*Engineering Depth*

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Program Totals: (ABET Requirements)

- Engineering Topics Total: (68 units minimum)
- Experimentation Total: (8 units minimum)
- Mathematics and Science Total: (45 units minimum)

### Advisor Approval

- Printed Name: 
- Date: 
- Signature: 

### Departmental Approval

- Printed Name: 
- Date: 
- Signature: 

### School of Engineering Approval

- Printed Name: 
- Date: 
- Signature: 

**NOTES**

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4. All courses listed on this form must be taken for a letter grade if offered by the instructor.
5. Minimum Combined Grade Point Average for all courses in Engineering Topics is 2.0.
6. Transfer credits in Math, Science, Funds., & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.
### Mathematics

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**Mathematics Total**  

### Science

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**Science Total**  

**Mathematics + Science Total**: 45 units minimum required

### Technology in Society (1 course required)

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### NOTES

1. Engineering Science, Design, and Experimentation units do not apply to shaded areas.
2. ENGR 155A may be substituted for MATH 53, STAT 116 or MATH 151 for EE178. Other substitutions require approval.

REV: 08/03  
Continues on back of sheet
### Electrical Engineering—Computer Software example

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**Engineering Topics (Engineering Science + Design)**

*Engineering Fundamentals (3 courses required)*

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**Program Totals: (ABET Requirements)**

- **Engineering Topics Total**: 68 units minimum
- **Experimentation Total**: 8 units minimum
- **Mathematics and Science Total**: 45 units minimum

---

**NOTES**

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## Electrical Engineering—Controls Example
— ABET Accreditation Criteria Apply —

### Name:

### ID #:

### Local Address:

### Local Phone:

### E-mail:

### Date B.S. expected:

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### Mathematics

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| Math  | 42  | Calculus (req'd)                             | 5     |              |         |        |              |              |          |        |          |
| Math  | 51  | Calculus (req'd)                             | 5     |              |         |        |              |              |          |        |          |
| Math  | 52  | Calculus (req'd)                             | 5     |              |         |        |              |              |          |        |          |
| Math  | 53  | Ordinary Differential Equations (req'd)      | 5     |              |         |        |              |              |          |        |          |
| EE    | 178 | Intro Prob Sys Anal (req'd)                 | 3     |              |         |        |              |              |          |        |          |
| Math  | 113 | Linear Algebra and Matrix Theory            | 3     |              |         |        |              |              |          |        |          |
| Math  | 114 | Linear Algebra and Matrix Theory II         | 3     |              |         |        |              |              |          |        |          |

**Mathematics Total**

| Math  | 51  | Light and Heat (req'd)                       | 0     |              |         |        |              |              |          |        |          |
| Math  | 53  | Mechanics (req'd)                            | 0     |              |         |        |              |              |          |        |          |
| Math  | 55  | Electricity and Magnetism (req'd)            | 0     |              |         |        |              |              |          |        |          |

**Science**

**Mathematics + Science Total** (45 units minimum required)

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<tbody>
<tr>
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REV: 08/03

Continues on back of sheet ↓
## Electrical Engineering—Controls Example

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**Fundamentals Total** (at least 3 required)

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**Program Totals: (ABET Requirements)**

- **Engineering Topics Total** (68 units minimum)
- **Experimentation Total** (8 units minimum)
- **Mathematics and Science Total** (45 units minimum)

### Advisor Approval

- **Printed Name:**
- **Date:**
- **Signature:**

### Departmental Approval

- **Printed Name:**
- **Date:**
- **Signature:**

### School of Engineering Approval

- **Printed Name:**
- **Date:**
- **Signature:**

### NOTES

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2. EE 41 or EE 141.
3. This form is available as an Excel file at http://ughb.stanford.edu/ The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
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**STANFORD UNIVERSITY**  
**SCHOOL OF ENGINEERING**  
**2003-04 Sample Program Sheet**  
**Electrical Engineering—Electronics Example**  
— ABET Accreditation Criteria Apply —

Name: ___________________________  
ID #: ___________________________  
Local Address: ___________________  
Local Phone: _____________________  
E-mail: __________________________  
Date B.S. expected: _______________

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**Mathematics**

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**Mathematics Total**

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**Science Total**

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**Technology in Society (1 course required)**

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<td>(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.</td>
</tr>
<tr>
<td>(2) ENGR 155A may be substituted for MATH 53, STAT 116 or MATH 151 for EE178. Other substitutions require approval.</td>
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REV: 08/03  
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**Electrical Engineering—Electronics Example**

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**Engineering Topics (Engineering Science + Design)**

*Engineering Fundamentals (3 courses required)*

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**Fundamentals Total** *(three courses required)*

**Engineering Depth**

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**Program Totals: (ABET Requirements)**

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<td>Mathematics and Science Total</td>
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**Advisor Approval**

Printed Name: ___________________________ Date: ___________________________

Signature: ___________________________

**Departmental Approval**

Printed Name: ___________________________ Date: ___________________________

Signature: ___________________________

**School of Engineering Approval**

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### Electrical Engineering—Fields and Waves Example

— ABET Accreditation Criteria Apply —

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**Mathematics Total**

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**Science Total**

**Mathematics + Science Total** (45 units minimum required)

**Technology in Society (1 course required)**

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REV: 08/03

Continues on back of sheet
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#### Engineering Topics (Engineering Science + Design)

**Engineering Fundamentals (3 courses required)**

|        |        |                              |       |       |           |           |       |           |          |      |          |
|--------|--------|------------------------------|-------|-------|-----------|-----------|-------|-----------|          |      |          |
| ENGR   | 40     | Introductory Electronics (req'd) | 3     | 2     | 2         | 5         |       |           |          |      |          |
| ENGR   | 70X    | Prog Meth and Abst (CS106X) (req'd) | 4     | 1     | 0         | 5         |       |           |          |      |          |
| ENGR   | 14     | Applied Mechanics             | 2     | 1     | 0         | 3         |       |           |          |      |          |

**Fundamentals Total** (three courses required)

#### Engineering Depth

|        |        |                              |       |       |           |           |       |           |          |      |          |
|--------|--------|------------------------------|-------|-------|-----------|-----------|-------|-----------|          |      |          |
| EE     | 100    | Electrical Engineering Profession (req'd) | 0     | 0     | 0         | 0         |       |           |          |      |          |
| EE     | 141    | Eng Electromagnetics (req'd) (see note 2) | 4     | 0     | 0         | 4         |       |           |          |      |          |
| EE     | 101A   | Electronics I (req'd)         | 4     | 0     | 1         | 4         |       |           |          |      |          |
| EE     | 101B   | Electronics II (req'd)        | 3     | 1     | 1         | 4         |       |           |          |      |          |
| EE     | 102A   | Signals and Systems I (req'd) | 4     | 0     | 1         | 4         |       |           |          |      |          |
| EE     | 102B   | Signals and Systems II (req'd) | 4     | 0     | 1         | 4         |       |           |          |      |          |
| EE     | 108A   | Digital Systems I (req'd)     | 3     | 1     | 1         | 4         |       |           |          |      |          |
| EE     | 108B   | Digital Systems II (req'd)    | 3     | 1     | 1         | 4         |       |           |          |      |          |
| EE     | 122    | Analog Laboratory (req'd)     | 1     | 2     | 3         | 3         |       |           |          |      |          |
| ENGR   | 102E   | Tech/Prof Writing (req'd) (see note 1) | 0     | 0     | 0         | 0         |       |           |          |      |          |
| EE     | 142    | Electromagnetic Waves         | 2.5   | 0.5   | 0         | 3         |       |           |          |      |          |
| EE     | 144    | EM Waves Design Laboratory    | 1.5   | 1.5   | 1.5       | 3         |       |           |          |      |          |
| EE     | 179    | Introduction to Communication | 3     | 0     | 0         | 3         |       |           |          |      |          |
| EE     | 241    | Waves I                      | 3     | 0     | 0         | 3         |       |           |          |      |          |
| EE     | 247    | Intro to Optical Fiber Comm   | 2     | 1     | 0         | 3         |       |           |          |      |          |
| EE     | 252    | Antennas for Telecom. and Remote Sensing | 2     | 1     | 0         | 3         |       |           |          |      |          |
| EE     | 261    | Fourier Transform and Applications | 3     | 0     | 0         | 3         |       |           |          |      |          |
| EE     | 278    | Intro to Statistical Signal Processing | 3     | 0     | 0         | 3         |       |           |          |      |          |
| EE     | 279    | Intro to Communication Systems | 3     | 0     | 0         | 3         |       |           |          |      |          |

### Program Totals: (ABET Requirements)

<p>| | | | | | | | | | | | | | |</p>
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#### Advisor Approval

Printed Name: ______________________ Date: ______________________

Signature: ______________________

#### Departmental Approval

Printed Name: ______________________ Date: ______________________

Signature: ______________________

#### School of Engineering Approval

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<td>Ordinary Differential Equations (req'd)</td>
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<tr>
<td>EE</td>
<td>178</td>
<td>Intro Probabilistic Sys Analysis (req'd)</td>
<td>3</td>
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<tr>
<td>MATH</td>
<td>13</td>
<td>Linear Algebra and Matrix Theory</td>
<td>3</td>
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<td>ESYS</td>
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<td>Introduction to Earth Systems</td>
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<td>(45 units minimum required)</td>
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<tr>
<td>STS</td>
<td>101Q</td>
<td>Technology in Contemporary Society</td>
<td>4</td>
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</table>

**NOTES**

(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.
(2) ENGR 155A may be substituted for MATH 53, STAT 116 or MATH 151 for EE178. Other substitutions require approval.

REV: 08/03

Continues on back of sheet
Electrical Engineering—Signal Processing Example

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### Engineering Topics (Engineering Science + Design)

#### Engineering Fundamentals (3 courses required)

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<tr>
<th>ENGR</th>
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<th>Introductory Electronics (req'd)</th>
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<tr>
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<td>70X</td>
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<td>ENGR</td>
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### Engineering Depth

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<td>141</td>
<td>Eng Electromagnetics (req'd) (see note 2)</td>
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<td>101A</td>
<td>Electronics I (req'd)</td>
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<tr>
<td>EE</td>
<td>101B</td>
<td>Electronics II (req'd)</td>
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<td>4</td>
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<tr>
<td>EE</td>
<td>102A</td>
<td>Signals and Systems I (req'd)</td>
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<td>Tech/Prof Writing (req'd) (see note 1)</td>
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<td>Internet Technologies</td>
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<td>EE</td>
<td>261</td>
<td>Fourier Transforms</td>
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<td>EE</td>
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<td>Signal Processing Laboratory</td>
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<td>EE</td>
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<td>Intro to Communication Systems</td>
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<td>0</td>
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</tr>
</tbody>
</table>

Program Totals: (ABET Requirements)

- Engineering Topics Total
- Experimentation Total
- Mathematics and Science Total

### Advisor Approval

Printed Name: ___________________________ Date: ___________________________

Signature: ____________________________

### Departmental Approval

Printed Name: ___________________________ Date: ___________________________

Signature: ____________________________

### School of Engineering Approval

Printed Name: ___________________________ Date: ___________________________

Signature: ____________________________

### NOTES

1. Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 96 or later.
2. EE 41 or EE 141.
3. This form is available as an Excel file at http://ughb.stanford.edu/ The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
4. All courses listed on this form must be taken for a letter grade if offered by the instructor.
5. Minimum Combined Grade Point Average for all courses in Engineering Topics is 2.0.
6. Transfer credits in Math, Science, Funds., & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.
ENVIRONMENTAL ENGINEERING

The environmental engineering profession works to protect and manage our air, water, and energy resources. Environmental engineers quantitatively analyze the environmental changes that inevitably result from human activities, designing strategies to remediate problems, minimize impacts, and measurably improve environmental quality.

The environmental engineering field is refreshingly multi-disciplinary in nature, combining fundamental principles drawn from physics, chemistry, geology and biology with analytical methods. Practitioners focus on developing devices, techniques and solutions that can effectively address a variety of real-world environmental problems.

OBJECTIVES AND OUTCOMES FOR ENVIRONMENTAL ENGINEERING

Objectives:
1. Principles and Skills: Provide an understanding of engineering principles along with analytical, problem-solving, design, and communication skills to continue succeeding and learning in diverse careers.
2. Preparation for Practice: Prepare for successful engineering practice with a longer-term perspective that takes into account new tools, such as advanced information technology and biotechnology, and increasingly complex professional and societal expectations.
3. Preparation for Graduate Study: Prepare for possible graduate study in engineering or other fields.
4. Preparation for Service: Develop the awareness, background, and skills to become responsible citizens and leaders in service to society.

Outcomes:
(a) A proficiency in and ability to apply knowledge of engineering, mathematics through differential equations, probability and statistics, and science including physics and chemistry
(b) An ability to design and conduct experiments, as well as to analyze and interpret data
(c) An ability to design a system, component, or process to meet desired needs
(d) An ability to function on multi-disciplinary teams
(e) An ability to identify, formulate, and solve engineering problems
(f) An understanding of professional and ethical responsibility
(g) An ability to communicate effectively
(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) A recognition of the need for, and an ability to engage in life-long learning
(j) A knowledge of contemporary issues
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
(l) Background for admission to engineering or other professional graduate programs
THE CURRICULUM

The undergraduate environmental engineering curriculum consists of a set of core classes considered essential for the major, along with additional classes students can select from a list of breadth electives. This major was added to Stanford’s undergraduate curriculum in 2000, and is structured to fulfill ABET requirements for an environmental engineering major. The department is currently applying for accreditation, in accordance with ABET requirements (which require students to graduate with this major before the application can be submitted).

Those undergraduates potentially interested in the Environmental Engineering major may want to examine the Environmental and Water Studies specialization of the Civil Engineering major as a possible alternative; a comparison of these two majors is presented on the next page.

If you would like more information on environmental engineering, contact Marie Ochi-Jacobs in Room M-42 of the Terman Engineering Center (email: marieo@stanford.edu).
A COMPARISON:
ENVIRONMENTAL ENGINEERING VS. CIVIL ENGINEERING

Those students interested in environmental studies should be aware of the differences between choosing the Environmental Engineering major and the Environmental and Water Studies specialization of the Civil Engineering major. Noteworthy considerations include:

1. Curricular Differences: The Civil Engineering (CivE) major requires ENGR 14 (Applied Mechanics), CEE101A (Mechanics of Materials), and CEE101C (Geotechnical Engineering), while the Environmental Engineering (EnvE) major does not. This is because these classes are essential background for the structures/construction area of Civil Engineering. The EnvE major lists CEE 64 (Air Pollution) as a required class (while CivE does not); offers 10 units of Breadth electives (vs 6 units for CivE); and has room for up to 8 units of other School of Engineering electives (vs 6 units in CivE).

2. Professional Considerations: For some career paths, accreditation is not an issue; for other career paths where being a professionally registered engineer is important, having an accredited degree is quite valuable. Currently, CivE is an ABET-accredited major, while EnvE is not. The Civil & Environmental Engineering Department plans to apply for retroactive accreditation for the Environmental Engineering major, but in accordance with ABET requirements, this cannot occur until 2003 at the very earliest. If ABET grants accreditation, then anyone who has received a Stanford B.S. in EnvE in the intervening years will have earned an ABET-accredited EnvE degree. While the department is confident of achieving accreditation for the EnvE major, we cannot absolutely guarantee to you that the EnvE degree will become accredited.

3. Philosophical Considerations: Some faculty and students feel that "Civil Engineering" implies a broader background, and may thus lead to a broader range of job opportunities. But others argue that "Environmental Engineering" is a more accurate description for a course of study that emphasizes the environment. And finally, there are others who feel that the name itself makes little or no difference.
EXPLORING ENVIRONMENTAL ENGINEERING AS A MAJOR

Attention, freshmen and sophomores! Are you thinking about an engineering major, or wondering whether an Environmental Engineering major is for you? If so, here is some advice on courses accessible early in your undergraduate career that will help you assess your interest in our major. If you end up joining our program, this early start on fulfilling requirements will pay off by giving you more flexibility in class scheduling for your junior and senior years.

1. For an introduction to Environmental Engineering, classes required for all of our declared majors which are readily accessible to you are:
   CEE 70: Environmental Science & Technology (A)
   CEE100: Managing Civil Engineering Projects (WIM)(A)

2. For electives providing additional exposure to the Environmental Engineering major, look at:
   CEE 61Q: Big Dams, City Hall, and the Sierra Club (given 04-05; soph. seminar)
   CEE 63: Weather and Storms (A)
   CEE 64: Air Pollution: from Urban Smog to Global Change (S)
   CEE 99: Environmental Issues Seminar (A,W)
   CEE173A: Energy Resources (W)

3. For any Engineering major, 3 Engineering Fundamentals must be taken out of the 8 courses offered. Early on, you should consider taking:
   ENGR 30: Engineering Thermodynamics (A,W; a req'd fundamental for EnvE)
   ENGR 60: Engineering Economy (A,W, Su; a req'd fundamental for EnvE)

4. You should make sure you take the following Science/Math classes, which are required for almost all majors within the School of Engineering:
   CHEM 31: Chemical Principles (A, W, Su)
   PHYSICS 53: Mechanics (W) [co-requisite: MATH 41]
   MATH 51: Linear Algebra & Differential Calculus (A,W,S,Su) [prerequisite: MATH 21, 42]

5. Finally, there are additional Science/Math classes required for students majoring in Environmental Engineering which can readily be taken early on:
   GES 1: Fundamentals of Geology (A,W,S)
   STAT 110 (or STAT 60 or GES 160): Statistics (A,W,S)
2003-04 ENVIRONMENTAL ENGINEERING MAJOR
REQUIREMENTS

Mathematics and Science (45 units minimum), including:

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>UNITS</th>
<th>QTR.</th>
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</thead>
<tbody>
<tr>
<td>ENGR 155A</td>
<td>Math/Computational Methods for Engineers (or Math 53)</td>
<td>5</td>
<td>W,S</td>
</tr>
<tr>
<td>PHYSICS 53</td>
<td>Mechanics</td>
<td>4</td>
<td>W</td>
</tr>
<tr>
<td>CHEM 31</td>
<td>Chemical Principles</td>
<td>4</td>
<td>A,W,Su</td>
</tr>
<tr>
<td>CHEM 33</td>
<td>Structure and Reactivity (organic chemistry)</td>
<td>4</td>
<td>W,S,Su</td>
</tr>
<tr>
<td>CHEM 35 or 135</td>
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<tr>
<td>GES 1</td>
<td>Fundamentals of Geology</td>
<td>5</td>
<td>A,W,S</td>
</tr>
<tr>
<td>STAT 110</td>
<td>Statistical Methods (or Stat 60 or GES 160 or ENGR 155C)</td>
<td>4-5</td>
<td>A,W,S</td>
</tr>
</tbody>
</table>

Engineering Fundamentals (3 courses minimum, at least one of which must be unspecified by the department), including:

- ENGR 30  Engineering Thermodynamics 3 A,W
- ENGR 60  Engineering Economy 3 A,W, Sum

Technology in Society: 1 course

See the “Approved Courses” section of this handbook for courses that fulfill the TIS requirement.

You are encouraged to choose a course with an ethical component; TIS courses recommended for Environmental Engineering majors are marked with a footnote.

Experimentation:

At least eight units of experimentation are required. At least 6 units will be earned by fulfilling the Depth requirements below, and 1 unit from GES 1.

REQUIREMENTS CONTINUED ON NEXT PAGE…
Environmental Engineering Depth: *(Fundamentals + Depth = 68 Units Minimum)*

**REQUIRED CORE:** (45 UNITS)

<table>
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<tr>
<td>CEE 64*</td>
<td>Air Pollution: Urban Smog to Global Change</td>
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<td>S</td>
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<tr>
<td>CEE 70</td>
<td>Environmental Science and Technology</td>
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<td>A</td>
</tr>
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<td>CEE 100</td>
<td>Managing Civil Engineering Projects</td>
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<td>A</td>
</tr>
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<td>CEE 101B</td>
<td>Mechanics of Fluids</td>
<td>4</td>
<td>A</td>
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<td>CEE 101D*</td>
<td>Math. Lab Applications in CEE</td>
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<td>A</td>
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<td>CEE 160</td>
<td>Mechanics of Fluids Laboratory</td>
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<td>S</td>
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<td>CEE 161A</td>
<td>Rivers, Streams and Canals (formerly Open Channel Flow)</td>
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<td>A</td>
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<tr>
<td>CEE 166A</td>
<td>Watersheds and Wetlands</td>
<td>3</td>
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<td>CEE 166B</td>
<td>Floods and Droughts, Dams and Aqueducts (formerly Water Resources)</td>
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<td>CEE 171</td>
<td>Environmental Planning Methods</td>
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<td>W</td>
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<td>CEE 172</td>
<td>Air Quality Management</td>
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<td>CEE 177</td>
<td>Aquatic Chemistry and Biology</td>
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<td>CEE 179A</td>
<td>Water Chemistry Laboratory</td>
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<td><em>Design Experience: either CEE169, or CEE179B</em></td>
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*Can count either towards the Math or Science requirement, or as engineering units.

**BREADTH COURSES:** *(At least 10 additional units from the following list)*

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<td>CEE 63*</td>
<td>Weather and Storms</td>
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<td>CEE 101C</td>
<td>Geotechnical Engineering</td>
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<td>CEE 164</td>
<td>Introduction to Physical Oceanography</td>
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<td>W</td>
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<tr>
<td>CEE 166D</td>
<td>Water Resources and Water Hazards Field Trips</td>
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<td>CEE 169</td>
<td>Environmental and Water Studies; Design <em>(alternate years)</em></td>
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<td>CEE 173A</td>
<td>Energy Resources <em>(alternate years)</em></td>
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<td>W</td>
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<td>CEE 173B</td>
<td>Seminar: The Coming Energy Revolution <em>(alternate years)</em></td>
<td>3</td>
<td>W</td>
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<tr>
<td>CEE 176A</td>
<td>Energy Efficient Buildings <em>(alternate years)</em></td>
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<td>CEE 176B</td>
<td>Electric Power: Renewables and Efficiency <em>(alternate years)</em></td>
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<tr>
<td>CEE 178</td>
<td>Introduction to Human Exposure Analysis</td>
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<td>S</td>
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<td>CEE 179B</td>
<td>Process Design for Environ. Biotechnology <em>(alternate years)</em></td>
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<tr>
<td>CEE 199</td>
<td>Undergrad Research in Civil &amp; Env. Engineering</td>
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<td>Any</td>
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*Can count either towards the Math or Science requirement, or as engineering units.

**OTHER ELECTIVE COURSES:**

Choose additional courses from within the School of Engineering to reach a total of 68 units of Science+Design. Depending on which Engineering Fundamentals and Breadth classes are taken, up to 9 additional units may be required. Students may need up to 1 more experimentation unit. **Total science+design units for engineering fundamentals plus core, required courses, and electives must be at least 68 units.**
# Engineering Science, Engineering Design, and Experimentation Units

## School of Engineering Courses

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<tr>
<th>Course</th>
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<th>ENGR DSGN</th>
<th>Expr</th>
<th>Total</th>
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<td>ENGR 15</td>
<td>Dynamics</td>
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<td>ENGR 20</td>
<td>Introduction to Chemical Engineering</td>
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<td>-</td>
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<td>ENGR 30</td>
<td>Engineering Thermodynamics</td>
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<td>ENGR 40</td>
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<td>ENGR 50</td>
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<td>-</td>
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## Department of Civil and Environmental Engineering Courses

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### Engineering Science, Design, and Experimentation Units, Cont.

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Environmental Engineering
Typical Sequence of Courses

**Frosh**
- **Math 41 (A)**
- **Math 42 (A,W)**
- **Math 51 (A,W,S,Su)**
- **Physics 53 (W)**

**Soph**
- **GES 1 (A,W,S)**
- **Engr 60 (A,W,Su)**
- **CEE 70 (A)**

**Junior**
- **Engr 100**
- **Engr 155A**
- **CEE 101B**
- **CEE 101D**
- **CEE 177**
- **CEE 172**

**Senior**
- **CEE 160**
- **CEE 161A**
- **CEE 166A**
- **CEE 166B**
- **CEE 169 or 179B**

*Plus Statistics, an STS course, one more Engineering Fundamental, and 10+ units of breadth electives*
## ENVIRONMENTAL ENGINEERING

### Early Start Program***

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|                | Total Math & Science Units: 46 | Total Engineering Units: 68 | Total Other Units: 66 | Total Units: 180 |

^ Students should explore majors of interest to them using unrestricted electives. Courses in the School of Engineering can count towards the CE major; see description of "Other Elective Courses" for details.

* These classes all are typically offered MWF10.

* In alternate years, when CEE 169 is not offered, take CEE 179B in the spring to fulfill design experience.

** Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Units; see description of "Other Elective Courses" for details.

*** Additional 4-year plans for students interested in going abroad are available at http://ughb.stanford.edu

These classes all are typically offered MWF10.
# ENVIROMENTAL ENGINEERING

**Regular Program**

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Total Math & Science Units: 46
Total Engineering Units: 68
Total Other Units: 66
Total Units: 180

* These classes all are typically offered MWF10.
+ In alternate years, when CEE 169 is not offered, take CEE 179B in the spring to fulfill the design experience.
^ Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Units; see description of "Other Elective Courses" for details.

*** Additional 4-year plans for students interested in going abroad are available at http://ughb.stanford.edu
ENVIRONMENTAL ENGINEERING

Autumn Qtr Abroad (Berlin, Florence, Paris) **

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|                | MATH 42    | -     | -     |
|                | IHum       | -     | 5     |
|                | Writing    | -     | 3     |
|                | Unrstr Elctv | - | 2     |

|                | MATH 51    | -     | -     |
|                | IHum       | -     | 5     |
|                | Writing    | -     | 3     |
|                | Unrstr Elctv | - | 2     |

Subtotals: 5 0 10

| Total          | 15         |       |       |

| Sophomore      | Language   | -     | 5     |
|                | CHEM 31    | 4     | -     |
|                | PHYSICS 53 | -     | 4     |
|                | CEE 100*   | -     | 4     |
|                | CEE 70     | -     | 3     |

|                | Engr Elctv^ | -     | 3     |
|                | STAT 60    | -     | 5     |

Subtotals: 4 7 5

| Total          | 16         |       |       |

| Junior         | EnvE Depth | -     | 4     |
|                | CHEM 135   | 3     | -     |
|                | CEE 101B*  | -     | 4     |
|                | CHEM 160   | -     | 2     |
|                | CEE 172*   | -     | 3     |
|                | ENGR 60    | -     | 3     |
|                | GES 1      | -     | 5     |

Subtotals: 0 3 9

| Total          | 12         |       |       |

| Senior         | CEE 101D   | 2     | -     |
|                | -         |       |       |
|                | CEE 166B   | -     | 3     |
|                | -         |       |       |
|                | CEE 169+   | -     | 5     |
|                | CEE 161A*  | -     | 4     |
|                | CEE 171    | -     | 3     |
|                | ENGR 30*   | -     | 3     |
|                | CEE 64     | -     | 3     |
|                | CEE 177    | -     | 4     |
|                | CEE 179A   | -     | 2     |
|                | EnvE Depth | -     | 3     |

Subtotals: 2 11 4

| Total          | 14         |       |       |

|                | CEE 101D   | 2     | -     |
|                | -         |       |       |
|                | CEE 166B   | -     | 3     |
|                | -         |       |       |
|                | CEE 169+   | -     | 5     |
|                | CEE 161A*  | -     | 4     |
|                | CEE 171    | -     | 3     |
|                | ENGR 30*   | -     | 3     |
|                | CEE 64     | -     | 3     |
|                | CEE 177    | -     | 4     |
|                | CEE 179A   | -     | 2     |
|                | EnvE Depth | -     | 3     |

Subtotals: 0 11 4

| Total          | 17         |       |       |

|                | CEE 101D   | 2     | -     |
|                | -         |       |       |
|                | CEE 166B   | -     | 3     |
|                | -         |       |       |
|                | CEE 169+   | -     | 5     |
|                | CEE 161A*  | -     | 4     |
|                | CEE 171    | -     | 3     |
|                | ENGR 30*   | -     | 3     |
|                | CEE 64     | -     | 3     |
|                | CEE 177    | -     | 4     |
|                | CEE 179A   | -     | 2     |
|                | EnvE Depth | -     | 3     |

Subtotals: 0 11 4

| Total          | 15         |       |       |

Total Math & Science Units: 46
Total Engineering Units: 68
Total Other Units: 66
Total Units: 180

* These classes are typically offered MWF10.
+ In alternate years, when CEE 169 is not offered, take CEE 179B in Spring to fulfill the design experience.
^ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units; see description of "Other Elective Courses" for details.

** NOTES:
(1) At the overseas campuses listed, you should be able to take a 3rd Engineering Fundamental (E40 or E50), one GER 3, and either a STS class or a second GER 3 course. Save GER 3 requirements to fulfill abroad!
(2) It is essential to take CEE100 during your Soph. year (as it conflicts with CEE161A), along with another class typically taken Autumn of Senior year (e.g., CEE 70, 101D, or a GER); the above program assumes you take CEE 70. It also assumes you take 6 units of Engineering Electives during sophomore year; these may be swapped with other classes listed later (e.g., CHEM 135, Engineering Fundamentals, etc.).
(3) To the extent your schedule allows, take some of the following prior to junior year:
       GES 1 (A, W, S), CEE101D (A), E30 or E60, and/or other EnvE electives.
# ENVIRONMENTAL ENGINEERING

Winter Quarter Abroad (Berlin, Florence, Paris) **

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Total Math & Science Units: 47
Total Engineering Units: 68
Total Other Units: 65
Total Units: 180

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^ Enough coursework from within the School of Engineering is needed to reach a total of 68 Engineering Units; see description of "Other Elective Courses" for details.

**NOTES:**
(1) At the overseas campuses listed, you should be able to take a 3rd Engineering Fundamental (E40 or E50), one GER 3, and either a STS class or a second GER 3 course. Save GER 3 requirements to fulfill abroad!
(2) It is essential to take ENGR 30 during your Soph. year (as it conflicts with CEE 161A and CEE 172), along with at least 6 (and preferably 9) units of other Engineering Electives (or Fundamentals); this program also assumes you take CEE 64, CEE 70, and one other Engineering Elective during sophomore year.
(3) To the extent your schedule allows, take some of the following prior to junior year:
GES 1 (A,W,S), CEE 101D (A), CEE 172 (W), and/or other EnvE electives.
### Environmental Engineering

**Spring Quarter Abroad (Berlin, Florence, Paris, Kyoto)**

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<td>15</td>
<td></td>
<td>Total</td>
</tr>
</tbody>
</table>

**Sophomore**

| Language | -             | -              | Language       | -             | -              |
| CHEM 31  | 4             | -              | PHYSICS 51     | 4             | -              |
| CEE 70   | -             | 3              | CHEM 33        | -             | 4              |
| Engr Elet^ | -      | 3              | GER            | -             | 4              |
| Subtotals | 4          | 6              | Subtotals      | 8            | 9              |
| Total | 15            |                 | Total          | 17           |                 |

**Junior**

| STAT 110 | 5             | -              | EnvE Depth     | -             | 4              | ***OVERSEAS*** |
| CEE 100*  | 4             | -              | CHEM 135      | 3             | -              | E40 or E50     |
| CEE 101D  | 2             | -              | CEE 172*      | -             | 3              | GER 3          |
| CEE 177   | -             | 4              | ENGR 155A     | 4             | -              | STS or GER 3   |
| Subtotals | 7          | 8              | Subtotals      | 7            | 7              | 0              |
| Total | 15            |                 | Total          | 14           |                 |

**Senior**

| EnvE Depth | -             | 3              | CEE 166B      | -             | 3              | CEE 169*       |
| CEE 161A* | -             | 4              | CEE 171      | -             | 3              | CEE 64         |
| CEE 166A  | -             | 3              | ENGR 30*     | -             | 3              | GER 3 or STS   |
| ENGR 60   | -             | 3              | CEE 179A     | -             | 2              | EnvE Depth     |
| GER       | -             | 4              | GES 1        | 5             | -              |                |
| Subtotals | 0          | 13             | Subtotals      | 5            | 11             | 0              |
| Total | 17            |                 | Total          | 16           |                 |

Total Math & Science Units: 46
Total Engineering Units: 68
Total Other Units: 66
Total Units: 180

* These classes are typically offered MWF10.
+ In alternate years, when CEE 169 is not offered, take CEE 179B in the spring to fulfill the design experience.
^ Enough coursework from within the School of Engineering to reach a total of 68 Engineering Units;
see description of “Other Elective Courses” for details.

**NOTES:**

1. At the overseas campuses listed, you should be able to take a 3rd Engineering Fundamental (E40 or E50),
one GER 3, and either a STS class or a second GER 3 course. Save GER 3 requirements to fulfill abroad!
2. It is essential to take CEE101B and CEE160 Spring Quarter Sophomore year; this program also assumes
during your soph. year you take CEE70 (or another class typically taken in Autumn of Jr/Sr year)
and 6 other units of Engineering Electives (or Fundamentals).
3. To the extent your schedule allows, take some of the following prior to junior year:
   GES 1 (A,W,S), CEE101D (A), CEE100 (A), ENGR 30 (A,W), and/or other EnvE electives.
# Environmental Engineering

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<th>Units</th>
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<td>ENGR</td>
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<td>Statistical Methods</td>
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<td>Science</td>
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<td>PHYSICS</td>
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<td>CHEM</td>
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<td>Chemical Principles (req'd)</td>
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<td>CHEM</td>
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<td>Structure and Reactivity (req'd)</td>
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<td>GES</td>
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<td>Fundamentals of Geology (req'd)</td>
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<td>Mathematics + Science Total</td>
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**NOTES**

(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.

(2) MATH 53 may be substituted for ENGR 155A. Other substitutions require approval.

Continues on back of sheet
### Environmental Engineering Sample Program Sheet

<table>
<thead>
<tr>
<th>Dept</th>
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<th>Grade</th>
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#### Engineering Topics (Engineering Science + Design)

**Engineering Fundamentals (3 courses required)**

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<th>Grade</th>
<th>Transfer Credit</th>
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<tr>
<td>ENGR</td>
<td>30</td>
<td>Engineering Thermodynamics (req'd)</td>
<td>3 0 0 3</td>
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<td>ENGR</td>
<td>60</td>
<td>Engineering Economy (req'd)</td>
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#### Fundamentals Total

(3 courses required)

**Engineering Depth**

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<th>Transfer Credit</th>
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<tr>
<td>CEE</td>
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<td>Air Pollution:Urban Smog/Global Change (req'd)</td>
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<td>CEE</td>
<td>70</td>
<td>Environ. Science &amp; Technology (req'd)</td>
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<td>CEE</td>
<td>100</td>
<td>Managing CE Projects (req'd) (see note 1 below)</td>
<td>2.5 1.5 1 4</td>
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<tr>
<td>CEE</td>
<td>101B</td>
<td>Mechanics of Fluids (req'd)</td>
<td>3 1 0 4</td>
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<tr>
<td>CEE</td>
<td>160</td>
<td>Mechanics of Fluids Laboratory (req'd)</td>
<td>1 1 2 2</td>
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<tr>
<td>CEE</td>
<td>161A</td>
<td>Rivers,Streams and Canals (req'd)</td>
<td>2 2 1 4</td>
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<tr>
<td>CEE</td>
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<td>Watersheds and Wetlands (req'd)</td>
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<tr>
<td>CEE</td>
<td>166B</td>
<td>Floods Droughts, Dams Aqueducts (req'd)</td>
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<td>Environmental Planning Methods (req'd)</td>
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<td>CEE</td>
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<td>Air Quality Management (req'd)</td>
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<td>CEE</td>
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<td>Aquatic Chemistry and Biology (req'd)</td>
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<td>CEE</td>
<td>179A</td>
<td>Aquatic Chemistry Lab (req'd)</td>
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#### Program Totals: (ABET Requirements)

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<th>Dept</th>
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<th>Grade</th>
<th>Transfer Credit</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Engineering Science+Engineering Design Total</td>
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<td>(68 units minimum)</td>
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<tr>
<td></td>
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<td></td>
<td>Experimentation Total</td>
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<td>(8 units minimum)</td>
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<tr>
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<td></td>
<td></td>
<td>Mathematics and Science Total</td>
<td></td>
<td>(45 units minimum)</td>
</tr>
</tbody>
</table>

**Advisor Approval**

Printed Name: ____________________________ Date: ________________

Signature: _______________________________

**Departmental Approval**

Printed Name: ____________________________ Date: ________________

Signature: _______________________________

**School of Engineering Approval**

Printed Name: ____________________________ Date: ________________

Signature: _______________________________

#### NOTES

1. Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 1996 or later.
2. This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
3. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is 2.0.
4. Transfer credits in Math, Science, Fundamentals, & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.

REV: 8/03
The Department of Management Science and Engineering is concerned with how best to organize resources - people, money, and materials - in our information-intensive, technology-based economy. The degree programs in MS&E prepare students to solve practical problems based on fundamental engineering principles. The department has strong research and teaching programs in decision and risk analysis, economics, engineering management, entrepreneurship, finance, information, operations research, organizations, production and manufacturing, strategy, systems analysis, and technology policy.

The undergraduate curriculum in Management Science and Engineering provides students training in the fundamentals of engineering systems analysis to prepare them to plan, design, and implement complex economic and technological management systems where a scientific or engineering background is necessary or desirable. Graduates will be prepared for work in a variety of career paths, including facilities and process management, investment banking, management consulting, or graduate study in industrial engineering, operations research, economics, public policy, medicine, law, or business.

The program builds on the foundational courses for engineering including calculus, physics, chemistry, and engineering fundamentals. The department core, taken for all concentrations, includes courses in computer science, mathematical modeling, optimization, finance, organization theory, probability, and statistics. Through the core, all students in the program are exposed to the breadth of faculty interests, and are in a good position to choose a concentration during the junior year.

The six concentrations are designed to allow a student to explore one area of the department in greater depth. They are:

1. **Industrial Engineering**: focuses on the design and analysis of manufacturing, production and service systems. This program includes a capstone project course, and its curriculum is accredited by the Accreditation Board for Engineering and Technology (ABET). This facilitates the process for those students who wish to become licensed industrial engineers.

2. **Operations Management**: also focuses on the design and analysis of manufacturing, production and service systems, but does not require the project course.

3. **Financial and Decision Engineering**: focuses on the design and analysis of financial and strategic plans. It features accounting, decision analysis, economics, finance, investment science, and stochastic models.

4. **Operations Research**: provides a more mathematical program, based on algorithms, theory, and applications in economics and operations.
5. *Technology and Organizations:* designed for students seeking a broad technological background coupled with an understanding of the behavior of individuals and groups. It features courses exploring different aspects of technology-based organizations.

6. *Technology and Policy:* designed for students seeking a broad technological background coupled with policy analysis. It features courses in microeconomics, public policy, ethics or the law, and applications in national security and commercial technology policy.

### OBJECTIVES AND OUTCOMES FOR MANAGEMENT SCIENCE & ENGINEERING

<table>
<thead>
<tr>
<th>Objectives:</th>
<th></th>
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<tbody>
<tr>
<td><strong>1. Principles and Skills:</strong> Provide our students with a basic understanding of management science and engineering principles, including analytical problem solving and communication skills.</td>
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</tr>
<tr>
<td><strong>2. Preparation for Practice:</strong> Prepare our students for practice in a field that sees rapid changes in tools, problems, and opportunities.</td>
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</tr>
<tr>
<td><strong>3. Preparation for Continued Growth:</strong> Prepare our students for graduate study and self development over an entire career, and</td>
<td></td>
</tr>
<tr>
<td><strong>4. Preparation for Service:</strong> Develop in our students the awareness, background, and skills necessary to become responsible citizens, employees, and leaders</td>
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</table>

<table>
<thead>
<tr>
<th>Outcomes:</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>(a) An ability to apply knowledge of math, science, and engineering;</td>
<td></td>
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<tr>
<td>(b) An ability to design and conduct experiments;</td>
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</tr>
<tr>
<td>(c) An ability to design a system or components to meet desired needs;</td>
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<tr>
<td>(d) An ability to identify, formulate, and solve engineering problems;</td>
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<tr>
<td>(e) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice;</td>
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<tr>
<td>(f) An ability to function on multidisciplinary teams;</td>
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<tr>
<td>(g) An ability to communicate effectively;</td>
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<tr>
<td>(h) A recognition of the need for and an ability to engage in life-long learning;</td>
<td></td>
</tr>
<tr>
<td>(i) Background necessary for admission to top professional graduate engineering or business programs;</td>
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<tr>
<td>(j) An understanding of professional and ethical responsibility;</td>
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<tr>
<td>(k) The broad education necessary to understand the impact of engineering solutions in a global and societal context; and</td>
<td></td>
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<tr>
<td>(l) A knowledge of contemporary issues pertinent to the field of management science and engineering.</td>
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</tbody>
</table>
The program for students in all concentrations builds on a strong engineering foundation. The required mathematics courses include calculus of single and multiple variables, linear algebra, probability, statistics, and stochastic models. At least fourteen units of science are required, including chemistry, physics through electricity, and a laboratory course. The required and elective mathematics and science requirements can be met by the approved courses, listed earlier in this handbook, or by PHYSICS 21, 22, 23, 24, 25, or 26, PSYCH 40 (cognitive psychology) or 70 (social psychology), or AP credit for biology, chemistry, mathematics, physics, or statistics.

The program includes three Engineering Fundamental courses, in addition to the three engineering fundamental courses included in the department core, ENGR 60, ENGR 62, and CS106A. ENGR 40 provides some background and laboratory experience in electrical engineering. Although students can choose any two other engineering fundamentals, it is strongly recommended that they take ENGR 25, which presents the basic science and engineering principles of biotechnology.

The Technology in Society requirement is satisfied by a subset of the courses approved by the School of Engineering, particularly those that emphasize social responsibility. Some of these courses are also included in some of the concentrations; any given course can be used to satisfy either the Technology in Society or depth requirement, but not both.

The Writing in the Major (WIM) requirement can be met by four restricted electives in the program, MS&E 152W, 164, 193W, or 197. It is up to the students to ensure that their programs include at least one of them, either in their concentrations or their Technology in Society courses. Students are welcome to take more than one WIM course, and WIM courses can be used to satisfy other requirements.

The department core comprises courses in computer science, deterministic optimization, finance, organization theory, and either a senior project or information science. Students in Financial and Decision Engineering must take another finance course in addition to MS&E 242, required for the concentration. Students in the Industrial Engineering concentration are required to take the capstone project course; other students may choose to take MS&E 131 instead.

Some of the concentrations include courses with prerequisites (ECON 1 or PSYCH 1) not included in the degree program, but those courses could be used to satisfy the General Education Requirements (GERs).
Although there are prerequisites for most MS&E courses, we encourage students to take some MS&E courses in their freshman and sophomore year. Introductory courses without prerequisites include: 107, 131, 152, and 180. Introductory courses with calculus prerequisites include: E60, E62, and MS&E 120.

For information about an MS&E minor, see the chapter on "Other Degree Programs" elsewhere in this handbook.

In addition to the B.S. degree, the MS&E Department offers Master of Science and Doctor of Philosophy degrees in Management Science and Engineering.

If you would like more information about our degree programs, please come visit Lori Cottle, the MS&E Student Services Manager, in Terman Engineering Center Room 306. Students are encouraged to plan their academic programs as early as possible, ideally in the freshman or sophomore year. Please do not wait until you are declaring a major to consult with us. This is particularly important if you would like to study overseas or pursue another major or minor.
MS&E Financial and Decision Engineering
Typical Sequence of Courses

**Freshman**
- ECON 1 (A,W,S)
- MATH 41 (A)
- MATH 42 (A,W)
- MATH 51 (A,W,S)
- PHYS 53 (W)
- PHYS 55/56 (S)

**Sophomore**
- ECON 50 (A,W,S)
- ECON 51 (W, S)
- ECON 62 (A,S)
- MS&E 120 (A)
- MS&E 152 (S)
- CS 106A (A,W,S)
- CS 106B (A,W,S)
- CHEM 31 (A,W)
- Science

**Junior**
- ENGR 60 (W, S)
- MS&E 242 (A)
- MS&E 180 (A,S)
- MS&E 131 (W)
- STAT 110 (A)
- MS&E 121 (W)
- ENGR 40 (A, S)
- Technology in Society
- Math or Science
- Science

**Senior**
- MS&E 245/7 (W, S)
- or
- MS&E 108 (W)
- MS&E 140 (A)
- 2 Financial and Decision Electives
- Engineering Fundamental
- ENGR 25 or other Fundamental
MS&E Industrial Engineering/Operations Management
Typical Sequence of Courses

**Freshman**
- MATH 41 (A)
- MATH 42 (A,W)
- MATH 51 (A,W,S)
- PHYS 53 (W)
- PHYS 55/56 (S)

**Sophomore**
- ENGR 60 (W, S)
- MS&E 180 (A,S)
- ENGR 62 (A,S)
- MS&E 120 (A)
- CS 106A (A,W,S)
- CS 106B (A,W,S)
- CHEM 31 (A,W)
- ENGR 25 or other Fundamental
- Math or Science

**Junior**
- MS&E 140 (A)
- MS&E 131 (W) or MS&E 108 (W)
- MS&E 121 (W)
- STAT 110 (A)
- MS&E 169 (W)
- MS&E 164 (A)
- ENGR 40 (A,S)
- Technology in Society
- "IE" Elective

**Senior**
- MS&E 24X (A,W)
- MS&E 108 (W)
- MS&E 160 (A)
- MS&E 26X (W,S)
- MS&E 130 (W)
- "IE" Elective
- Engineering Fundamental
MS&E Operations Research
Typical Sequence of Courses

**Freshman**
- ECON 1 (A,W,S)
- MATH 41 (A)
- MATH 42 (A,W)
- MATH 51 (A,W,S)
- PHYS 53 (W)
- PHYS 55/56 (S)

**Sophomore**
- ECON 50 (A,W,S)
- MS&E 120 (A)
- ENGR 62 (A,S)
- CS 106A (A,W,S)
- CS 106B (A,W,S)

**Junior**
- ENGR 60 (W, S)
- MS&E 180 (A,S)
- MS&E 131 (W)
- STAT 110 (A)
- MS&E 121 (W)

**Senior**
- MS&E 24x (A,W)
- 5 Operations Research Electives
- ENGR 40 (A,S)
- Technology in Society
- Chemistry

Math or Science

Engineering Fundamental
MS&E Technology and Organizations
Typical Sequence of Courses

**Freshman**
- PSYCH 1 (A,W,S)
- MATH 41 (A)
- MATH 42 (A,W)
- MATH 51 (A,W,S)
- PHYS 53 (W)
- PHYS 55/56 (S)

**Sophomore**
- MATH 51 (A,W,S)
- PHYS 55/56 (S)
- MS&E 180 (A,S)
- ENGR 60 (W, S)
- CS 106A (A,W,S)
- CS 106B (A,W,S)
- CHEM 31 (A,W)
- ENGR 25 or other Fundamental
- Math or Science

**Junior**
- 6 Technology and Organization Electives
- Technology in Society
- MS&E 131 (W) or MS&E 108 (W)
- STAT 110 (A)
- MS&E 120 (A)
- MS&E 121 (W)
- MS&E 24X (A,W)
- ENGR 62 (A,S)

**Senior**
- MS&E 108 (W)
- Engineering Fundamental
- Science
**MS&E Technology and Policy**

**Typical Sequence of Courses**

**Freshman**
- MATH 41 (A)
- MATH 42 (A, W)
- MATH 51 (A, W, S)
- ECON 1 (A, W, S)
- PHYS 53 (W)
- PHYS 55/56 (S)
- CHEM 31 (A, W)
- ENGR 25 or other Fundamental

**Sophomore**
- ENGR 60 (W, S)
- CS 106A (A, W, S)
- CS 106B (A, W, S)
- ECON 50 (A, W, S)
- ECON 51 (W, S)
- Technology in Society

**Junior**
- MS&E 180 (A, S)
- MS&E 131 (W)
- MS&E 120 (A)
- MS&E 121 (W)
- ECON 150 (W)
- ENGR 40 (A, S)
- Math or Science
- Engineering Fundamental

**Senior**
- MS&E 24X (A, W)
- MS&E 108 (W)
- ENGR 62 (A, S)
- 3 Technology and Policy Electives

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*Note: W, S, A indicate Winter, Spring, and Autumn terms respectively.*
# Management Science & Engineering

with AP/IB math credit

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<thead>
<tr>
<th>Class</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<tbody>
<tr>
<td></td>
<td>Math/Sc.</td>
<td>Engr</td>
<td>Other</td>
</tr>
<tr>
<td><strong>Freshman</strong></td>
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<tr>
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Total Math & Science Units: 35
Total Engineering Units: 72
Total Other Units: 73
Total Units: 180
# MANAGEMENT SCIENCE & ENGINEERING

without AP/IB math credit

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**Total Math & Science Units:** 46
**Total Engineering Units:** 72
**Total Other Units:** 62
**Total Units:** 180
### Mathematics (28 units minimum required)

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**Mathematics Total** (28 units minimum required)

### Science (14 units minimum required)

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**Science Total** (14 units minimum required)

**Mathematics + Science Total** (45 units minimum required)

### Technology in Society (1 course required from MS&E approved list)

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**NOTE**

(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.

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## Management Science & Engineering

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### Engineering Topics (Engineering Science + Design)

**Engineering Fundamentals (5 courses required)**

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**Fundamentals Total** (five courses required)

### Engineering Depth - Core (7 courses required)

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### Engineering Depth - Concentration (6-7 courses required)

*Circle One Concentration: F&DE, IE/OM, OR, T&O, T&P*

### Program Totals: (ABET Requirements)

- **Engineering Topics Total** (68 units minimum)
- **Experimentation Total** (8 units minimum)
- **Mathematics and Science Total** (45 units minimum)

### Adviser Approval

**Printed Name:** ___________________________  **Date:** ___________________________

**Signature:** ___________________________

### Departmental Approval

**Printed Name:** ___________________________  **Date:** ___________________________

**Signature:** ___________________________

### School of Engineering Approval

**Printed Name:** ___________________________  **Date:** ___________________________

**Signature:** ___________________________

### NOTES

- **(1)** Fulfills "Writing in the Major" requirement for Freshmen and transfer students entering Fall 1996 or later.
- **(2)** This form is available as an Excel file at http://ughb.stanford.edu/. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
- **(3)** All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is 2.0.
- **(4)** Transfer credits in Math, Science, Fundamentals, & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.
- **(5)** Engineering Science, Design and Experimentation units apply only to ABET accredited IE concentration.

**REV:** 08/03
MATERIALS SCIENCE AND ENGINEERING

Materials Science and Engineering is concerned with the relation between the structure and properties of materials. One important goal of this work involves the development of processes for altering the structure of materials and thereby controlling their properties. This field brings together, in a unified discipline, developments in Physical Metallurgy, Ceramics, Physics, and Chemistry which can be, and in fact are, applied to modern problems of technological, engineering, and scientific significance.

Students who are interested in both science and its application to important technological problems should consider a career in Materials Science and Engineering. The Undergraduate Program described here has a dual function. It provides basic training for those who wish to become materials engineers, and it provides a foundation for more advanced work in the field. Such advanced study enables students to respond effectively to technological change. Able students are encouraged to take at least one year of graduate study to extend their coursework and to obtain training in research. Co-terminal degree programs are recommended for both undergraduate majors in Materials Science and Engineering and for undergraduate majors in related disciplines. Current research strengths of the Department include transmission electron microscopy, microelectronic materials science, structure and properties of thin film materials, semiconductors, magnetic materials, photoelectronic materials, mechanics and mechanical properties of solids, computer modeling of materials behavior and processing of metals and alloys.

Students who wish to receive further information about the programs in Materials Science and Engineering should contact:

Professor Bruce M. Clemens
Department of Materials Science and Engineering (MSE)
Building 550, 416 Escondido Mall
Stanford University
Stanford, CA 94305-2205
REQUIREMENTS FOR UNDERGRADUATES IN MATERIALS SCIENCE AND ENGINEERING

Mathematics and Science (40 units combined, minimum)
Math (approved courses): 20 Units Minimum
Science (approved courses): 20 Units Minimum

Technology In Society (1 course)
See the “Approved Courses” section of this handbook for courses that fulfill the TIS requirement.

Engineering Fundamentals & Depth (61 units combined, minimum)

FUNDAMENTALS
(3 Courses minimum, at least one of which must be unspecified by the department)

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DEPTH (52 units required)

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<td>MATSCI 161</td>
<td>Materials Science Labs I</td>
<td>4</td>
</tr>
<tr>
<td>MATSCI 162</td>
<td>Materials Science Labs II (Satisfies WIM requirement)</td>
<td>4</td>
</tr>
<tr>
<td>MATSCI 163</td>
<td>Materials Science Labs III</td>
<td>4</td>
</tr>
<tr>
<td>MSE Fundamentals</td>
<td>Materials Science Fundamentals</td>
<td>24</td>
</tr>
<tr>
<td>Option Courses</td>
<td>Science and Engineering Options</td>
<td>9</td>
</tr>
</tbody>
</table>
MSE FUNDAMENTALS (24 units, choose six courses from the following)

- MATSCI 190 Organic Materials 4
- MATSCI 191 Mathematical & Computational Methods in Materials Science 4
- MATSCI 192 Solid State Thermodynamics 4
- MATSCI 193 Atomic Arrangements in Solids 4
- MATSCI 194 Phase Equilibria 4
- MATSCI 195 Waves and Diffraction in Solids 4
- MATSCI 196 Imperfections in Crystalline Solids 4
- MATSCI 197 Rate Processes in Materials 4
- MATSCI 198 Mechanical Properties of Materials 4
- MATSCI 199 Electrical, Optical and Magnetic Properties of Materials 4

OPTIONS (choose 9 units from one of the following six options)

Chemical Engineering Option

- CHEMENG 110 Equilibrium Thermodynamics 3
- CHEMENG 130 Separation Processes 3
- CHEMENG 140 Microelectronics Processing Technology 3
- CHEMENG 150 Biochemical Engineering 3
- CHEMENG 170 Kinetics & Reactor Design 3
- ENGR 20 Introduction to Chemical Engineering 3
- ME 70 Introductory Fluid Engineering (was ME 33) 4

Chemistry Option

- CHEM 151, 153 Inorganic Chemistry I & II 6
- CHEM 171, 173, 175 Physical Chemistry 9
### Electrical Engineering Option

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 101A</td>
<td>Circuits I</td>
<td>4</td>
</tr>
<tr>
<td>EE 101B</td>
<td>Circuits II</td>
<td>4</td>
</tr>
<tr>
<td>EE 102A</td>
<td>Signal Processing and Linear Systems I</td>
<td>4</td>
</tr>
<tr>
<td>EE 102 B</td>
<td>Signal Processing and Linear Systems II</td>
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</tr>
<tr>
<td>EE 141</td>
<td>Engineering Electromagnetic</td>
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<tr>
<td>EE 142</td>
<td>Electromagnetic Waves</td>
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<tr>
<td>ENGR 40</td>
<td>Introductory Electronics</td>
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### Mechanical Engineering Option

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<thead>
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<th>Units</th>
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<tbody>
<tr>
<td>ENGR 14</td>
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<td>ENGR 15</td>
<td>Dynamics</td>
<td>3</td>
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<tr>
<td>ME 70</td>
<td>Introductory Fluid Engineering (was ME 33)</td>
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<td>ME 80</td>
<td>Stress, Strain and Strength (was ME 111)</td>
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<tr>
<td>ME 131A</td>
<td>Heat Transfer</td>
<td>3-4</td>
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<tr>
<td>ME 131B</td>
<td>Fluid Mechanics</td>
<td>3</td>
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<tr>
<td>ME 161</td>
<td>Dynamic Systems</td>
<td>4</td>
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<td>ME 203</td>
<td>Manufacturing and Design (was ME 103)</td>
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### Physics Option

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<tbody>
<tr>
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<td>Intermediate Mechanics</td>
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<tr>
<td>PHYSICS 120, 121</td>
<td>Intermediate Electricity and Magnetism</td>
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<tr>
<td>PHYSICS 130, 131</td>
<td>Quantum Mechanics</td>
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<tr>
<td>PHYSICS 134</td>
<td>Advanced Topics in Quantum Mechanics</td>
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<tr>
<td>PHYSICS 170, 171</td>
<td>Thermodynamics, Kinetic Theory &amp; Statistical Mechanics</td>
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<td>PHYSICS 172</td>
<td>Physics of Solids I</td>
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</table>

### Self-Defined Option *(must contain 9 units)*

Student may petition for approval of a self-defined option containing a minimum of 9 units that comprise a cohesive program of study.
Materials Science and Engineering
Typical Sequence of Courses

**Freshman**

- MATH 41 (A)
- MATH 42 (A, W)
- MATH 51 (A, W, S)
- PHYS 51 (A)
- PHYS 53 (W)
- PHYS 55 (S)
- CHEM 31 (A, W, S)
- ENGR 50 (W, S)

**Sophomore**

- MATH 52 (A, W, S)
- MATSC 192 (A)
- MATSC 194 (W)
- MATSC 197 (S)
- MATSC 193 (A)
- MATSC 195 (W)
- MATSC 198 (S)
- MATSC 196 (W)
- MATSC 198 (S)
- MATSC 152 (S)

Choose 6 Fundamental courses (in dashed box).

Choose one set of courses on right (9 units)

**Junior and Senior Years**

- **Chem Eng Option**
  - ENGR 20
  - ME 70
  - CHEME 110
  - CHEME 130
  - CHEME 140
  - CHEME 150
  - CHEME 170

- **Chemistry Option**
  - CHEM 151,153
  - CHEM 171,173,175

- **Elec Engr Option**
  - ENGR 40
  - EE 101A,B
  - EE 102A,B
  - EE 141,142

- **Mech Engr Option**
  - ENGR 14,15
  - ME 70
  - ME 80
  - ME 131A,B
  - ME 161
  - ME 203

- **Physics Option**
  - PHYS 110
  - PHYS 120,121
  - PHYS 130,131,134
  - PHYS 170,171,172

- **Self Defined Option**
  - Approved by Petition
### Materials Science and Engineering

**Name:**  
ID #:  
**Local Address:**  
**Local Phone:**  
**E-mail:**  
**Date B.S. expected:**  

<table>
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<tr>
<th>Dept</th>
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<th>Grade Transfer</th>
<th>√ if Transfer Credit</th>
<th>Approval Date</th>
<th>Initials</th>
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**Mathematics**  
(20 units minimum required)

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**Science**  
(20 units minimum required)

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<th>Approval Date</th>
<th>Initials</th>
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</thead>
</table>

**Engineering Fundamentals**  
(3 courses required)

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<th>√ if Transfer Credit</th>
<th>Approval Date</th>
<th>Initials</th>
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</thead>
</table>

**Fundamentals Total**

**Technology in Society**  
(1 course required)

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<tr>
<th>Title</th>
<th>Total Units</th>
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<th>√ if Transfer Credit</th>
<th>Approval Date</th>
<th>Initials</th>
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</table>

**Totals This Page**

Continues on other side
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<th>Title</th>
<th>Total Units</th>
<th>Grade Transfer Approval</th>
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<tbody>
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<td>MATSCI</td>
<td>151</td>
<td>Microstructure and Mechanical Properties</td>
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<tr>
<td>MATSCI</td>
<td>152</td>
<td>Electronic Materials Engineering</td>
<td>3</td>
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<tr>
<td>MATSCI</td>
<td>161</td>
<td>Materials Science Labs I</td>
<td>4</td>
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<tr>
<td>MATSCI</td>
<td>162</td>
<td>Materials Science Labs II (see note 1 below)</td>
<td>4</td>
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</tr>
<tr>
<td>MATSCI</td>
<td>163</td>
<td>Materials Science Labs III</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Choose 6 courses from the MSE Fundamentals list (24 units)

MATSCI 4

Choose 9 units from one of the six Option Areas

---

**Engineering Depth Total**

(51 units minimum required)

Totals This Page

Totals Previous Page

Program Totals

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**Advisor Approval**

Printed Name: ____________________________ Date: _______________

Signature: ________________________________

**Department Approval**

Printed Name: ____________________________ Date: _______________

Signature: ________________________________

**School of Engineering Approval**

Printed Name: ____________________________ Date: _______________

Signature: ________________________________

---

**NOTES**

(1) Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 1996 or later.

(2) This form is available as an Excel file at ughb.stanford.edu. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.

(3) All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is 2.0.

(4) Transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.

REV: 08/03
The goal of Stanford’s undergraduate program in Mechanical Engineering is to provide each student with a balance of intellectual and practical experiences, accumulation of knowledge and self-discovery in order to prepare the graduate to address a variety of societal needs. The program prepares each student for entry-level work as a mechanical engineer, for graduate study in engineering, or for graduate study in another field where a broad and fundamental engineering background provides a desirable foundation. With solid grounding in the principles and practice of mechanical engineering, graduates are ready to engage in a lifetime of learning about and employing new concepts, technologies, and methodologies, whatever their ultimate career choice.

The educational objectives and outcomes for the Mechanical Engineering program appear in the table at the top of the following page.

**Requirements**

**Mathematics and Science**

24 units of Mathematics minimum, (must include a course in Differential Equations (e.g., ENGR155A), 18 units of Science minimum (must include both Chemistry and Physics with a depth* in at least one). (See Mathematics and Science Requirement section of this handbook) for a total of 45 units (Math & Science) combined.

* Depth in Physics: A depth is defined as 3 courses taken at Stanford. Students without advanced placement in Physics take PHYSICS 51, 53, & 55. Students with 5 units of advanced placement take PHYSICS 51 & 55.

**Engineering Fundamentals: 3 courses required (Fr, So, Jr)**

- ENGR40 Introduction to Electronics (Required)
- ENGR70A Programming Methodology or Programming Methodology & Abstractions (Required)
- Other Fundamental course (see Engineering Fundamentals section of this Handbook)

**Technology in Society (TIS): 1 course required**

- STS110 “Ethics or Public Policy” or STS115 “Ethical Issues in Engineering”
## Objectives and Outcomes for Mechanical Engineering

**Objectives:**

1. Understanding of basic principles, mathematics and science, and mechanical systems with an ability to analyze, model, synthesize, ideate, iterate, prototype, and implement engineering solutions in a broad range of fields.
2. Understanding of product development and manufacturing with the capability of working effectively in multidisciplinary teams, providing leadership and technical expertise, and being effective communicators.
3. Preparation for graduate study in engineering or other professional fields.
4. Developing an ethical approach to engineering with concern for society and the environment, and the ability to provide understandable technical expertise to non-technical individuals.

**Outcomes:**

(a) An ability to apply knowledge of mathematics, science, and engineering  
(b) An ability to design and conduct experiments, as well as to analyze and interpret data  
(c) An ability to design a system, component, or process to meet desired needs  
(d) An ability to function on multi-disciplinary teams  
(e) An ability to identify, formulate, and solve engineering problems  
(f) An understanding of professional and ethical responsibility  
(g) An ability to communicate effectively  
(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context  
(i) A recognition of the need for and an ability to engage in life-long learning  
(j) A knowledge of contemporary issues  
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.  
(l) Background for admission to engineering or other professional graduate programs
# Mechanical Engineering Depth Requirements

(55-56 units from the following list)

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>ENGR. SCI.</th>
<th>ENGR. SCI. DSGN.</th>
<th>ENGR. EXPR.</th>
<th>TOTAL QTR</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 14</td>
<td>Applied Mechanics: Statics</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>AWS Fr,So</td>
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<tr>
<td>ENGR 15</td>
<td>Dynamics</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>3</td>
<td>AS So, Jr</td>
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<tr>
<td>ENGR 30</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>AW So, Jr</td>
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<tr>
<td>ME70</td>
<td>Introductory Fluids Engineering</td>
<td>4</td>
<td>-</td>
<td>1</td>
<td>4</td>
<td>WS So, Jr</td>
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<tr>
<td>ME101</td>
<td>Visual Thinking</td>
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<td>3</td>
<td>-</td>
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<td>AWS So, Jr</td>
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<tr>
<td>ENGR102M*</td>
<td>Tech/Professional Writing for ME</td>
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<td>AW So, Jr</td>
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<td>ME103D</td>
<td>Engineering Drawing</td>
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<td>1</td>
<td>-</td>
<td>1</td>
<td>AW So, Jr</td>
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<tr>
<td>ME80</td>
<td>Stress, Strain &amp; Strength</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>A Jr, Sr</td>
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<td>ME140</td>
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<td>2</td>
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<td>ME161</td>
<td>Dynamic Systems</td>
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<tr>
<td>ME203*</td>
<td>Manufacturing &amp; Design</td>
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<td>4</td>
<td>1</td>
<td>4</td>
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</table>

**Options to complete the ME Degree (select 2 courses below)**

<table>
<thead>
<tr>
<th>COURSE</th>
<th>TITLE</th>
<th>ENGR. SCI.</th>
<th>ENGR. SCI. DSGN.</th>
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<th>YEAR</th>
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<td>1</td>
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<tr>
<td>ME150</td>
<td>Internal Combustion Engines</td>
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<tr>
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<td>Intro to Mechatronics</td>
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<tr>
<td>ME227</td>
<td>Vehicle Dynamics</td>
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<td>Skeletal Development &amp; Evolution</td>
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<tr>
<td>ME281</td>
<td>Biomechanics of Movement</td>
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<td>1.5</td>
<td>1.5</td>
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<td>W Jr, Sr</td>
</tr>
</tbody>
</table>

*Must be taken concurrently to fulfill the “Writing in the Major” requirement.

**NOTES:**

1. The Committee on Departmental Petitions of the Department of Mechanical Engineering Student Services Office must approve any deviation from the Engineering Depth (ME) requirement. Such petitions must be prepared on the School of Engineering petition forms, approved by the advisor, and be submitted before the end of the second week of Autumn Quarter for June graduation, or the equivalent quarter for other graduation times.

2. Courses listed in the Depth requirements may not be used to satisfy the engineering fundamentals requirement.

3. It is recommended that students review prerequisites for all courses.
Mechanical Engineering
Typical Sequence of Courses

**Freshman**
- ENGR 154 (A)
- ENGR 155A (W)
- ENGR 155B (S)
- PHYS 51 (A)

**Sophomore**
- ENGR 15 (A)
- ENGR 40 (S)
- ENGR 30 (A, W)
- ME 70 (W, S)
- ME 80 (A)
- ME 101 (A)
- ME 103 (A, W)
- ME 203 (A, W)
- ME 103D (A, W)
- ENGR 102M (A, W)

**Junior and Senior Years**
- ME 161 (A)
- ME 112 (W)
- ME 113 (S)

Three of the following:
- ME 150 (A)
- ME 210 (W)
- ME 220 (S)
- ME 227 (S)
- ME 280 (S)
- ME 281 (A)
- ENGR 105 (A)
# MECHANICAL ENGINEERING

## Plan A (Using Math 40 series)

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<td></td>
<td></td>
<td><strong>Winter</strong></td>
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**Notes:**

- ME 203 must be taken concurrently with ENGR 102M to fulfill the “Writing in the Major” requirement.
- E30 may be taken one quarter earlier.
- Students who test out of the language requirement should replace language units with technical electives.
- Students without AP math/science credit should add math units to this program (24 math units and 18 science units are required).
- Students 5 units of Advanced Placement, place out of Physics 53 (Physics 51 & 55 must be taken).
- Students may take E154 in Fall (Sophomore Yr) instead of MATH 51 in Spring (Freshman Yr).
- ENGR 30 may be taken in Winter and ME70 in Spring.
- ENGR 15 may be taken in Winter.
### MECHANICAL ENGINEERING

#### Plan B (Using E154, 155AB Series)

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**Total Math & Science Units:** 38  
**Total Engineering Units:** 76  
**Total Other Units:** 85  
**Total Units:** 199

**Notes:**
- ME 203 must be taken concurrently with ENGR 102M to fulfills the "Writing in the Major" requirement.
- ENGR 30 may be taken one quarter earlier.
- Students 5 units of Advanced Placement, place out of Physics 53 (Physics 51 & 55 must be taken).
- Students who test out of the language requirement should replace language units with technical electives.
- Students without AP math credit should add math units to this program (24 units total are required).
- ENGR 15 may be taken in Spring.
- Students may elect to take Math 51, 52, 53 instead of E154 and 155A.
# MECHANICAL ENGINEERING

**Plan C** *(Tough, since both 113 and 140 are taken senior year)*

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**Notes:**

- ME 203 must be taken concurrently with ENGR 102M to fulfill the "Writing in the Major" requirement.
- ENGR 30 may be taken one quarter earlier.
- Students who test out of the language requirement should replace language units with technical electives.
- Students without AP math credit should add math units to this program (24 units total are required).
- Students 5 units of Advanced Placement, place out of Physics 53 (Physics 51 & 55 must be taken)
- ME 70 May be taken in Winter or Spring.
- ENGR 155A May be taken Autumn or Spring.
- Students may elect to take Math 51, 52, 53.
## MECHANICAL ENGINEERING

**Plan D** (For those who want to do it all)

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<th>Engr.</th>
<th>Other</th>
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<td>IHum</td>
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<td>Writing</td>
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<td>ENGR 155B</td>
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<td>-</td>
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<td>PHYSICS 55</td>
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<td><strong>Subtotals</strong></td>
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<td><strong>Total</strong></td>
<td>17</td>
<td></td>
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</table>

### Notes:
- ME 203 must be taken currently with ENGR 102M to fulfill the “Writing in the Major” requirement.
- ENGR 30 may be taken one quarter earlier.
- Students who test out of the language requirement should replace language units with technical electives.
- Students without AP math/science credit should add math/science units to this program (24 math & 18 science are required).
- Students 5 units of Advanced Placement, place out of Physics 53 (Physics 51 & 55 must be taken).
- Students may elect to take Math 51, 52 & 53 instead of ENGR 154, 155A, 155B.
- ME 70 may be taken in Winter or Spring.
- ENGR 155A may be taken Autumn or Spring.

### Total Math & Science Units: 48
### Total Engineering Units: 69
### Total Other Units: 83
### Total Units: 200
This form must be completed and approved by the first quarter of the junior year AND revised (if necessary) by the second quarter of the senior year.

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<thead>
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<th>Title</th>
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<th>Transfer Credit</th>
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<tbody>
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**Mathematics (24 units minimum required)**

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<tbody>
<tr>
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</tbody>
</table>

**Science (18 units minimum required)**

<table>
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<th>Units</th>
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<tbody>
<tr>
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</table>

**Technology in Society (1 course required)**

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<th>Grade</th>
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<td>STS</td>
<td></td>
<td>Ethics and Public Policy</td>
<td>5</td>
</tr>
<tr>
<td>STS</td>
<td></td>
<td>Ethical Issues in Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

**NOTES**

(1) Engineering Science, Design, and Experimentation units do not apply to shaded areas.
# Mechanical Engineering

<table>
<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Units</th>
<th>√ if Transfer Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Engineering Science</td>
<td>Experiment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Fundamentals (3 courses required)</td>
<td></td>
<td></td>
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<tr>
<td>ENGR</td>
<td>40</td>
<td>Intro Electronics (reqd)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ENGR</td>
<td>70A</td>
<td>Programming Methodology (reqd)</td>
<td>4</td>
<td>1</td>
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<tr>
<td>ME</td>
<td>112</td>
<td>Mechanical Systems</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>ME</td>
<td>113</td>
<td>Engineering Design</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>ME</td>
<td>131A</td>
<td>Heat Transfer</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>ME</td>
<td>131B</td>
<td>Fluid Mechanics</td>
<td>3</td>
<td>0</td>
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<tr>
<td>ME</td>
<td>140</td>
<td>Advanced Thermal Systems</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ME</td>
<td>161</td>
<td>Dynamic Systems</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>ME</td>
<td>203</td>
<td>Manufacturing &amp; Design</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>ME</td>
<td>105</td>
<td>Control Design</td>
<td>3</td>
<td>0</td>
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<tr>
<td>ME</td>
<td>150</td>
<td>Internal Combustion Engines</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>ENGR</td>
<td>210</td>
<td>Introduction to Mechatronics</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ME</td>
<td>220</td>
<td>Introduction to Sensors</td>
<td>2</td>
<td>0.5</td>
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<tr>
<td>ME</td>
<td>227</td>
<td>Vehicle Dynamics</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>ME</td>
<td>280</td>
<td>Skeleton Development &amp; Evolution</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>ME</td>
<td>281</td>
<td>Biomechanics of Movement</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Fundamentals Total** (three courses required)

**Depth Total**

## Options to complete the ME Degree sequence (select 2 courses below)

| ME   | 105| Control Design                       | 3       | 0                    | 0     | 3   |
| ME   | 150| Internal Combustion Engines          | 1.5     | 1.5                  | 3     | 3   |
| ENGR | 210| Introduction to Mechatronics         | 2       | 2                    | 3     | 4   |
| ME   | 220| Introduction to Sensors              | 2       | 0.5                  | 1     | 3   |
| ME   | 227| Vehicle Dynamics                     | 1.5     | 1.5                  | 1     | 3   |
| ME   | 280| Skeleton Development & Evolution     | 2       | 1                    | 0     | 3   |
| ME   | 281| Biomechanics of Movement             | 2       | 1.5                  | 1.5   | 3   |

## Program Totals: (ABET Requirements)

**Engineering Topics Total**

**Experimentation Total**

**Mathematics and Science Total**

(68 units minimum)  
(8 units minimum)  
(45 units minimum)

## Advisor Approval

Printed Name: ___________________________  
Signature: ___________________________  
Date: ___________________________

## Departmental Approval

Printed Name: ___________________________  
Signature: ___________________________  
Date: ___________________________

## School of Engineering Approval

Printed Name: ___________________________  
Signature: ___________________________  
Date: ___________________________

### NOTES

1. Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 96 or later.
2. This form is available as an Excel file at [http://ughb.stanford.edu/](http://ughb.stanford.edu/). The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
3. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engr. Fundamentals and Engr. Depth (combined) is 2.0.
4. Transfer credits in Math, Science, Fundamentals, & TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engr Depth must be approved by the advisor and ME Undegraduate Curriculum Committee.
INSTRUCTIONS FOR DECLARING
MECHANICAL ENGINEERING (BSME)

1. Obtain your Stanford transcript (unofficial from Axess is fine).
2. Download the program sheet from the School of Engineering web site. Complete the program sheet. If you need instructions on how to download, consult the School of Engineering Student Affairs Office in Terman 208.
3. Once you have these documents, go see Judith Haccou, Student Services Manager (Bldg. 530-125).
4. You will be assigned to an advisor or you may choose your own, if you prefer.
5. Discuss the program with your advisor, have him/her sign off on the program sheet AND the declaration form (form available from the ME Student Services Office, Bldg. 530, Room 125).
6. Return completed documents to the ME Student Services Office and get on Axess to complete the major declaration process.

BS in Mechanical Engineering Declaration

Shaded sections to be completed by ME Student Services, Building 530, Room 125

Student Information (please print)

Name _________________________________________  Student ID# _______________

Email _________________________________________

Assigned Advisor: Prof. ________________________  Office Location: _________________

Authorized by:  ___________________________________

Interview Section (obtain appropriate signatures)

Associate Chairman of Student Services ______________________________ Date ______

Professor Reginald Mitchell, Bldg. 520-520C

Major Advisor ______________________________________________ Date ______

Declaration Approval _____________________________________ Date ______

Judith Haccou, Manager of Student Services
PRODUCT DESIGN

Product Design concerns itself with the conception and design of product experiences for the benefit of society. It encourages creativity, craftsmanship, and personal expression, while serving larger goals of common good. Students studying Product Design generally follow the Mechanical Engineering curriculum and focus on a process that resolves constraints arising from technical, human, aesthetic and business concerns. The course work provides the skills necessary to carry projects from initial concept to completion of working prototypes.

Students who also complete the requirements for Mechanical Engineering will receive the ME degree and a transcript that says “Has completed all the requirements of Product Design.”

MATHEMATICS
20 units minimum (recommend course in statistics)

SCIENCE
14 units minimum (recommend a year of physics 50 series)

BEHAVIORAL SCIENCE
PSYCH 1 4 units
PSYCH Elective* 3-5 units (Courses numbered 20-95)
*a quarter overseas can substitute for PSYCH Elective

ENGINEERING FUNDAMENTALS
ENGR 40 (required) 5 units
ENGR 70 (required) 5 units

TIS
ME 120 3-4 units
**ENGINEERING DEPTH**

<table>
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<tbody>
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<tr>
<td>ENGR Fundamental</td>
<td>3 – 5 units</td>
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<tr>
<td>ENGR 102M**</td>
<td>1 unit</td>
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<tr>
<td>ME101</td>
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<tr>
<td>ME 203**</td>
<td>4 units</td>
</tr>
<tr>
<td>ME103D</td>
<td>1 unit</td>
</tr>
<tr>
<td>ME 80</td>
<td>3 units</td>
</tr>
<tr>
<td>ME112</td>
<td>4 units</td>
</tr>
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<td>ME115</td>
<td>3 units</td>
</tr>
<tr>
<td>ME116</td>
<td>4 units</td>
</tr>
<tr>
<td>ME 216A</td>
<td>4 units</td>
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<tr>
<td>ME 216B</td>
<td>4 units</td>
</tr>
<tr>
<td>ARTSTUDI 60</td>
<td>3 units</td>
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<tr>
<td>ARTSTUDI 160</td>
<td>3 units</td>
</tr>
<tr>
<td>Two Studio Art</td>
<td>6 units (ARTSTUDI 70 recommended)</td>
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<tr>
<td>ME110A</td>
<td>1 unit</td>
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</table>

*PSYCH Elective requirement waived if student takes a quarter abroad

**Must be taken concurrently to fulfill the "Writing in the Major" requirement
Product Design
Typical Sequence of Courses

**Freshman**
- Science (A)
- Math (A)
- Fundamentals (A)

**Sophomore**
- ME 101 (A, W, S)
- ENGR 14 (A)
- ARTSTUDI 60 (A)
  - ARTSTUDI 160 (W) or Junior year
- ME 80 (A)
- PSYCH elective* (S)

**Junior**
- ME 101* (A)
- ME 80* (A)
- ME 203 (A)
- ME 115 (W)
- ME 112 (W)
- Overseas Studies (S)
- ME 116 (A)
- ME 116 (A)
- ME 216A (W)
- ME 216B (S)
- ME 120* (S)

**Senior**
- ME 120* (S)

Notes:
1. ME 115, ME 116, ME 216A, ME 216B is a sequence that may not be ignored.
2. PSYCH elective requirement is waived if student takes a quarter abroad.
INSTRUCTIONS FOR DECLARING
PRE-APPROVED INDIVIDUALLY DESIGNED BS IN
ENGINEERING PRODUCT DESIGN (BSPD)

Detailed instructions can be obtained from the ME Student Services Office (Building 530, Room 125)

1. Obtain your Stanford transcript (unofficial from Axess is fine).
2. Download the program sheet from the School of Engineering web site. Complete the program sheet. If you need instructions on how to download, consult the School of Engineering Student Affairs Office in Terman 201.
3. Once you have these documents, go see Judith Haccou, Student Services Manager (Bldg. 530-125).
4. Discuss the program with your advisor and have him/her sign off on the program sheet AND the declaration form (form available from the ME Student Services Office, Bldg. 530-125).
5. Return completed documents to the ME Student Services Office and get on Axess to complete the major declaration process.

   Note: In Axess, you MUST select “Engineering” as your major (NOT Mechanical Engineering) with a field in “Product Design.”

*********************************************************************************************
<table>
<thead>
<tr>
<th>Dept</th>
<th>No</th>
<th>Title</th>
<th>Total Units</th>
<th>Grade</th>
<th>√ if Transfer Credit</th>
<th>Course #/School Approval Date</th>
<th>Initial</th>
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</table>

**Mathematics (20 units minimum required. Recommend course in statistics)**

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<th>Dept</th>
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<th>Title</th>
<th>Total Units</th>
<th>Grade</th>
<th>√ if Transfer Credit</th>
<th>Course #/School Approval Date</th>
<th>Initial</th>
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Mathematics Total (20 units minimum required)

**Science (14 units minimum required. Recommend one year of physics)**

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<th>Grade</th>
<th>√ if Transfer Credit</th>
<th>Course #/School Approval Date</th>
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Science Total (14 units minimum required)

**Behavioral Sciences**

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<th>Total Units</th>
<th>Grade</th>
<th>√ if Transfer Credit</th>
<th>Course #/School Approval Date</th>
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</table>

Behavioral Sciences Total (8 units required)

**Engineering Fundamentals (3 courses required)**

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<th>Grade</th>
<th>√ if Transfer Credit</th>
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Fundamentals Total (15 units minimum required)

**Technology in Society (1 course required)**

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<th>Grade</th>
<th>√ if Transfer Credit</th>
<th>Course #/School Approval Date</th>
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Totals This Page

Continues on back of sheet
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</tr>
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<td>Applied Mechanics</td>
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<td>80</td>
<td>Stress, Strain &amp; Strength</td>
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<td>ME</td>
<td>101</td>
<td>Visual Thinking</td>
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<td>ENGR</td>
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<td>Tech/Prof Writing (reqd)</td>
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<td>ME</td>
<td>103D</td>
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<td>ME</td>
<td>110A</td>
<td>Design Sketching</td>
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<td>115</td>
<td>Human Values in Design</td>
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<td>116</td>
<td>Advanced Product Design</td>
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<td>ME</td>
<td>203*</td>
<td>Manufacturing Technology</td>
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<tr>
<td>ME</td>
<td>216A</td>
<td>Advanced Product Design: Needfinding</td>
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<tr>
<td>ME</td>
<td>216B</td>
<td>Advanced Product Design: Synthesis</td>
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<td>60</td>
<td>Basic Design</td>
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<td>Intermediate Design</td>
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<td>Studio Art Course</td>
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</table>

**Engineering Depth Total** (47 units minimum required)

**Totals from this page**

**Totals from previous page**

**Program Totals**

---

**Advisor Approval**

Printed Name: ______________________ Date: ______________________

Signature: ______________________

**Department Approval**

Printed Name: ______________________ Date: ______________________

Signature: ______________________

**School of Engineering Approval**

Printed Name: ______________________ Date: ______________________

Signature: ______________________

---

**NOTES**

1. Fulfills "Writing in the Major" requirement for Freshmen and Transfer students entering Fall 1996 or later.
2. This form is available as an Excel file at ughb.stanford.edu. The printed form must be signed by the advisor and, if required, by the departmental representative. Changes must be initialed in ink.
3. All courses listed on this form must be taken for a letter grade if offered by the instructor. Minimum Grade Point Average (GPA) for all courses in Engineering Fundamentals and Engineering Depth (combined) is a 2.0.
4. All transfer credits in Math, Science, Fundamentals, and TIS must be approved by the Senior Associate Dean for Student Affairs. Transfer credits in Engineering Depth must be approved by the Advisor.

REV: 8/03
APPENDIX B

INFORMATION FOR ADVISERS

Advising within the School of Engineering varies somewhat depending upon the category of student involved. Engineering advisers are typically assisting graduate students, undergraduates who have declared their majors, and undeclared undergraduates who have indicated a preliminary academic interest in engineering. This Handbook deals only with undergraduates.

Advising of undergraduates can occur on many levels. Most of the questions that advisees will bring to you relate to specific requirements for an engineering degree at Stanford. This Undergraduate Handbook is meant to serve both you and your advisees as the source of most of the answers to such questions. Further clarifications on curricula can be obtained from the Office of Student Affairs in Terman 201, 723-9106.

There is, of course, no manual to turn to for the most valuable information that you will be able to impart to your advisees, which is based on your knowledge, wisdom, and personal experiences. The individual counseling of your students on matters of personal concern to them is probably the most valuable function that you will perform.

At times, you may feel the need to refer the student to any of a variety of support services offered by the School and University, including: the Undergraduate Advising Center (UAC), the Center for Teaching and Learning (CTL), Engineering Diversity Programs (Terman 201), the Career Development Center (CDC), Counseling and Psychological Services (CAPS), Vaden Health Center, the Bechtel International Center, the University Ombudsperson, and the Dean of Students. The Undergraduate Advising Center also provides resources and general information at http://uac.stanford.edu/advisor/.

Advisers are strongly encouraged to make themselves available on a regular basis to their advisees, but in particular it is essential that each adviser schedule a liberal number of office hours during registration periods. During these registration periods, students frequently need to be able to stop by to obtain necessary signatures and advice. Your indulgence in these sometimes-unscheduled visits is greatly appreciated by the students as they go about their rush of activities.
**Freshman Advisers** have special responsibilities. The Freshman Advising Program is residence-based and does require some participation in dorm activities by the adviser. During the Autumn orientation period before registration, you will be asked to participate in a reception held at the dorm to meet your advisees. That same weekend you will arrange appointments with each advisee to help him or her plan a first-year program. At various times throughout the school year, your dorm will schedule “Adviser Nights” that you will be asked to attend.

A special feature of freshman advising is the **Peer Advising Associate Program**. Each freshman adviser is assigned an undergraduate student to assist in the advising process. Peer Advising Associates (PAAs) are invaluable as sources of information and perspectives that complement the knowledge of the faculty adviser. You are encouraged to use your Peer Advising Associate to help you arrange activities with your freshmen, to act as a liaison with your dorm, to help you invite your advisees to lunch, as well as to assist you in the actual process of academic advising. Peer Advising Associates can greatly improve the overall effectiveness of Freshman Advising, and you are encouraged to take maximum advantage of their services.

The freshman advisees that you acquire stay with you until they declare their majors. You may want to encourage them to make that declaration as soon as is practical so that an adviser in their chosen field can guide them. Students need to declare a major by the time they achieve junior status.

For your advisees that have already declared your department as their major, one of your principal administrative responsibilities is the approval of their Program Sheet, which they must submit as they approach graduation time. You must certify that their course work meet the degree requirements established by your own department and by the School of Engineering. As mentioned in this Handbook, deviations within the category of Engineering Depth must be approved by a student's adviser—including approval of courses transferred from another institution. Your approval of such variances is indicated by initialing and dating the entry on the Program Sheet.
THE ADVISEE MEAL PROGRAM

The Advisee Meal Program offers an opportunity for advisers and their undergraduate advisees to get to know each other in a situation that is informal and comfortable. You are encouraged to invite your advisees and your Peer Advising Associate to lunch or dinner as often as once per quarter. The program is funded by the Office of the Dean of the School of Engineering for juniors and seniors, and by the Undergraduate Advising Center (augmented by the Dean) for freshmen and undeclared sophomores.

WHO MAY PARTICIPATE IN THE PROGRAM? All of your undergraduate advisees are eligible for the program, as well as your Advising Associate.

HOW MUCH MAY THIS COST? The buffet lunch with dessert and non-alcoholic beverage at the Faculty Club is the "target cost limit." This amounts to about $16.00 per person, plus service and facility fees, if applicable. Please note that you will not be reimbursed for wine or other alcoholic beverages. This does not mean you have to take your advisees to the Faculty Club (you must be a member of the Club to do so, by the way), just be aware of the cost limit wherever you entertain them. If you don't use the Club, be sure to save receipts for any expenditure made.
How Do I Get Reimbursed? Forward your original Faculty Club chit (or restaurant receipt), a signed green “Travel and Reimbursement” envelope (SU-33E), and this completed form to Bertha Love, Terman 201, Mail Code 4027. Please indicate the status of each advisee in terms of whether they are "undeclared" or "declared major" students (this sorts out the funding by sponsor). If you eat at the Faculty Club, the Club will be reimbursed directly. 

Note: Processing for those requests submitted on a UAC reimbursement form or without the “Travel and Reimbursement” green envelope will be delayed.

| Name: ____________________________ | Dept: ____________ | Lunch Date: ____________ |
| Address: ____________________________ | City, Zip: ____________ |

Second Account # to be used for overage: ____________________________
Second Account # Approver: ____________________________
Location: [ ] Faculty Club  [ ] Other: ____________________________

Signature: ____________________________ Date: ____________________________

Attendees:
(List all attendees below, including Peer Academic Adviser. Please indicate declaration status.)

<table>
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REV: 8/02
# School of Engineering Deans and Department Chairs

## Deans

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Office</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Jim Plummer</td>
<td>Dean, School of Engineering</td>
<td>Terman 214</td>
<td>3-3938</td>
</tr>
<tr>
<td>Susan Clement</td>
<td>Assistant Dean for Graduate Student Affairs</td>
<td>Terman 208A</td>
<td>3-2117</td>
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<tr>
<td>Linda Faris</td>
<td>Manager, Human Resources</td>
<td>Terman 251</td>
<td>3-3872</td>
</tr>
<tr>
<td>Anne Hannigan</td>
<td>Senior Associate Dean for Administration</td>
<td>Terman 259A</td>
<td>3-0004</td>
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<tr>
<td>Noé Lozano</td>
<td>Associate Dean for Engineering Diversity Programs</td>
<td>Terman 202</td>
<td>3-9107</td>
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<tr>
<td>Brad Osgood</td>
<td>Senior Associate Dean for Student Affairs</td>
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<tr>
<td>Channing Robertson</td>
<td>Senior Associate Dean for Faculty Affairs</td>
<td>Terman 214</td>
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## Office & Phone

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## Representative

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<th>Name</th>
<th>Position</th>
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<tr>
<td>Marie Thompson</td>
<td>Assistant to the Dean</td>
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<tr>
<td>Karen Rentschler</td>
<td>Administrative Associate</td>
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<tr>
<td>Yolanda Williams</td>
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<td>Elaine Glatzel</td>
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<tr>
<td>Karen Rentschler</td>
<td>Program Coordinator</td>
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<tr>
<td>Bertha Love</td>
<td>Asst. Director for Undergraduate Studies</td>
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<tr>
<td>Marie Thompson</td>
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## Department Chairs

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<tbody>
<tr>
<td>Aeronautics &amp; Astronautics</td>
<td>Brian Cantwell</td>
<td>Durand 271</td>
<td>3-4825</td>
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<tr>
<td>Chemical Engineering</td>
<td>Curt Frank</td>
<td>Stauffer III-111</td>
<td>3-4573</td>
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<tr>
<td>Civil and Environmental</td>
<td>Richard G. Luthy</td>
<td>Terman M-50</td>
<td>3-3921</td>
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<tr>
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<td>Hector Garcia-Molina</td>
<td>Gates 276</td>
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<td>Electrical Engineering</td>
<td>Bruce Wooley</td>
<td>Packard 175</td>
<td>5-5782</td>
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<td>Management Science and</td>
<td>Elisabeth Paté-Cornell</td>
<td>Terman 340</td>
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<td>5-7455</td>
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<tr>
<td>Mechanical Engineering</td>
<td>Fritz Prinz</td>
<td>Bldg. 530-113</td>
<td>3-4023</td>
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