

2. TYPES OF ENGINEERING MAJORS & ACCREDITATION

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 degree¹ in:

- Chemical Engineering
- Civil Engineering
- Computer Science
- Environmental Engineering
- Electrical Engineering
- Management Science and Engineering
- Materials Science and Engineering
- Mechanical Engineering.

Unlike undergraduate programs at Stanford outside of the School of Engineering, these majors share a common curricular structure and are subject to school-wide requirements:

- 36 units (minimum) to 45 units (maximum) of Mathematics and Science, **combined**. (Departments may place individual minimums for both Mathematics and Science.)

¹ Although it has “Engineering” in its title, Petroleum Engineering is offered by the Department of Energy Resources Engineering rather than the School of Engineering. For details on Petroleum Engineering, please see the *Stanford Bulletin*.

- 1 course in “Technology in Society” (3 units minimum)
- 3 courses in “Engineering Fundamentals,” at least one of which is left up to the student to choose
- “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 and 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. At present, there are seven such pre-approved majors:

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

Detailed program and declaration requirements for these pre-approved School of Engineering majors appear in Section 4, along with the requirements for departmental majors.

INDIVIDUALLY DESIGNED MAJORS

Individually Designed Majors in Engineering (IDMENS) are intended for undergraduates interested in studying engineering in areas not covered by departmental majors or the pre-

approved School of Engineering majors. Each IDMEN curriculum is designed by the student in consultation with at least two faculty advisors. Each student's primary academic advisor 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 advisor; 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 advisor. The IDMEN degree is designated as a "Bachelor of Science in an Individually Designed Major in Engineering: *Approved Title*." This degree program is not accredited by ABET (see later section on Accreditation for more information).

To pursue an IDMEN, a student must submit a written proposal to the IDMEN Subcommittee of the Undergraduate Council detailing her or his proposed course of study; you may bring your proposal to 201 Terman. IDMEN 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 the forms section) and accessible as an Excel spreadsheet on the

web at <http://ughb.stanford.edu>, should be filled out completely including an 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 IDMEN program sheet must be signed by two faculty members: the student's primary advisor, who **must** be an Academic Council member of the School of Engineering faculty, and a secondary advisor. These signatures certify that the advisors endorse the major as described in the proposal and agree to serve as the student's permanent advisors.

3. **Four-year plan sheet.** This form is also available in the "Forms" section of this handbook and on the web at <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 advisor 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 IDMEN 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 advisors and reapproved by the IDMEN Subcommittee of the Undergraduate Council. Proposals are reviewed and acted upon once per quarter by the IDMEN 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 27, 2006

Winter Quarter: February 9, 2007

Spring Quarter: May 4, 2007

Once the proposal has been accepted by the IDMEN subcommittee, the School of Engineering will notify the registrar to add the approved major to your information in Axess.

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 IDMEN alternative. This handout is available from the Office of Student Affairs.**

INSTRUCTIONS FOR DECLARING AN INDIVIDUALLY DESIGNED MAJOR

1. Investigate existing majors to determine whether your goals can be met by pursuing a pre-defined major. It is important to gather information about the majors and their options by talking to students and professors.
2. If you decide to pursue an individually designed major, talk to faculty members to get their advice. Identify two Stanford faculty members who can serve as advisors, and select one as your "primary" advisor.
 - a. The primary advisory must be within the School of Engineering and must be a member of the Stanford Academic Council, which means that Lecturers and Visiting Professors cannot fill this role.
 - b. The secondary advisor need not be a member of the Academic Council, and may be outside of the School of Engineering.
3. Work with your advisors to design a proposal (as described in the previous section of this handbook), including the following materials:
 - a. A rationale statement describing the proposed major
 - b. An Individually Designed Major program sheet
 - c. A four-year plan listing the courses you intend to take
4. Submit the proposal package and a letter of support from your primary advisor to Bertha Love in the SoE Student Affairs Office, Terman 201. See previous section for quarterly deadlines.
5. If and when your major is approved, the SoE Student Affairs Office will notify the Registrar's Office to add your major in Axess.

ACCREDITATION

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, Environmental Engineering, and Mechanical Engineering, all at the Bachelor of Science level. Computer Science is not an accredited program, by choice of the department and the School; lack of ABET accreditation is no reflection on the quality of the department or program. 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; and
- a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives.