

Engineering, Jacobs School of

OFFICE: 7310 Engineering Building Unit 1,
Warren Mall

<http://www.jacobsschool.ucsd.edu>

The Irwin and Joan Jacobs School of Engineering at UCSD comprises the Departments of Bioengineering (BE), Computer Science and Engineering (CSE), Electrical and Computer Engineering (ECE), Mechanical and Aerospace Engineering (MAE), and Structural Engineering (SE). The Jacobs School is directed by the dean of engineering. The departments offer seventeen undergraduate programs that fall into three categories: impacted, pre-major, and open major programs as well as many graduate degree programs. For a complete list of engineering undergraduate and graduate programs, please visit our Web site at <http://www.jacobsschool.ucsd.edu>. Students interested in engineering should consult the Web site and the individual department listings which follow this section of the catalog.

UCSD's six undergraduate colleges differ in their general-education requirements. Prospective students should review the general-education requirements and take them into account when planning their college curriculum.

Acceptance to the Jacobs School of Engineering

Student demand exceeds program capacity in several of the undergraduate majors. Owing to limited departmental resources, major programs to which more students apply than can be accepted have been declared impacted majors. Acceptance into an impacted engineering major is based on academic excellence demonstrated in high school or at a community college. Acceptance will be granted to the maximum number of students in each of these impacted major programs consistent with maintaining acceptable program quality and in compliance with admissions procedures and criteria approved by the Academic Senate's Committee on Educational Policy.

Remember that admission to the university and to a college does not guarantee acceptance to an impacted major.

FRESHMAN

Freshmen are admitted to engineering majors in one of three ways: open majors, pre-majors and impacted majors.

Open Majors

The following seven majors are open to all admitted UCSD students: aerospace engineering, chemical engineering (offered through the Chemical Engineering Program), engineering science (offered through MAE department), engineering sciences (offered through SE department), environmental engineering, mechanical engineering, and structural engineering. All applicants who have been accepted to UCSD and indicated a pre-major or open engineering major on their application are placed directly into that major.

Required Review of Student Progress for Electrical Engineering Majors

Effective fall 2006 the electrical engineering major within the Department of Electrical and Computer Engineering (ECE) is no longer considered an impacted major. Entering freshmen and transfer students who have indicated the desire to major in electrical engineering will be admitted directly to the major. Continuing UCSD students who wish to transfer into the electrical engineering major will be evaluated under the rules that are in effect for the year in which they enter the major. Effective fall 2006, to remain in good standing as an electrical engineering major, a student must complete a minimum of eight Progress Review Courses with a C- or better during his or her first five quarters for freshmen or during the first three quarters for continuing UCSD or transfer students. The average GPA from any six of the Progress Review Courses, including at least two from EE Progress Review Courses, must exceed 2.50.

The required review of student progress for electrical engineering majors is explained in greater detail under the "Department of Electrical and Computer Engineering (ECE)" section of this catalog.

Pre-major Programs

There are two engineering pre-major programs offered: (1) bioengineering: pre-medical and (2) engineering physics. Incoming freshmen who identified either of these pre-majors as their first choice on their UCSD admissions application are accepted directly into these pre-majors upon

admission to UCSD. Subsequent acceptance to the major is dependent on performance in selected mathematics, science, and engineering screening courses as well as competitive grade-point average in the pre-major screening courses.

Pre-major engineering students are expected to apply for acceptance to the major during the spring quarter of their freshman year. Acceptance to the major is based on the grade-point average in the screening courses only. The grade-point average required for acceptance to the major by pre-majors is set individually by each engineering program. Pre-majors should consult their departments concerning the appropriate screening courses and the current grade-point average standards for acceptance. In addition to the courses required by the departments, it is expected that all pre-major students will take twelve to eighteen units of general-education college requirements during their first year.

Pre-major engineering students who are not able to apply before the end of their third quarter, or who wish to reapply following an unsuccessful application, must contact their department as soon as possible for further advising as **acceptance to any engineering major will not be considered after six quarters of enrollment.**

Impacted Majors

The following five engineering majors are impacted: bioengineering, bioengineering: biotechnology, computer engineering (CSE), computer engineering (ECE), and computer science. Applicants must indicate one of these impacted majors as their first choice on their UC application in order to be considered for acceptance to the major by the Jacobs School. The Jacobs School will subsequently notify all engineering students admitted to UCSD of their acceptance status.

Effective fall 2001, this selection is based on the freshman review criteria (Comprehensive Review) administered by the UCSD Office of Admissions and Relations with Schools.

It is strongly suggested that all students accepted into engineering programs consult their department's academic adviser at an early stage to plan their lower-division engineering courses, and that they consult with a college academic counselor to arrange general-education

tion courses around the required screening courses. Students admitted fall quarter should attend the engineering department's orientation meetings during Welcome Week.

Bioinformatics Programs

Students interested in applying to either the bioengineering: bioinformatics major (offered by the bioengineering department), or the computer science major with a specialization in bioinformatics (offered by the computer science and engineering department) should consult individual department listings which follow this section of the catalog.

TRANSFERS

Following California's Master Plan for Higher Education, The Jacobs School of Engineering gives high priority to students transferring from California community colleges.

Transfer students are admitted to engineering majors in one of three ways: open majors, pre-majors, and impacted majors. Effective fall 2006, all applicants who have been accepted to UCSD and indicated an engineering major on their UC application will be reviewed for major-preparation course work (see courses below.) For major-specific advising, please contact the relevant departmental undergraduate academic advising office.

Effective **fall 2004**, it is **strongly recommended** that transfer students complete the following preparation for engineering majors*.

*Effective **fall 2006**, these courses will be **required** preparation for **all** engineering transfer students.

- Calculus I—for Science and Engineering (Math. 20A)
- Calculus II—for Science and Engineering (Math. 20B)
- Calculus and Analytic Geometry (Math. 20C)
- Differential Equations (Math. 20D)
- Linear Algebra (Math. 20F)
- Complete calculus-based physics series with lab experience (Physics 2A-B-C)
- Chemistry 6A (except Computer Science and Computer Engineering majors)

Note: Effective fall 2007, a total of ten quarter-units of general chemistry (including laboratory) will be required for students applying to all majors offered by the Department of Bioengineering.

- Highest level of introductory computer programming language course offerings at the community college**

**Refer to the *UCSD General Catalog* to select major prerequisite requirement for computer language courses.

For impacted majors (bioengineering, bioengineering: biotechnology, computer science, computer engineering (CSE), and computer engineering (ECE), we recommend a competitive UCSD transferable cumulative GPA of 3.20 and 3.40 in the major-preparation courses.

Open Majors

The following seven majors are open to all admitted UCSD students: aerospace engineering, chemical engineering (offered through the Chemical Engineering Program), engineering science (offered through MAE), engineering sciences (offered through SE), environmental engineering, mechanical engineering, and structural engineering. Through the fall 2005 admissions cycle, all transfer applicants who have been admitted to UCSD and indicated an open engineering major on their application are placed directly into that major. Effective fall 2006, transfer applicants to open majors will be screened for completion of the above preparation courses.

Required Review of Student Progress for Electrical Engineering Majors

Effective fall 2006 the electrical engineering major within the Department of Electrical and Computer Engineering (ECE) is no longer considered an impacted major. Entering freshmen and transfer students who have indicated the desire to major in electrical engineering will be admitted directly to the major. Continuing UCSD students who wish to transfer into the electrical engineering major will be evaluated under the rules that are in effect for the year in which they enter the major. Effective fall 2006, to remain in good standing as an electrical engineering major, a student must complete a minimum of eight Progress Review Courses with a C- or better during his or her first five quarters for freshmen or during the first three quarters for continuing UCSD or transfer students. The average GPA from any six of the Progress Review Courses, including at least two from EE Progress Review Courses, must exceed 2.50.

The required review of student progress for electrical engineering majors is explained in

greater detail under the Department of Electrical and Computer Engineering (ECE) section of this catalog.

Pre-major Programs

There are two engineering pre-major programs offered: (1) bioengineering: pre-medical and (2) engineering physics. Subsequent acceptance to the major is dependent on performance in selected mathematics, science, and engineering screening courses as well as competitive grade-point average in the pre-major screening courses.

Pre-major transfer engineering students are expected to apply for acceptance to the major during their third quarter of their first year at UCSD. Acceptance to the major is based on the grade-point average in the screening courses only. The grade-point average required for acceptance to the major by pre-majors is set individually by each engineering program. Pre-majors should consult their departments concerning the appropriate screening courses and the current grade-point average standards for acceptance. In addition to the courses required by the departments, it is expected that all pre-major students will take twelve to eighteen units of general-education college requirements during their first year.

Pre-major transfer engineering students must apply to the major before the end of their third quarter as acceptance to any engineering major by a transfer student will not be considered after the end of third quarter of enrollment.

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Impacted Majors

Since acceptance to impacted engineering majors is quite competitive for freshman and transfer applicants alike, academic standards are high. Transferring students must demonstrate both the completion of most of their lower-division courses at the community college, and a high level of academic competence (GPA) in these courses.

The Jacobs School evaluates transfer students who choose impacted engineering major programs as their first choice major on their UC application. Those seeking acceptance to the following impacted engineering majors: bioengineering and bioengineering: biotechnology, computer science, and computer engineering will have their community college work evaluated by the Jacobs School of Engineering.

Acceptance to impacted majors may be limited to the best transfer applicants, e.g., those who have been admitted to UCSD with the most complete lower-division preparation and the highest college grade-point averages. For impacted majors, a competitive UCSD transferable cumulative GPA of 3.20 and 3.40 in the major-preparation courses is recommended. Since acceptance is restricted to these majors, **transfer students are encouraged to apply to more than one major degree program.**

It is strongly suggested that all students accepted into engineering programs consult their department's academic adviser at an early stage to plan their lower-division engineering courses, and that they consult with a college academic counselor to arrange general-education courses around the required screening courses. Students admitted fall quarter should attend the engineering department's orientation meetings during Welcome Week.

For specific program requirements for transfer students, please refer to the appropriate department's listing which follow this section of the catalog.

Bioinformatics Programs

Students interested in applying to either the bioengineering: bioinformatics major (offered by the bioengineering department), or the computer science major with a specialization in bioinformatics (offered by the computer science and engineering department) should consult individual department listings which follow this section of the catalog.

CONTINUING UCSD STUDENTS

Through the fall 2005 admissions cycle, UCSD undergraduate students who were not accepted into an engineering major as entering students may, *with engineering departmental approval*, change their major to any **non-impacted engineering major**. Effective fall 2006, continuing transfer students to open majors will be screened for completion of required major preparation course work (see beginning of "TRANSFERS" section above for more details). Interested students should make an appointment to speak with the departmental undergraduate adviser prior to changing their major for more details.

EXCEPTIONAL ADMISSION PROGRAM (CSE AND ECE IMPACTED MAJORS)

The Departments of Computer Science and Engineering and Electrical and Computer Engineering may periodically grant admission to the computer engineering (CE) or computer science (CS) majors to a small number of academically exceptional UCSD undergraduate students who were not admitted to these majors as entering students. Refer to the department section in this catalog for program requirements and information. At this time, the Department of Bioengineering does not participate in the Exceptional Admission Program for its impacted major programs.

Access of Non-Engineering Majors to the Jacobs School of Engineering Courses

The number of students enrolled in some courses offered by the Jacobs School of Engineering must be restricted to meet the resources available. Students who have successfully completed all prerequisite courses will be enrolled in these restricted courses in the following order:

1. students accepted by the department to a major curriculum
2. students accepted by the department to a minor curriculum
3. students fulfilling a requirement for another major
4. all others, with permission of the department and instructor

Students should check with the departments concerning the limitations on specific courses and the requirements needed prior to attempting to enroll.

Double Majors and Minors

It is the policy of the Jacobs School of Engineering not to approve double majors within engineering. Students who qualify for admission to graduate school and who have the extra time are encouraged to consider co-terminal B.S./Master's degrees in one or two engineering disciplines. Engineering minors may be taken only by non-engineering majors.

Integrative Engineering Education

ESS—Office of the Dean: The mission of ESS is to promote the personal and professional development of the undergraduate and graduate engineering student body. ESS activities and programs are designed to assist students as they pursue their chosen degrees and to prepare them for life outside of the university as engineering professionals and responsible citizens. To this end, the office serves as a resource for those interested in applying to engineering majors; getting involved in student organizations; locating an internship; accessing tutoring information; or simply as a referral to on-campus and community resources. In addition, the office supports the Teams in Engineering Service (TIES) Program, Team Internship Program (corporate), and the California State Summer School for Mathematics and Science (COSMOS). For more details, visit the office in Engineering Building Unit 1, Room 1400, email ess@soe.ucsd.edu, or visit <http://www.jacobsschool.ucsd.edu/ESS/>.

Teams in Engineering Service (TIES): Jacobs School undergraduates can place their technical and creative skills to work for San Diego non-profit organizations through the new Teams in Engineering Service (TIES) Program. Through TIES, multidisciplinary teams of UCSD students design, build, and deploy projects that solve technology-based problems for local community organizations, and receive technical elective (or academic) credit. For details, visit <http://ties.ucsd.edu>.

Team Internship Program: This corporate-sponsored program gives students the opportunity to develop their engineering skills in a collaborative work environment that mirrors what they will encounter as they enter the workforce. In these full-time, competitive summer paid internships, students work on-site with industry partners as a systems-oriented solution team focused on a clearly defined and significant project. For details, visit http://www.jacobsschool.ucsd.edu/ESS/team_intern/.

The California State Summer School for Mathematics and Science (COSMOS) is a four-week residential pre-college academic experience in math, science, and engineering for top high school students. Students participate in one of the following seven academic courses (or

clusters): 1. Adventures in Media Computing; 2. Kinetic Sculpture and Clocks; 3. Living Oceans and the Impacts of Climate Change; 4. Earthquakes in Action; 5. The Molecular Biology Revolution; 6. The Physics of Waves and Stars; and 7. Bioengineering and Modeling of the Red Blood Cell Membrane. In summer 2005, one-third of the admitted students were awarded full financial aid. For more information, visit <http://www.jacobsschool.ucsd.edu/cosmos>.

COURSES

For course descriptions not found in the 2006–2007 General Catalog, please contact the department for more information.

100. Principles of Team Engineering (2)

Introduction to the practice of engineering as a team-driven profession. Levels of the design process, verbal and written communication, principles of teamwork, project management, ethics, legal issues, quality management, entrepreneurship, and community involvement. *Prerequisites: concurrent enrollment in or completion of one of the following: DOC 2, CAT 2, HUM 2, MMW 2, MCWP 50, or WCWP 10B and one university-level mathematics course (or equivalent) or consent of instructor. Preference given to engineering majors. Not open to graduate students.*

100L. Team Engineering Laboratory (2)

Faculty-directed, multi-disciplinary, long-term engineering projects. Students use their technical knowledge to design and develop solutions to real problems in consultation with customers such as community organizations. *Prerequisite: ENG 100 (required prior to or in concurrent enrollment with ENG 100).*

101. Team Engineering (4)

Fundamental principles of team engineering practice. Team formation and leadership, project creation and management, statistical tools for quality improvement, engineering business economics, law, and ethics. Interdisciplinary student teams will research, refine, and propose the design, manufacture, and marketing of a novel engineering product. Four hours of lecture. *Prerequisite: a course in probability of statistics.*

201. Venture Mechanics (4)

Examines the engineering/entrepreneurism interface. Discovery, development, and implementation of new product ideas. Understanding markets, competitors, and selling innovations. Cultivating effective working relationships between research, engineering, manufacturing, and marketing elements of an organization. Priority enrollment given to engineering majors.

202. Enterprise Dynamics (4)

Case studies of start-ups, strategic technology management, practice in use of industrial decision-making tools, and speakers from successful firms combined with experience in making management decisions dynamically in a competitive computer-simulated enterprise. Field study of ongoing processes in a local high technology company. Priority enrollment given to engineering majors.

203. Applied Innovations (4)

Course includes the examination of business plans developed by early stage technology businesses. Students expected to work on the development of business plans for real, innovative business organizations. Will explore all of the business research and analysis that needs to be undertaken in order to develop a complete business plan. Completion of ENG 201 or ENG 202 preferred.

204. Theory and Practice of University Teaching (2)

Teaching and learning at the college/university level. Readings in engineering and cognitive science, plus opportunities for teaching and evaluating college level students. Covers theoretical underpinnings and the practice of teaching. Participation in some practicum teaching experience will be required.