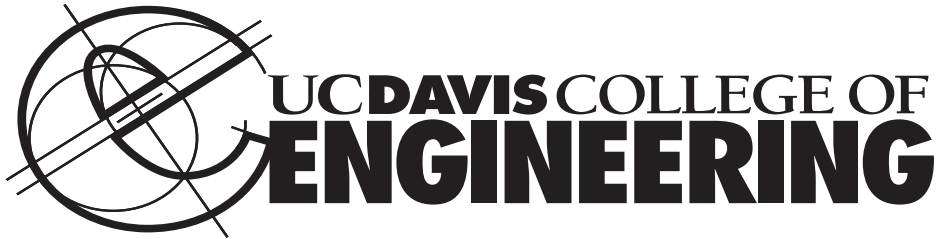


2009-2010 Engineering Bulletin

Because Engineering is a rapidly developing profession, curricular changes are made by the faculty from year to year. In order to ensure that students benefit from these changes, the College of Engineering has established a policy that students must fulfill the degree requirements stipulated for the declared major in the academic year of your graduation or in the immediately preceding academic year.

The Engineering Bulletin is revised once a year to provide engineering students with current information about degree requirements. This Bulletin reflects the degree requirements in effect for the 2009-2010 academic year. Students graduating in the 2008-2009 or 2009-2010 academic year may use the major program curriculum printed in this Bulletin to satisfy degree requirements.

Undergraduate Study



Engineering is the profession in which the physical, biological, and social sciences are applied in a practical way for the benefit of mankind. As an engineering undergraduate, you will learn to observe and describe technological problems and to seek useful solutions to these problems.

Undergraduate students are currently admitted to the sixteen engineering programs (including three combined major programs) in eight different academic departments in the College of Engineering at Davis. These four-year programs all lead to the degree of Bachelor of Science.

Department of Applied Science

- Computational Applied Science (not accepting new students)**
- Optical Science and Engineering**

Department of Biological and Agricultural Engineering

- Biological Systems Engineering**

Department of Biomedical Engineering

- Biomedical Engineering**

Department of Chemical Engineering & Materials Science

- Biochemical Engineering**
- Chemical Engineering**
- Chemical Engineering/Materials Science and Engineering**
- Electronic Materials Engineering**
- Materials Science and Engineering**

Department of Civil & Environmental Engineering

- Civil Engineering**

Department of Computer Science

- Computer Science and Engineering**

Department of Electrical & Computer Engineering

- Computer Engineering**
- Electrical Engineering**

Mechanical & Aerospace Engineering

- Aerospace Science and Engineering**
- Mechanical Engineering**
- Mechanical Engineering/Materials Science and Engineering**

Undergraduate Advising

UC Davis and the College of Engineering offer many types of academic advising to help students get the most from a UC Davis education. A well-developed group of faculty, staff, and peer advisers assist students in meeting degree requirements and taking maximum advantage of the resources available at UC Davis.

New Student Advising

Both incoming freshman and transfer students are expected to attend the UC Davis Orientation program held the summer before the first quarter of enrollment. Orientation sessions provide the information needed to make a student's academic experience rewarding and effective. Incoming students meet with the departmental staff adviser for a student's declared major before registering for courses for the first time. For information about the UC Davis Orientation program, visit <http://orientation.ucdavis.edu/>

While it is expected that all students will attend UC Davis Orientation, we recognize that some students are unable to attend. In the event of this, you should contact the departmental staff adviser in the department of the major program before signing up for classes. The list of advisers can be found at: http://engineering.ucdavis.edu/pages/current_students/advising/department_advisers.html

Continuing Student Advising

In establishing the College of Engineering's undergraduate programs, every effort has been made to provide for maximum flexibility consistent with rigorous preparation for professional practice or graduate study. The key to successful flexibility is an effective system of advising. Faculty, staff, and peer advisers are available to all students in the College.

Departmental Staff Advisers

It is essential that each student meet with the departmental staff adviser for his or her major on a regular basis. The departmental staff adviser has the most current information about degree requirements and the most appropriate course sequences for students in that major to follow. These advisers know when courses in the major program will be offered and can provide students with valuable referrals to faculty advisers within the department. Wise students meet with these advisers often.

Contact information for Departmental Staff Advisers can be found at: http://engineering.ucdavis.edu/pages/current_students/advising/department_advisers.html

Advising Holds

To ensure that students meet with an adviser at least once a year, the College has implemented a mandatory advising program. Each student is required to meet with an adviser once a year, during a specific quarter, which is determined by the first letter of the student's last name as listed below. Students who meet with an adviser during the quarter of the hold, and have the hold released, should have no difficulties with subsequent registration. Students have approximately four months to clear an advising hold.

- A-G=Fall Hold; Meet with adviser during Fall Quarter, hold must be cleared by January 4, 2010
- H-N=Winter Hold; Meet with adviser during Winter Quarter, hold must be cleared by March 25, 2010
- O-Z=Spring Hold; Meet with adviser during Spring Quarter, hold must be cleared by September 20, 2010

Students are notified of the hold by checking SISWEB at the time of registration. Students who do not clear their advising hold during the specified period will be unable to make changes to current registration and to register for future quarters.

Engineering Undergraduate Advising Office

1050 Kemper Hall (530) 752-1979

<http://engineering.ucdavis.edu>

Information and assistance regarding academic, career and personal matters is available in the Undergraduate Advising Office, either through direct assistance from one of the staff advisers or through referral to other offices on campus. The Undergraduate Advising Office handles student petitions (change of major, late drop, multiple repeat, etc), general education credit evaluation, transfer credit evaluation, articulation and degree certifications. In addition, the office serves as a primary contact for students with questions regarding undergraduate curriculum policy and procedures. Advisers in the Undergraduate Advising Office meet with students who are subject to dismissal and on academic probation to develop academic and personal plans that promote a return to good academic standing.

Students considering graduate study following their undergraduate career should take advantage of the **Gearing Up for Grad School** seminar series and other pre-graduate school advising offered through the Undergraduate Advising Office (1050 Kemper Hall).

Faculty Advisors

Faculty advisors are a valuable resource for students within the College of Engineering. Students are encouraged to seek faculty advice about the field of study,

career, and graduate school plans. Faculty are a good resource for identifying undergraduate research experiences and to sponsor student internships.

Peer Advisers

Peer advisers provide students with information about their own experience as an engineering student. Peer advisers talk with students about workable course loads and valuable extracurricular activities. Peer advisers are available in 1050 Kemper Hall. They are also available during designated hours in the residence halls. To speak with a peer adviser, call the Undergraduate Advising Office at (530) 752-0553.

Planning an Academic Program

When planning an academic program it is important to remember that engineering degree requirements change frequently. Students are required to complete the degree requirements stipulated in the Engineering Bulletin in the academic year of graduation or in the immediately preceding academic year.

Each student is held responsible for planning his or her own academic program. But that does not mean that students are without resources to help with accurate planning. Faculty and departmental staff advisers, with whom students are strongly urged to consult before registration each quarter, are the primary source of assistance. The Undergraduate Advising Office and other advising offices throughout the campus also provide valuable assistance to students as they plan their programs.

It is important to carefully observe course prerequisites to avoid delaying graduation. Course prerequisites are specified to help students avoid courses for which they are unprepared and to help the instructor establish a starting point for a given course. Students may be dropped from courses for which they are unable to demonstrate completion of prerequisites. The instructor may waive course prerequisites for an individual student for good cause. Students must check with the instructor prior to registering for a course if they have not completed stated prerequisites.

Course Recommendations for Entering Freshmen

Course priorities for most students in the first quarter of the freshman year are suggested below.

- Mathematics: Determined by SAT scores or diagnostic exam results, consult with an adviser
- Chemistry: Determined by diagnostic exam results, consult with an adviser
- Lower division writing: Dependent upon satisfaction of Entry Level Writing Exam, consult with an adviser

If the Entry Level Writing Requirement (formerly Subject A) is not satisfied before entering the university it must be satisfied during the first year of residence. If the requirement is not complete after three quarters of enrollment, a student will be disenrolled and must apply for readmission after satisfying the requirement at a community college. General Education writing credit cannot be earned until the Entry Level Writing Requirement has been satisfied.

- Communication 1 or 3: For most majors
 - Communication 1 only for Computer Science and Engineering and Biomedical Engineering majors;
 - Neither course is required for Chemical Engineering, Chemical Engineering/Materials Science or Biochemical Engineering majors.
- General Education Courses: Choose lower division courses from the Arts & Humanities and Social Sciences topical breadth lists:
<http://registrar.ucdavis.edu/UCDWebCatalog/ugraded/gereqt.html>

Course Load

- **Expected Progress.** Students are expected to graduate in 12 quarters (four years). To do so, students should plan to complete an average of 15 units per quarter (15 units per quarter for 12 quarters totals 180 units). Due to the high number of units for majors in Engineering, students frequently need to take more than 15 units in some quarters or take courses during summer to complete degree requirements in four years. Because occasions arise which prevent students from achieving expected progress towards the degree, the campus has established minimum progress requirements, to which students must adhere.
- **Minimum Progress Requirements.** To meet minimum progress, a full-time regular undergraduate is required to maintain an average of at least 13 units passed over all quarters of enrollment. Minimum progress is calculated at the end of every Spring Quarter for the preceding three quarters (Fall, Winter, Spring) comprising the academic year. Undergraduate students falling below this requirement are not in good academic standing for quantitative reasons and may be disqualified from further enrollment at the University. Quarters for which a student was officially approved for part-time status are omitted from the minimum progress calculation. Please refer to the Probation and Dismissal: Quantitative Standards section of the General Catalog for more information.
- **Certification of Full-Time Status.** If you are an undergraduate student, you must carry a course load of at least twelve units (including workload units) each quarter in order to be certified as a full-time student for insurance or financial-aid purposes or to compete in intercollegiate athletics. Certification of student status can be obtained from the Office of the Registrar 12 Mrak Hall.

Choosing a Major

Students must declare a major when they apply to the College of Engineering. The ability to change majors after enrollment is determined by satisfactory performance in key engineering prerequisites. Requirements for changing to a College of Engineering major vary by major and can be found at:

http://engineering.ucdavis.edu/pages/current_students/advising/change_major.html#chg or by contacting the Undergraduate Advising Office (530) 752-1979.

Although students are admitted to the College of Engineering with a declared major, there are many campus advising and counseling services for students who are uncertain about remaining in the major chosen at the time of admission.

The Internship and Career Center in South Hall offers career discovery workshops and CAPS (Counseling and Psychological Services) in North Hall offers career explorations groups each quarter.

A number of freshman engineering courses are designed to describe the engineer's role in society and to show the similarities and differences among various engineering branches:

- Aeronautical Science & Engineering 1 (Introduction to Aerospace Science Engineering)
- Applied Science 1 (Introduction to Optical Science and Engineering)
- Biological Systems Engineering 1 (Introduction to Biological Systems Engineering)
- Biomedical Engineering 1 (Introduction to Biomedical Engineering)
- Chemical Engineering 80 (Chemical Engineering Profession)
- Electrical and Computer Engineering 1 (Introduction to Electrical and Computer Engineering)
- Mechanical Engineering 1 (Mechanical Engineering)

You may also wish to take one of these courses to assist in your decision about a change of major.

Multiple Majors

Engineering has several established combined majors. In addition to the combined majors, students may choose to complete two engineering majors. Enrollment in an engineering major and a non-engineering major may be possible. Double-major students must satisfy the requirements for both majors. Degree requirements for such double majors ordinarily cannot be completed within four academic years. A change of major petition is required for all requests and appropriate approvals from all applicable departments and dean's offices are necessary. Triple majors will not be approved.

Some combinations of double majors are prohibited. The list of prohibited double majors can be found at:

http://engineering.ucdavis.edu/pages/current_students/advising/change_major.html#chg

Minors

Students in Engineering may, with the approval of the Undergraduate Advising Office (1050 Kemper Hall) and the adviser in the minor department, elect a minor in the College of Letters and Science, the College of Biological Sciences, the College of Agricultural and Environmental Sciences, or the Graduate School of Management. The Construction

Engineering and Management minor in the College of Engineering is also available to engineering students.

A minor normally consists of 18—24 units of upper division coursework specified by the department offering the minor. Students must also complete all the prerequisites for the minor. When planning a minor, students should plan coursework carefully with an academic adviser. At most, one course taken in satisfaction of a major requirement may be applied to the completion of the minor. If a student elects more than one minor, the minors may not have any courses in common.

Students must file a petition for a minor which is available online at:

http://engineering.ucdavis.edu/pages/current_students/pdf_forms/minor_form.pdf

The completed petition must be approved by the minor adviser and then turned into the Undergraduate Advising Office of the College of Engineering for certification at least one quarter prior to graduation.

INTERNSHIPS AND WORK EXPERIENCES

Internships and work experiences provide opportunities to gain professional engineering experience before graduation. The advantages of internships and work experiences include the clarification of your academic and career goals, valuable practical experience, financial assistance, and acquaintance with people who may be important for your career. Some internships (also referred to as co-ops) are paid, full-time positions lasting six months. Students take a planned educational leave (PELP) for the quarter in which they are working. Other internships are part-time positions during the school year or full-time jobs during the summer. Long- and short-term positions in industry, government, and academic departments are available.

If you participate in co-op or internship positions, you must still complete all the standard academic work required for graduation. Many positions are paid and entail responsibilities appropriate to your level of education or work experience. The complexity and challenge of each assignment is expected to increase over time as your educational level increases. Opportunities are available as early as your sophomore year. Assignments will vary with your field and the type of employer. Your needs, desires, and professional goals determine what internships you should apply for. Including a co-op or internship in your program requires you to plan your program carefully, since you must still complete your graduation requirements, and because they entail a commitment of your time.

If you are interested in co-op, internship, or career advising, you can get more detailed information from the Internship and Career Center at (530) 752-2855 or on the web at <https://iccweb.ucdavis.edu/>

Study Abroad in Engineering

Students in the College of Engineering can, with careful planning, participate in many education abroad experiences. The Education Abroad Center has developed a one unit seminar, offered at least once a year, to help students develop an academic plan that includes participation in an education abroad program. Additional information can be found by visiting the Education Abroad Center located at 207 Third Street, Suite 120, 297-4633. The EAC website is: <http://eac.ucdavis.edu/eac/welcome.cfm>

DEGREE REQUIREMENTS

NO UNIT OF COURSEWORK YOU COMPLETE MAY BE USED TO SATISFY TWO DIFFERENT DEGREE REQUIREMENTS (EXCEPT WHERE THE CATALOG OR BULLETIN SPECIFICALLY INDICATES OTHERWISE).

YOU ARE RESPONSIBLE FOR PLANNING YOUR PROGRAM AND FOR SATISFACTORILY COMPLETING ALL DEGREE REQUIREMENTS.

Degree Checks

You should use the degree requirement check sheets available in the Undergraduate Advising Office (1050 Kemper Hal) for monitoring your progress toward your degree. The Engineering Undergraduate Advising Office is responsible for preparing and reviewing your degree requirements. You must submit a signed degree check request, preferably one year before you anticipate graduating. This degree check is provided as a service to you and does not relieve you of the responsibility of making sure that you have met all your degree requirements. You can obtain request forms and further information concerning this service in the Engineering Undergraduate Advising Office. Refer to the General Catalog for minimum progress requirements as you plan.

GENERAL UNIVERSITY REQUIREMENTS

A bachelor's degree is awarded by the University of California to those candidates who satisfy the requirements of the university (see the General Catalog) in regard to Entry Level Writing Requirement, American History and Institutions, Residence, Scholarship, Units, and Application for Degree Candidacy.

CAMPUS REQUIREMENTS

The General Education requirements for the bachelor's degree are campus requirements and are explained in the bachelor's degree requirements section of the General Catalog. In addition to the campus requirement, the College of Engineering has additional general education requirements. See the General Education requirements section below for specific details.

All majors in the College of Engineering are in the "Science and Engineering" General Education area. Therefore, courses used to satisfy general education requirements must be chosen from the remaining two areas: "Arts and Humanities" and "Social Sciences." The relationship of these courses to the humanities and social sciences electives is discussed under "Electives."

COLLEGE OF ENGINEERING REQUIREMENTS

Unit Requirement

Each candidate for the degree of Bachelor of Science in Engineering must satisfactorily complete an approved curriculum in engineering. While University requirements state that a student must complete 180 units for graduation, many engineering majors require more than 180 units to complete all degree requirements. Each major specifies lower and upper division coursework required to satisfy all engineering requirements.

Residence Requirement

In addition to fulfilling the university residence requirement, you must complete at least 35 of the final 45 units while registered in the college.

Scholarship Requirement

In addition to meeting the University scholarship requirement, you are required to maintain a minimum overall GPA of 2.0 for all engineering coursework taken.

English Composition Requirement (upper division)

The upper division composition requirement can be satisfied by receiving a C- or better in an approved upper-division writing course. Consult your major's degree requirements for the list of courses approved for your major.

Some programs (excluding Biological Systems Engineering) allow students to satisfy the requirement by passing the Upper-Division Composition Examination after the student has satisfied the lower-division composition requirement and has 70 or more units. The Upper-Division Composition Examination is administered through the College of Letters and Science. It is typically offered on Saturday mornings in mid-October, late January and late April. Specific information about the exam and instructions for registering can be found at: <http://writing.ucdavis.edu/students/compexam/>

Registration for the exam is done on-line beginning the Monday before each exam date until Friday at noon or until the exam slots are filled. You must obtain the English Composition Examination form, available at the UC Davis Bookstore, to take the exam. (Units of credit are not given for passing this examination.)

This requirement is in addition to the lower-division composition requirement (Advanced Placement credit or a grade of C- or better in English 3; Comparative Literature 1, 2, 3 or 4; Native American Studies 5; or University Writing Program 1).

Degree Requirements

Since engineering is a rapidly developing profession, curricular changes are made by the faculty from year to year. In order to ensure that you benefit from these changes, the College of Engineering has established a policy that you must fulfill the degree requirements stipulated for your major in the academic year of your graduation or in the immediately preceding academic year.

Petition for Modification of Requirements

You may, for good cause, request a modification of particular degree requirements by submitting a student petition. These petitions, which are available from your major program adviser and in the Undergraduate Advising Office, can be a valuable aid in resolving individual program conflicts or other special problems. Such petitions are

subject to approval by the Committee on Student Petitions, a body of eight faculty members and non-voting staff advisers and student representatives. A negative decision by the committee may be appealed to the Executive Committee of the College for action at a regular meeting.

Pass/No Pass Grading Option

Students enrolled in any undergraduate major offered by the College of Engineering may not exercise the Passed/Not Passed grading option for any course work that might be presented in satisfaction of course or unit requirement. Additionally, undergraduate students may not exercise the Passed/Not Passed option for any course offered through the College of Engineering. Courses offered only on a P/NP basis are acceptable for specific program area degree requirements. This applies to the General Education requirement, the Technical Electives requirement, and also to unrestricted electives.

Students wishing to take a non-engineering course that is not needed to satisfy a degree requirement who are in good standing can submit a P/NP petition to the Undergraduate Advising Office (1050 Kemper Hall). Engineering students are unable use SISWEB to elect P/NP grading option.

Pass/No Pass Petition:

http://engineering.ucdavis.edu/pages/current_students/pdf_forms/pass_no_pass.pdf

GUIDELINES FOR PETITIONS TO REPEAT A COURSE MORE THAN ONCE

Repeating Courses

Students are allowed to repeat a course they received a D or F grade one time. Specific information about repeating course can be found in the “Repeating Courses” section of the General Catalog. Repeating a course more than once requires approval of the College of Engineering. A student petition to repeat a course more than once will be approved only when there are exceptional and compelling circumstances. Students must submit a Petition for Multiple Repeat to the Undergraduate Advising Office (1050 Kemper Hall). Documentation of compelling circumstances will be required. Approval or denial of a student petition to repeat a course more than once is ultimately the decision of the Associate Dean for Undergraduate Studies of the College of Engineering. The petition may be approved conditionally, with additional stipulations levied upon the student.

GUIDELINES FOR DISMISSAL AND READMISSION

A student will be placed on probation or subject to disqualification for failure to meet qualitative (GPA below 2.0 overall, or in a given quarter) or quantitative (number of units completed) standards of scholarship.

Dismissal for either qualitative or quantitative reasons is based on the decision of the Associate Dean for Undergraduate Studies. Such dismissal is from the University of California system and not simply the college or the Davis campus. Should a former Davis

student later wish to be readmitted to the Davis campus, the authority to do so rests with the dean of the college from which the student was dismissed.

Students should go to the Engineering Undergraduate Advising Office for academic advising about probation and dismissal. The academic probation and dismissal policies outlined in the General Catalog will be rigorously enforced according to the following guidelines.

Dismissal for failure to meet Qualitative Standards

1. A student who is placed on academic probation (AP) or becomes subject to academic disqualification (SD) at the end of a given quarter will be promptly dismissed if he/she is SD at the end of the second quarter following the quarter first resulting in AP or SD status. (See the General Catalog for SD and AP definitions.)

Readmission

2. Dismissed students will not be readmitted prior to one year from the end of the most recently completed quarter. Students who were dismissed while in lower division standing will be encouraged to complete all remaining lower division requirements at a community college or other institution. Students must submit an application for readmission when he or she is eligible to return.

Second and Final Dismissal

3. A student readmitted following dismissal will be promptly dismissed for a second and final time if after any quarter he or she is SD and has not established a clear trajectory toward regaining good academic standing and completing his/her major, as determined by the Associate Dean for Undergraduate Studies. A student may also be dismissed if he or she is SD at the end of the second quarter following readmission.
4. A previously dismissed student who has been readmitted will be promptly dismissed for a second and final time if he or she is SD after completion of the third quarter following readmission. If the student is no longer subject to academic disqualification at the end of the third quarter following readmission, second and final dismissal could occur later according to the guideline for dismissal stated in item (1) above.

Dean's Authority

5. Dismissal and readmission of students according to the guidelines outlined above shall be ultimately at the discretion of the Associate Dean of the College of Engineering for Undergraduate Studies.

Dismissal for failure to meet Quantitative Standards

See the General Catalog for current guidelines for dismissal of students failing to meet the minimum progress requirements.

ELECTIVES

In general, there are three kinds of electives in the engineering curricula: General Education, Technical, and Unrestricted.

GENERAL EDUCATION REQUIREMENTS

The General Education (GE) requirement promotes the intellectual growth of all undergraduates by ensuring that they acquire a breadth of knowledge that will enlarge their perspectives beyond the focus of a major and serve them well as participants in a knowledge-based society. It seeks to stimulate continued intellectual growth by providing students with knowledge not only of the content but also of the methodologies of different academic disciplines. It involves students in the learning process by its expectation of considerable writing and class participation. It encourages students to consider the relationships between disciplines.

The GE requirement has three components: Topical Breadth, Social-Cultural Diversity, and Writing Experience. The most current list of general education courses appears each quarter at the back of the Class Schedule and Registration Guide.

<http://registrar.ucdavis.edu/csrg/>

For details about the campus general education requirement, refer to the UC Davis General Catalog.

<http://registrar.ucdavis.edu/UCDWebCatalog/pdf.html>

General Education Courses for College of Engineering Students

Because, as an engineer, you will be a significant participant in the human setting, you will need to have a breadth of education that will allow you to deal with contemporary social issues and to understand the impact of engineering solutions in the global and societal context. In addition to meeting the campus General Education requirement as outlined in the General Catalog, you must also meet the College of Engineering General Education requirements. You will need to take a minimum of 24 units of General Education courses (**or 33 units for majors in Computer Science and Engineering**). In addition, to ensure that your GE program has a degree of depth and coherence, at least two of the courses that you take for your GE topical breadth requirement must be upper division courses (courses numbered 100 or above).

Since all engineering programs are in the Science and Engineering GE topical breadth area, you will fulfill the campus GE requirements by taking courses in the Arts and Humanities and the Social Sciences areas.

In satisfying the GE requirement note that (a) you must take GE courses for a letter grade, and (b) you must satisfy the Entry Level Writing requirement before you can receive writing experience credit for any course. In consultation with your academic adviser, you should attempt to design a coherent approach to contemporary issues by using your GE electives.

NO UNIT OF COURSEWORK YOU COMPLETE MAY BE USED TO SATISFY TWO DIFFERENT DEGREE REQUIREMENTS (EXCEPT WHERE THE CATALOG OR BULLETIN SPECIFICALLY INDICATES OTHERWISE).

IGETC, TCC, and UC Reciprocity. You are exempt from the UC Davis *campus* GE requirement if you come from a California community college and are certified as having successfully completed the “Intersegmental General Education Transfer Curriculum” (IGETC) or “Transfer Core Curriculum” (TCC), or if you come from another UC campus and are certified as having successfully completed the lower division breadth or General Education requirements of that UC campus (UC reciprocity).

Note that completing a TCC or IGETC will NOT completely satisfy the College of Engineering’s General Education requirement. The College of Engineering has a requirement of 24 units of General Education (33 units for Computer Science and Engineering majors), of which two courses must be upper division courses.

Technical Electives

Technical electives permit you to tailor a program to your own academic and career objectives. For some, the technical electives offer the opportunity to prepare for a specific occupation. For others, they offer an opportunity to broaden a background in the sciences and engineering. You may receive technical elective credit up to a maximum of 6 units for any combination of engineering courses numbered 190C, 192, 198, and 199. (You should note that academic credit for 199 courses is limited to a maximum of 5 units for each substantially different project). Academic credit for engineering internship courses (192) is limited to a maximum of 5 units per quarter. (Individual departments may allow fewer units.) With the exception of the following courses, upper-division courses in chemistry, engineering, mathematics, physics, and statistics may be taken as technical electives.

2009-2010 TECHNICAL ELECTIVE LIST

The courses which may *not* be used are

Chemistry 195, 197
Engineering Computer Science 188
Engineering 191
Engineering 198: Gearing Up for Grad School/Undergraduate Research
Engineering 160 (restricted to one unit of technical elective)
Mathematics 197TC,
Physics 137, 160 (both are restricted to one unit of technical elective), 195, 197T
Statistics 100, 102, 103, 104, 106, 108

In addition to the upper-division chemistry, engineering, mathematics, physics, and statistics courses not excepted above, the following courses, **when not used to satisfy other degree requirements**, may be taken as technical electives.

Agricultural and Resource Economics (ARE) 100A, 100B, 106, 112, 118, 130, 132, 135, 136, 138, 139, 140, 155, 156, 157, 171A, 171B
Animal Biology (ABI) 102, 103
Animal Genetics (ANG) 101, 105, 107, 111, 120
Animal Science (ANS) 103, 104, 105, 106, 115, 118, 119, 120, 120L, 123, 124, 125, 126, 127, 128, 129, 131, 136, 137, 140, 142, 143, 144, 145, 146, 147, 149, 149L
Applied Biological Systems Technology (ABT) 101, 110L, 121, 142, 161, 163, 165, 175, 180, 182, 181N
Atmospheric Science (ATM) 110, 111, 115, 116, 120, 121A, 121B, 124, 128, 133, 149, 150, 158, 160
Avian Sciences (AVS) 100, 103, 115, 121, 123, 149, 150, 160, 170
Biological Sciences (BIS) 1A, 1B, 1C, 2A, 2B, 2C, 101, 101D, 102, 103, 104, 120, 120P, 122, 122P, 132
Biotechnology (BIT) 160, 161A, 161B
Chemistry (CHE) 2B, 2BH, 2C, 2CH, 8A, 8B
Economics (ECN) 100, 101, 102, 103, 122, 140
Engineering (ENG) 17, 35, 45
Entomology (ENT) 100, 100L, 101, 102, 103, 104, 109, 110, 116, 117, 119, 123, 135, 153, 156, 156L
Environmental Horticulture (ENH) 100, 102, 105, 120, 125, 129, 130, 133, 144, 145, 150, 160
Environmental and Resource Sciences (ERS) 100, 100L, 121, 131, 136, 140, 141, 144, 185, 186, 186L,
Environmental Science and Policy (ESP) 100, 110, 116, 116G, 121, 123, 124, 125A, 125B, 125C, 126, 150A, 150B, 150C, 151, 151L, 155, 155L, 160, 163, 167, 168A, 168B, 170, 171, 173, 175, 178, 179, 179L
Environmental Toxicology (ETX) 101, 102A, 102B, 103A, 103B, 111, 120, 127, 128, 131, 135, 138, 146
Evolution and Ecology (EVE) 100, 101, 102, 103, 104, 105, 108, 112, 112L, 115, 117, 119, 134, 134F, 134L, 138, 140, 141, 147, 149, 175
Exercise Biology (EXB) 101, 102, 103, 110, 111, 112, 113, 115, 116, 117, 125, 126
Fiber and Polymer Science (FPS) 100, 150, 161, 161L
Food Science and Technology (FST) 100A, 100B, 101A, 101B, 102A, 102B, 103, 104, 104L, 107, 108, 109, 110A, 110B, 117, 119, 120, 120L, 123, 123L, 127, 128, 131, 159, 160
Geology (GEL) 17, 32, 35, 36, 50, 50L, 60, 100, 100L, 101, 101L, 103, 105, 106, 107, 107L, 108, 109, 109L, 110, 130, 131, 134, 136, 138, 139, 142, 143, 144, 145, 146, 147, 148, 150A, 150B, 150C, 152, 156, 160, 161, 162, 163

Hydrologic Science (HYD) 110, 115, 124, 134, 141, 142, 143, 144, 146, 151, 182
Management (MGT) 11A, 11B, 100, 120, 140, 150, 160, 170, 180
Microbiology (MIC) 102, 102L, 105, 120, 120L, 140, 150, 155L, 160, 162, 170
Molecular and Cellular Biology (MCB) 120L, 121, 123, 126, 140L, 142, 143, 144, 145, 150, 150L, 160L, 161, 162, 163, 164
Nematology (NEM) 100, 110
Neurobiology, Physiology, and Behavior (NPB) 100 through 169
Nutrition (NUT) 111AV, 111B, 112, 114, 115, 116A, 116B, 116AL, 116BL, 117, 118, 119A, 119B, 122, 123, 123L, 124, 127, 130
Physics (PHY) 9D, 9HD, 9HE if not used to satisfy other degree requirements
Plant Biology (PLB) 102, 105, 108, 111, 111D, 112, 112D, 113, 113D, 116, 117, 118, 119, 123, 126, 140, 141, 142, 143, 144, 145, 146, 147, 148, 150, 152, 153, 154, 157, 158, 160, 161A, 161B, 170, 171, 172, 172L, 173, 174, 176, 178
Plant Pathology (PLP) 120, 123, 130, 140, 148, 150, 151A, 151B, 155, 185
Plant Sciences (PLS) any upper division course except 120 and 190 through 199
Soil Science (SSC) 100, 102, 105, 107, 109, 111, 112, 118, 120
Wildlife, Fish and Conservation Biology (WFC) 100, 101, 101L, 102, 102L, 110, 110L, 111, 111L, 120, 120L, 121, 122, 130, 136, 141, 151, 152, 153, 154, 155, 156, 157, 158

UNRESTRICTED ELECTIVES

You may count any course for which University credit is allowed as an unrestricted elective in the engineering curricula.

STUDENTS GRADUATING IN THE 2008-2009 ACADEMIC YEAR, OR THE 2009-2010 ACADEMIC YEAR MAY USE THE FOLLOWING CURRICULA TO SATISFY THE DEGREE REQUIREMENTS FOR THEIR MAJOR. MAJORS ARE LISTED ALPHABETICALLY.

AEROSPACE SCIENCE AND ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A-2B or 2AH-2BH	10
Engineering 4	3
Engineering 6 or Mechanical Engineering 5	4
Engineering 17, 35, 45	11
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Minimum Lower Division Units	93
Upper Division Required Courses	Units
Engineering 100, 102, 103, 104, 105	19
Mechanical Engineering 106, 107A & B, 165, 171, 172	22
Aeronautical Science and Engineering 126, 127, 129, 130A, 130B, 133, 135, 138	32
Select one course from Applied Science Engineering 115, Engineering 180 or Mathematics 128C	4
Engineering 190	3
Technical electives	7
A combined maximum of four units may be selected from project/independent study courses (184A, 184B, 185A, 185B, 192, 199).	
General Education electives	8
Minimum Upper Division Units.....	95
Minimum Units Required for Major	188

BIOCHEMICAL ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C	15
Chemistry 2A, 2B, 2C or Chemistry 2AH, 2BH, 2CH	15
Biological Sciences 2A	4
Chemical Engineering and Materials Science 5, 6.....	6
Chemical Engineering 51	4
Chemical Engineering 80.....	1
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
General Education electives	16
Minimum Lower Division Units	87

Upper Division Required Courses	Units
Chemical Engineering 140, 141, 142, 143, 146, 152A, 152B, 155A, 157, 158A, 158C, 161A, 161B, 161C, 161L	60
Biological Sciences 102	3
Microbiology 102.....	4
Chemistry 128A, 128B, 129A, 110A.....	12
Biochemical Engineering electives	10
Choose two laboratory courses from the laboratory electives list, and choose additional courses from the lecture elective list to provide a total of at least 10 units: <i>Laboratory elective list:</i> Biomedical Engineering 161L; Biotechnology 161A, 161B; Food Science and Technology 123L; Microbiology 102L, 155L; Molecular and Cellular Biology 120L (this course counts as two laboratory electives and completely satisfies the laboratory requirement), 160L; Neurobiology, Physiology, and Behavior 104L; Plant Sciences 153 two units of an internship (192), independent study (199), or Biotechnology 189L taken for 2 or more units can be used to satisfy one biochemical engineering laboratory elective requirement with the approval of a petition provided that the course is a laboratory-based experimental project, related to the biological and/or biochemical engineering sciences, and that the student submit a written report that demonstrates proficiency in laboratory skills, techniques, or methods. <i>Lecture elective list:</i> Applied Science 172; Biological Sciences 2B, 2C, 101, 103, 104; Biological Systems Engineering 160, 175; Biomedical Engineering 102, 107, 109, 117, 140, 162; Biotechnology 160, 188; Chemical Engineering 170; Chemistry 130A, 130B; Food Science and Technology 123; Microbiology 140, 150; Molecular and Cellular Biology 122, 123; Neurobiology, Physiology, and Behavior 103; Plant Biology 111, 112; Plant Sciences 152; Statistics 120, 130A, 131A.	
General Education electives	8
Minimum Upper Division Units	97
Minimum Units Required for Major	184

BIOMEDICAL ENGINEERING CURRICULUM

Lower Division Required Courses	UNITS
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C	15
Chemistry 2A-2B-2C, 8A-8B or 118A-118B	21
Engineering 6, 17	8
University Writing Program 1, or English 3, or Comparative Literature 1, 2, 3, or 4, or Native American Studies 5	4
Communication 1	4
Biological Sciences 2A	4
Biomedical Engineering 1*, 20	5
General Education electives	16
Minimum Lower Division Units	99

*Biomedical Engineering 1 is designed for freshman students. Transfer students will substitute one unit of additional engineering elective for this requirement.

Upper Division Required Courses	Units
Engineering 100 or Electrical and Computer Engineering 100	3
Engineering 105, 190	7
Biomedical Engineering 116 or Neurobiology Physiology Behavior 101	5
Biomedical Engineering 105,106, 107, 108, 109, 110A-110B, 111	30
Sciences electives.....	8
Any graded upper division course in Biological Sciences, Chemistry or Physics including BIS 2B, 2C, PHY 9D, BIM 161A, 161S, 161L	
Engineering electives	20
Any graded upper division Biomedical Engineering course except BIM 161A, 161S, 161L, Engineering 35, 45, 102, 103, 104, 106; Electrical and Computer Engineering 110A, 110B, 106, 118, 130A, 130B, 140A, 140B, 150A, 150B, 151, 157A, 157B; Applied Science Engineering 108A, 108B, 161A, 165, 166, 167, 169, 170, 171, 172; Biological Systems Engineering 128, 130, 165, 175; Chemical Engineering 160, 161A, 161B, 161L, 170; Materials Science and Engineering 147, 160, 162, 162L, 164, 172, 172L, 174, 174L, 181, 182; Mechanical Engineering 106, 107A, 107B, 150A, 150B, 152, 154, 165;	
General Education electives	8
Minimum Upper Division Units.....	81
Minimum Units Required for Major	180

Additional upper division elective policies:

- 2 units from CHE118A and 118B maybe applied toward Science elective if 118A and 118B are also used to satisfy lower division subject credit.
 - 2 units from ECE100 maybe applied toward Engineering elective if ECE100 is taken to satisfy upper division subject credit.
 - 4 units of BIM199 may be counted toward Engineering elective with approval of BME undergraduate committee.
- Science electives and Engineering electives are to be selected in consultation with a staff or faculty adviser.

BIOLOGICAL SYSTEMS ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C	15
Chemistry 2A-2B	10
Chemistry 8A or 118A	2 or 4
Chemistry 8B or 118B	4
Biological Sciences 2A-2B-2C	14
Biological Systems Engineering 1	4
Engineering 6, 17, 35	11
Biological Systems Engineering 75	4
University Writing Program 1	4
Communication 1 or 3	4
General Education electives	16
Minimum Lower Division Units	110

Upper Division Required Courses	Units
Engineering 100, 102, 104, 105, 106	18
Biological Systems Engineering 103, 125, 127 130, 165, 170A, 170B, 170BL, 170C, 170CL	29
Biological Systems Engineering electives—Select four units from all upper division Biological Systems Engineering courses not otherwise required, with the exception of Biological Systems Engineering courses 189-199	4
Statistics 100	4
Engineering electives—Select a minimum of 3 units. All upper division courses offered by the College of Engineering may be taken as engineering electives with the exception of the following: Computer Science Engineering 188, Engineering 103, 160, ECI 123, all courses numbered 190-197 and 199 (except Engineering 190, which may be taken for 2 units of engineering elective credit)	3
Biological science electives—All upper-division courses in the College of Biological Sciences (with the exception of Biological Sciences 132, Evolution and Ecology 175, Exercise Biology 102, 112, 115, 118 through 149L, Microbiology 100 and all courses numbered 190-199) may be used as biological sciences electives. The following courses may also be taken as biological science electives: Applied Biological Systems Technology 161; Animal Science 118, 143, 144, 146; Agricultural Management and Rangeland Resources 110A; Atmospheric Science 133; Avian Sciences 100; Cell Biology and Human Anatomy 101, 101L; Entomology 100; Environmental Horticulture 102; Environmental Science Policy and Management 120, 182, 185 (offered at UC Berkeley); Environmental Science and Policy 100, 110, 155; Environmental Toxicology 101, 112A, 131; Food Science and Technology 102A, 104L, 119, 120, 121, 128, 159, 159; Infectious Diseases 141; Soil Science 100; Wildlife, Fish and Conservation Biology 121. Students may choose other upper division courses with substantial biological content offered by the College of Agricultural and Environmental Sciences; consultation with a faculty adviser and approval by petition is required.)	4
Upper Division Composition Requirement *one of the following courses with a grade of C- or better: UWP 101, 102A, 102B, 102E, 102F, 102G, 104A, 104E, 104F	4
General Education electives	8

Minimum Upper Division Units..... 74
Minimum Units Required for Major..... 184

**The Upper-Division composition exam administered by the College of Letters and Sciences cannot be used to satisfy the upper-division composition requirement for students in the Biological Systems Engineering program.*

CHEMICAL ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C	15
Chemistry 2A, 2B, 2C or Chemistry 2AH, 2BH, 2CH	15
Chemical Engineering and Materials Science 5, 6.....	6
Chemical Engineering 51, 80.....	5
Engineering 45	4
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
General Education electives.....	16
Minimum Lower Division Units	87

Upper Division Required Courses	Units
Chemical Engineering, 140, 141, 142, 143, 146, 152A, 152B, 155A, 155B, 157, 158A, 158B, 158C	52
Biological Science 102.....	3
Chemistry 110A, 110B, 128A, 128B, 129A	16
Chemical Engineering and Materials Science Electives	6
Choose from the following: Chemistry 110C, 128C, 129B, 129C, 130A, 130B Chemical Engineering 144, 160, 161A, 161B, 161L, 166, 170 Materials Science and Engineering 147, 160, 164, 181 Fiber and Polymer Science 150	
Technical electives.....	10
General Education electives.....	8
Minimum Upper Division Units.....	95
Minimum Units Required for Major	182

CHEMICAL ENGINEERING/MATERIALS SCIENCE AND ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C	15
Chemistry 2A, 2B, 2C or Chemistry 2AH, 2BH, 2CH	15
Chemical Engineering and Materials Science 5, 6.....	6
Chemical Engineering 51, 80.....	5
Engineering 45	4
University Writing Program 1 or English 3, or Comparative Native Literature 1, 2, 3 or 4, or American Studies 5	4
General Education electives	16
Minimum Lower Division Units	87

Upper Division Required Courses	Units
Chemical Engineering 140, 141, 142, 143, 146, 152A, 152B, 155A, 155B, 157, 158A, 158B, 158C	52
Chemistry 110A, 110B, 128A, 128B, 129A	16
Biological Sciences 102	3
Materials Science and Engineering 160, 162, 162L, 164, and a minimum of 8 units chosen from Materials Science and Engineering 147, 172, 172L, 174, 174, 180, 181, 182, 188A-B	22
General Education electives	8
Minimum Upper Division Units.....	101
Minimum Units Required for Major	188

CIVIL ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C and choice of Physics 9D, Chemistry 2C, Biological Science 1A or Geology 50-50L*	19
Chemistry 2A-2B or 2AH-2BH	10
Civil and Environmental Engineering 3	4
<i>(Civil and Environmental Engineering 3 is designed for freshman students and is not open to upper division students. Students who do not take this course will substitute 4 units of additional engineering coursework. Non-engineering units from the approved Technical Elective list may be substituted if within the four unit maximum.)</i>	
Engineering 17, 35, 45	11
Civil and Environmental Engineering 16, 17	4
Civil and Environmental Engineering 19 or Engineering 6 or Computer Science 30	4
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Minimum Lower Division Units	98

**Units in excess of the requirement from Chemistry, Biological Sciences, Physics, or Geology courses may count toward the technical elective requirement. Please consult with the departmental staff adviser.*

Upper Division Required Courses	Units
Engineering 102, 103, 104, 104L, 105, 106	20
Applied Science Engineering 115	4
Civil and Environmental Engineering 114	4
One course from Applied Science Engineering 116, Civil and Environmental Engineering 153, Mathematics 118A, 121, or Statistics 108	4
A minimum of four of the following group options (a minimum of two courses in each of the four areas and a minimum of 19 design units from group option selections, technical electives, and programming electives. Courses listed in more than one group may be counted only once. The design unit content of each course is noted on the Civil Engineering degree requirement advising sheet, available from the department, also shown in its entirety on the department's undergraduate Web site.)	
Environment: Civil and Environmental Engineering 148A or 149 and at least one from courses 140, 143, 148B, 150;	
Geotechnical: Civil and Environmental Engineering 171 and 171 Lab and at least one from courses 173, 175, 179;	
Structures: Civil and Environmental Engineering 135 and at least one from courses 130, 131, 132, 136, 137, 138, 139, 179;	
Transportation: Civil and Environmental Engineering 161 or 163 and at least one from courses 162, 165, 179;	
Water Resources: Civil and Environmental Engineering 141 and 141 Lab and at least one from courses 142, 144, 145, 146, 155	
Technical electives	18

Fourteen units must be selected from upper division engineering courses; of these units, seven units must be selected from Civil and Environmental Engineering courses other than Civil and Environmental Engineering 192 or 199. No more than four units of non-engineering technical elective credit may be used.

General Education electives	8
Minimum Upper Division Units.....	86
Minimum Units Required for Major	184

**Units in excess of the 28 unit requirement may count toward the technical elective requirement. Please consult with the departmental staff adviser.*

CONSTRUCTION ENGINEERING AND MANAGEMENT MINOR PROGRAM

Students are required to pre-apply to the minor program offered by Civil and Environmental Engineering. Full details regarding admission and completion of the minor are included in the Application Form available from the department website or the undergraduate advisor (2045 Engineering III).

Minor Program Requirements:

Prerequisite courses must be completed prior to enrollment in coursework taken for minor.

UNITS

Construction Engineering and Management.....	24
Civil and Environmental Engineering 137, 143, 153.....	12
Twelve units from Civil and Environmental Engineering 179, Agricultural and Resource Economics 112, 155, 157, 171A, 171B, Economics 134, 162, Psychology 156; may include one course from Agricultural and Resource Economics 18, Management 11A, 11B....	12

Minor advisors: J.T. Harvey, J. Darby, J. Lund

COMPUTATIONAL APPLIED SCIENCE CURRICULUM

Not accepting new students)

Lower Division Required Courses	Units
Applied Science Engineering 2	4
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22AL-22B	7
Physics 9A-9B-9C-9D	19
Chemistry 2A	5
Civil Engineering 19	4
Engineering 17	4
Computer Science Engineering 30 and 40	8
Computer Science Engineering 20 or 50 or Electrical Engineering 70	4
University Writing Program 1 or English 3 or Comparative Literature 1, 2, 3, or 4 or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Minimum Lower Division Units	95

Upper Division Required Courses	Units
Applied Science Engineering 115, 116, 117A, 117B, 117C, 118, 119	31
Statistics 131A or Civil Engineering 114 or Mathematics 120	4
Physics 104A	4
Computational Applied Science electives*	32
Engineering 190	3
General Education electives	8
Unrestricted Electives	3
Minimum Upper Division Units.....	85
Minimum Units Required for Major	180

** Computational Applied Science Electives must be chosen in consultation with a faculty adviser. You may receive CAS elective credit, up to a maximum of 4 units, for any combination of engineering courses numbered 190C, 192, 198, and 199. With the exception of the following courses, all upper-division courses in chemistry, engineering, mathematics, physics, and statistics may be taken as CAS electives. The courses that may not be used are Chemistry 194HA, 194HB, 194HC, 197, 198, 199; Electrical and Computer Engineering 101; Engineering 160 (restricted to one unit of CAS elective); Mathematics 192, 194, 197TC, 198, 199; Physics 160 (restricted to one unit of CAS elective), 194HA, 194HB, 195, 197T, 198, 199; Statistics 102*

COMPUTER ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B.....	6
Physics 9A-9B-9C-9D	19
Chemistry 2A.....	5
Computer Science Engineering 20, 30, 40, 60	16
Engineering 6.....	4
Electrical and Computer Engineering 1	1
Electrical and Computer Engineering 70 or Computer Science Engineering 50	4
Engineering 17.....	4
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Total Lower Division Units.....	99

Upper Division Required Courses	Units
Electrical and Computer Engineering 100, 110A, 140A, 161, 170* 172, 180A, 180B, 196	36
Computer Science Engineering 122A, 150	8
Engineering 160, 190, or Computer Science Engineering 188	3
Upper-Division Elective Courses**.....	10
At least one course with the words “Design Project” in the title: EEC 136A-B, 193A-B, 181A-B, 194A-B-C, 195A-B	
The remaining design electives may be chosen from the list above or from: Electrical and Computer Engineering 110B, 112, 116, 118, 132A, 132B, 132C, 133, 135, 146B, 151, 152, 157A, 157B, 160, 171, 173A, 173B, 175, 183; Computer Science Engineering 122B, 140A, 140B, 142, 152B, 153, 158, 160, 163, 165A, 165B, 175, 177, 178	
Technical electives**, +	9
General Education electives	8
Unrestricted electives	7
Minimum Upper Division Units.....	81
Minimum Units Required for Major.....	180

* *Computer Science Engineering 154B may be substituted for the Electrical and Computer Engineering 170 requirement.*

** *After completion of the upper-division elective requirement, any units in excess of 10 may be counted toward the technical elective requirement.*

+ *ECS 157 may not be counted toward the technical elective requirement.*

COMPUTER SCIENCE AND ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A or 67, and 22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A	5
Computer Science Engineering 20, 30, 40, 60	16
Computer Science Engineering 50 or Electrical and Computer Engineering 70.....	4
Engineering 17	4
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1	4
General Education electives	25
Minimum Lower Division Units	103

Upper Division Required Courses	Units
Computer Science Engineering 188.....	4
Electrical and Computer Engineering 100, 172 and 180A	14
Computer Science Engineering 120† or 122A†	4
Computer Science Engineering 132, 140A, 150, 152A, 154A, 154B, 160	28
Computer electives—a minimum of 4 courses and a minimum of 15 units chosen from Computer Science Engineering 120†, 122A†, 122B, 130, 140B, 142, 145, 152B, 152C, 153, 158, 163, 165A, 165B, 170, 175, 177, 178; one course (minimum 3 units from one single course) from approved 192 or 199 or Electrical and Computer Engineering 194; Electrical and Computer Engineering 180B	15
General Education electives	8
Unrestricted elective	4
Minimum Upper Division Units.....	77
Minimum Units Required for Major	180

† Completion of both Computer Science Engineering 120 and 122A will satisfy the computer science theory requirement and a computer elective requirement.

ELECTRICAL ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A	5
Computer Science Engineering 30, 40.....	8
Engineering 6, 17	8
Electrical and Computer Engineering 1	1
Electrical and Computer Engineering 70 or Computer Science Engineering 50	4
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3.....	4
General Education electives	16
Minimum Lower Division Units	91

Upper Division Required Courses	Units
Electrical and Computer Engineering 100, 110A, 130A, 140A, 150A, 161, 180A, 196	31
Engineering 160, 190 or Computer Science Engineering 188	3
Upper-division electives***	27
Choose at least 7 courses for a minimum of 27 units from the following:	
<i>Two core electives*</i> : Electrical and Computer Engineering 110B, 130B, 140B, 150B, 157A, 160, 170, 180B	
<i>Two design laboratory electives</i> : Electrical and Computer Engineering 112, 116, 118, 132A, 132B, 132C, 136A-B, 146A, 146B, 151, 152, 157A, 157B, 165, 172, 175, 180B, 183, 194A-194B-194C (must be taken in consecutive quarters), 195A-195B (must be taken in consecutive quarters),	
<i>At least one "Design Project" course</i> : Electrical and Computer Engineering 136A-B, 193A-B, 181A-B,, 194A-194B-194C, 195A- 195B	
<i>Design electives</i> : may be chosen from the lists above or from the following courses: Electrical and Computer Engineering 110B, 133, 158, 160, 170 [^] , 171, 173A; Computer Science and Engineering 150, 152B, 163, 175, 177, 178	
Technical electives***, +.....	9
General Education electives	8
Unrestricted electives	11
Minimum Upper Division Units.....	89
Minimum Units Required for Major	180

**A maximum of one course appearing on both the core elective list and the design elective list may be counted in both categories.*

***Courses on both the lab elective list and the design elective list may be counted towards both categories simultaneously.*

****After completion of the upper-division elective requirement (7 core and design courses) any units in excess of 27 may be counted toward the technical elective requirement.*

[^] ECS 154B may be substituted for the EEC 170.

+ECS 157 may not be counted toward the technical elective requirement

ELECTRONIC MATERIALS ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A, 2B or 2AH, 2BH.....	10
Computer Science Engineering 30.....	4
Engineering 6, 17, 35, 45	15
University Writing Program 1 or English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5.....	4
Communication 1 or 3.....	4
General Education electives.....	16
Minimum Lower Division Units	94
Upper Division Required Courses	Units
Electrical and Computer Engineering 100, 110A, 110B, 130A, 130B, 140A, 140B, 146A.....	32
Materials Science and Engineering 160, 162, 162L, 164, 172, 172L, 174, 181, 188A7B.....	32
Engineering 190	3
Mathematics 135A, Statistics 120, 131A, or Civil Engineering 114,	4
Electronic Materials Electives	3
Choose from the following: Electrical and Computer Engineering 106, 112, 118, 132A, 133, 135, 136A-B, 146B, 151, 157A, 160, 166, 170, 172, 180A, 180B, 194A-B-C. 195A-B, Materials Science and Engineering 180, 182, Engineering 105	
General Education electives.....	8
Unrestricted electives.....	4
Minimum Upper Division Units.....	86
Minimum Units Required for Major	180

MATERIALS SCIENCE AND ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A, 2B or 2AH, 2BH.....	10
Engineering 6, 17, 35, 45	15
University Writing Program 1 or English 3 or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3.....	4
General Education electives.....	16
Minimum Lower Division Units	90

Upper Division Required Courses	Units
Engineering 100, 102, 103, 104, 105, 190	22
Materials Science and Engineering 147, 160, 162, 162L, 164, 172, 172L, 174, 174L, 180, 181, 182, 188A-188B	45
Select two courses from Aeronautical Science and Engineering 137, 138, Civil and Environmental Engineering 132, 135, Mechanical Engineering 150A, 150B.....	8
Select one course from Engineering 180; Mathematics 135A; Statistics 120, 131A; Civil and Environmental Engineering 114; Chemical Engineering 140; or Applied Science Engineering 115.....	4
Select from Chemistry 110A, 128A, Physics 121 or Geology 161	3
General Education electives.....	8
Minimum Upper Division Units.....	90
Minimum Units Required for Major	180

MECHANICAL ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A-2B or 2AH-2BH	10
Engineering 4	3
Engineering 6 or Mechanical Engineering 5	4
Engineering 17, 35, 45	11
Mechanical Engineering 50	4
University Writing Program 1 English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Minimum Lower Division Units	97

Upper Division Required Courses	Units
Engineering 100, 102, 103, 104, 105	19
Mechanical Engineering 106, 107A & B, 150A, 165, 171, 172,	26
Mechanical Engineering 185A & 185B (taken in consecutive quarters), or Aeronautical Science and Engineering 130A	4
Engineering 190	3
Select one course from Applied Science Engineering 115; Engineering 180; Mathematics 128C; Statistics 120, 131A	4
Technical electives	24
Sixteen of the 24 units must be selected from upper division courses in engineering; of these units, one course must be chosen from the following: Engineering 122, Mechanical Engineering 150B, 154	
Two additional courses must be chosen from the following design courses: Aeronautical Science and Engineering 129, 130B, 137, 138, 139, 189A, 189B; Materials Science and Engineering 180, 182; Mechanical Engineering 134, 151, 152, 154, 161, 162, 163. You may also choose from Mechanical Engineering 150B, 185A & 185B (taken in consecutive quarters), if these courses are not used in satisfaction of the core design requirement above.	
A combined maximum of 4 units may be selected from project/independent study courses (184A, 184B, 185A, 185B, 192, 199) not used in satisfaction of core degree requirements.	
The remaining units may be selected from the technical electives list.	
General Education electives	8
Minimum Upper Division Units	88
Minimum Units Required for Major	185

MECHANICAL ENGINEERING/MATERIALS SCIENCE CURRICULUM

Lower Division Required Courses	Units
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A-2B or 2AH-2BH	10
Engineering 4	3
Engineering 6 or Mechanical Engineering 5	4
Engineering 17, 35, 45	11
Mechanical Engineering 50	4
University Writing Program 1 English 3, or Comparative Literature 1, 2, 3 or 4, or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Minimum Lower Division Units	97

Upper Division Required Courses	Units
Engineering 100, 102, 103, 104, 105	19
Mechanical Engineering 106, 107A & B, 150A, 165, 171, 172	26
Mechanical Engineering 185A & 185B (taken in consecutive quarters), or Aeronautical Science and Engineering 130B	4
Materials Science and Engineering 160, 162, 164, 174	16
Materials Science and Engineering 172L or 174L	2
One course chosen from Materials Science and Engineering 172, 180, 181, 182, 188 A & B	4
Select one course from Applied Science Engineering 115; Engineering 180; Mathematics 128C; Statistics 120, 131A	4
Engineering 190	3
Technical electives	11
One course must be chosen from the following: Engineering 122, Mechanical Engineering 150B, 154.	
Two courses must be chosen from Aeronautical Science and Engineering 129, 130B, 137, 138, 139, 189A, 189B; Materials Science and Engineering 147, 180, 181, 182; Mechanical Engineering 134, 151, 152, 154, 161, 162, 163, 184A & 184B (taken in consecutive quarters); EME 150B, 154 or 185A with 185B (taken in consecutive quarters), if these courses are not used for a core design requirement above.	
A maximum of 4 units of courses numbered 184A, 184B, 185A, 185B may be applied to the technical elective degree requirement.	
General Education electives	8
Minimum Upper Division Units	97
Minimum Units Required for Major	194

OPTICAL SCIENCE ENGINEERING CURRICULUM

Lower Division Required Courses	Units
Applied Science Engineering 1	4
Mathematics 21A-21B-21C-21D	16
Mathematics 22A-22B	6
Physics 9A-9B-9C-9D	19
Chemistry 2A	5
Civil Engineering 19 or Computer Science Engineering 30	4
Engineering 17	4
Engineering 45	4
University Writing Program 1 or English 3 or Comparative Literature 1, 2, 3, or 4 or Native American Studies 5	4
Communication 1 or 3	4
General Education electives	16
Total Lower Division Units	86

Upper Division Required Courses	Units
Applied Science Engineering 108A, 108B, 108L, 115, 161A & B, 165, 166, and 167	36
Electrical and Computer Engineering 130A, 130B, and 135	11
Physics 104A	4
Chemistry 110A	4
Engineering 190	3
Optics electives	16
16 units from the following: Applied Science Engineering 116, 169, 170, 172; Biological Sciences 102; Chemistry 110B; Electrical and Computer Engineering 100, 106, 133, 136A-B, 140A, 140B, 150A, 150B	
Technical electives	12
General Education electives	8
Minimum Upper Division Units.....	94
Minimum Units Required for Major	180

Optics electives and technical electives should be chosen in consultation with a staff or faculty adviser.