

UNDERGRADUATE HANDBOOK

STRUCTURAL ENGINEERING

AEROSPACE • CIVIL • GEOTECHNICAL • STRUCTURAL HEALTH



UC San Diego
Structural Engineering
JACOBS SCHOOL OF ENGINEERING

UNDERGRADUATE STUDENT AFFAIRS
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Please only send emails regarding Office for Students with Disabilities (OSD) accommodations, if you need to send an attachment, or if you are contacting us on behalf of a student organization. All other academic advising is required to be via the Virtual Advising Center (VAC) at vac.ucsd.edu

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LOCATION

Structural Engineering faculty, staff, and laboratories primarily reside in the SME (Structural and Materials Engineering) building. The Jacobs School of Engineering Dean's office and administration is primarily located in Jacobs Hall. A detailed campus map may be found online at the following web link:

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INTRODUCTION TO THE DEPARTMENT

DEPARTMENT MISSION AND GOALS

The curricula of the Department of Structural Engineering has been specifically developed to educate and train engineers using a holistic approach to structural systems engineering by emphasizing and building on the commonality of engineering structures in materials, mechanics, analysis and design across the engineering disciplines of aerospace, civil, marine and mechanical engineering.

The Structural Engineering program has strong components of laboratory experimentation, numerical computation, and engineering design. Design is emphasized throughout the curricula by open-ended homework problems, laboratory and computer courses which include student-initiated projects, through team assignments and exercises, and finally by senior design project courses which involve teams of students working to solve engineering design problems brought in from industry. The Structural Engineering program is designed to prepare students receiving bachelor's degrees for professional careers or for graduate education in their intended area of specialization. In addition, the program is structured to provide a solid foundation for students who intend to use their undergraduate engineering education as preparation for postgraduate professional training in non-technological fields such as business administration, law or medicine.

WHAT DO STRUCTURAL ENGINEERS DO?

Design, analyze & create:

- Buildings
- Bridges
- Dams
- Automobiles
- Airplanes
- Rockets
- Satellites
- Ships
- Off-shore facilities
- Mechanical Structures
- Sporting Goods
- THE FUTURE !!**



Materials

Design

Analysis

Experiments



PROGRAM MISSION AND OBJECTIVES

The B.S. in Structural Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. Accreditation is an assurance that the program meets established quality standards.

B.S. STRUCTURAL ENGINEERING MISSION

To provide a comprehensive education and training to engineers using a holistic approach to structural systems engineering by emphasizing and building on the commonality of engineering structures at the levels of materials, mechanics, analysis and design.

B.S. STRUCTURAL ENGINEERING OBJECTIVES

Program Objectives represent graduates' performance 3-5 years after completing the B.S. program. Graduates will:

1. Retain a strong grasp of **engineering fundamentals and critical thinking skills** that enable them to consistently and successfully **apply Structural Engineering principles** within their chosen career path.
2. Embrace a passion for **lifelong learning**, empowering them to continue with **graduate education** and/or embark on successful **professional careers in industry** leading to professional licensure and leadership positions.
3. Possess a broad set of **multi-disciplinary skills**, including the inclination and ability to consider sustainability, resilience and socioeconomic community needs to accomplish professional objectives in a **rapidly changing technological world**.
4. Have a clear understanding of **ethical issues** pertaining to engineering and **adopt** industry **standards of ethical behavior**.
5. Utilize **strong communication and collaboration skills essential for professional practice**.

B.S. STRUCTURAL ENGINEERING OUTCOMES

Program Outcomes are the expected knowledge, skills, attitudes, and behaviors of students at the time of completing the B.S. program:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning

strategies 6

DEPARTMENT BACKGROUND

The Department of Structural Engineering (SE) was formally established on July 1, 1999 with Professor Frieder Seible as its first Chairman. Structural Engineering had its beginning in the Department of Aerospace and Mechanical Engineering Sciences (DAMES), instituted in March of 1964. In January of 1972, DAMES was renamed to the Department of Applied Mechanics and Engineering Sciences (AMES) to reflect its growth into other instructional and research areas. AMES offered instruction in mechanical engineering, structural engineering, chemical engineering, bioengineering and systems science. In 1989, the systems science group moved to the Department of Electrical and Computer Engineering (ECE). The first departmental spin-off in AMES came in 1994 with the formation of the Bioengineering Department (BE). In 1995 three separate departmental divisions were formed, namely, a Division of Mechanical Engineering, a Division of Chemical Engineering, and a Division of Structural Engineering. In July of 1999, AMES was divided into two new departments: Department of Mechanical and Aerospace Engineering (MAE) and Department of Structural Engineering.

The undergraduate degree programs offered by the Jacobs School of Engineering are listed by department in Table 1.

UNDERGRADUATE DEGREE PROGRAMS WITHIN THE JACOBS SCHOOL OF ENGINEERING
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Departments	Degree Programs
Structural Engineering (SE)	B.S. Structural Engineering
Mechanical and Aerospace Engineering (MAE)	B.S. Mechanical Engineering B.S. Aerospace Engineering
NanoEngineering	B.S. Chemical Engineering B.S. NanoEngineering
Bioengineering (BE)	B.S. Bioengineering B.S. Biotechnology B.S. Bioinformatics B.S. BioSystems
Computer Science and Engineering (CSE)	B.S. Computer Science B.S. Computer Engineering B.S. Computer Science: Bioinformatics B.A. Computer Science
Electrical and Computer Engineering (ECE)	B.S. Electrical Engineering B.S. Computer Engineering B.S. Engineering Physics B.A. Electrical Engineering & Society
Visit the appropriate major/departmental website for additional information.	

ETHICAL STANDARDS

WHAT IS EXPECTED OF THE STRUCTURAL ENGINEERING STUDENT

THE VALUE OF INTEGRITY AT UCSD IN THE STRUCTURAL ENGINEERING DEPARTMENT The Structural Engineering department faculty, staff, and students together strive to uphold the value of integrity in all aspects of education and scholarship. This value is essential for the academic community to thrive and to protect the validity of intellectual work and discourse. In light of this goal, the Structural Engineering department refers to the **UCSD Policy on Integrity of Scholarship**:

<http://senate.ucsd.edu/Operating-Procedures/Senate-Manual/Appendices/2>. The opening paragraph in this

policy affirms the importance of integrity and clearly states the overall principles:

“Integrity of scholarship is essential for an academic community. The University expects that both faculty and students will honor this principle and in so doing protect the validity of University intellectual work. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind. Instructors, for their part, will exercise care in planning and supervising academic work, so that honest effort will be upheld.”

The Structural Engineering department will adhere to all of the tenets of this policy, which dictates the responsibilities and obligations of the members of the university community to uphold the value of integrity as well as the procedures and consequences for those who violate its tenets.

DEFINING ACADEMIC MISCONDUCT

Academic misconduct is broadly defined as any prohibited and dishonest means to receive course credit, a higher grade, or avoid a lower grade.

Academic misconduct misrepresents your knowledge and abilities, which undermines the instructor's ability to determine how well you are doing in the course.

Instructors have the authority to define academic integrity in their classes because the expectations for academic conduct are tied directly to the objectives of the class. So there will be different rules and expectations for every class, and maybe every assignment in the same class!

However, you can generally assume the following rules apply unless the instructor tells you otherwise:

- Complete all academic assignments by yourself.
- Don't use aids during an exam.
- Acknowledge and cite source material in your papers or assignments.
- Don't alter a graded exam and submit for regrade.
- Don't copy another student's assignment, in part or in total, and submit it as your own work.

If you are unsure about how to complete an academic assignment with integrity, talk to your instructor or teaching assistant.

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Further resources for students on issues of academic integrity can be found on the following UCSD website:
<https://students.ucsd.edu/academics/academic-integrity>.

ADMISSIONS

For more information on UC San Diego's admissions process, please visit <https://admissions.ucsd.edu>.

NEW FIRST-YEAR ADMISSION

Students will be selected according to the UC San Diego Office of Undergraduate Admissions Holistic Review scores, taking into consideration the number of slots available in the Structural Engineering Department.

NEW TRANSFER ADMISSION

Students will be selected by the UC San Diego Office of Undergraduate Admissions based on the students' community college GPA, and taking into consideration the number of slots available in the Structural Engineering Department. Additionally, transfer students should have completed courses equivalent to UC San Diego's Math 18, Math 20A-D; Physics 2A–C, 2BL, 2CL; and Chemistry 6A.

CONTINUING STUDENT ADMISSION (CHANGE OF MAJOR)

Changes of major applications to Structural Engineering are open and reviewed each quarter. Students interested in applying to Structural Engineering are encouraged to meet with the SE Undergraduate Advisor early in their academic career to review their academic plan.

Continuing students are not eligible to apply after 6 quarters (2 years) for freshman, and after 3 quarters (1 year) for transfers, as time to graduation would be delayed. Continuing students who wish to be considered must meet the following minimum requirements:

1. Complete **at least two quarters** in residence at UC San Diego,
2. Complete the **required screening courses with a letter grade** (see below)

Students who entered UCSD as FIRST YEARS: Completion of at least Math 20A-C, Chem 6A, and Phys 2A, 2B ●
If applying after 4 quarters at UCSD, students will need to have completed the requirements above AND Math 20D and Phys 2C, 2CL

- If applying after 5 quarters at UCSD, students will need to have completed the requirements above AND Math 18
- If applying after 6 quarters at UCSD, students will need to have completed the requirements above AND Math 20E

Students who entered UCSD as TRANSFERS: Completion of all the following lower division major requirements: Math 20A, 20B, 20C, 20D, 20E, 18; Chem 6A; Phys 2A, 2B, 2C, 2CL

Application portal:

Upon completion of these courses, students can apply using the **My JSOE Major Change Application** which can be found here: <https://jacobsschool.ucsd.edu/academics/undergraduate-majors>

Applications will be accepted every quarter. Please check the SE website for the application dates: <http://se.ucsd.edu/academics/undergraduate-program/undergraduate-admission>

REGULATIONS AND REQUIREMENTS

Transfer students: Course requirements are the same for transfer students as they are for incoming first-year and continuing students. Accordingly, when planning their program, transfer students should be mindful of lower-division prerequisite course requirements for their major, as well as for meeting college requirements. Students who have taken equivalent courses elsewhere may request to have transfer credits apply toward the

department's major requirements. This is accomplished by submitting a petition request along with supporting documentation from the institution where the course(s) were taken. The Structural Engineering Undergraduate Affairs Committee Chair reviews these documents for approval.

Petition Process: Students may petition UCSD courses not listed as Structural Engineering approved courses, or courses taken at other universities, to count towards fulfilling requirements for the major. However, before petitioning:

- Students must check with the UCSD Admissions Office about the transfer of credits from other institutions, including institutions in other countries.
- Students who wish to study abroad should obtain tentative pre-approval of courses before enrolling to be sure courses taken abroad may count towards requirements for the major.

When submitting a petition to have courses accepted towards Structural Engineering requirements, the process is as follows:

- Current UCSD students should submit their petition request via the VAC and include specific notes on what they are requesting as well as their reason for the request. Non-matriculated students should send this information via email to se-adm-ugrads@ucsd.edu
- Students must email a course syllabus from the proposed course to se-adm-ugrads@ucsd.edu • The Undergraduate Affairs Committee Chair will then review the petition and students will be notified of the outcome via the VAC or email.

Students wishing to petition for math, physics or chemistry courses taken outside of UCSD must submit their petitions directly to those departments. Students transferring in should check their TritonLink account to see if the Admissions Office has already given them credit.

Prerequisites: Students are reminded that prerequisites for courses have been carefully chosen and evaluated; if a prerequisite for a course is listed, this means that the course inherently requires the student to know the material from the prerequisite thoroughly. Consequently, students are advised that requesting to waive a prerequisite or take a prerequisite concurrently is strongly discouraged. All pre-authorization requests should be submitted via EASy at easy.ucsd.edu. EASY requests can be submitted for a quarter once that quarter's schedule has been posted to the UCSD website.

Grading Requirements: All courses required for the major (lower-division and upper-division, including Math, Physics and Chemistry) must be taken for a letter grade. Pass/No Pass (P/NP) grades will only be accepted for independent study courses i.e. (SE 195-199).

Grade Point Average (GPA) Requirement: A minimum GPA of 2.0 is required to obtain the B.S. degree. Students are required to have a grade of C- or better in all course work required for the major. The grade D is not accepted for any major requirements, including Math, Physics and Chemistry.

Double Majors: Engineering students may not double major within any of the departments within the Jacobs School of Engineering.

ACADEMIC ADVISING

ORIENTATION: Incoming first year and transfer students are **required** to attend a scheduled orientation meeting with Structural Engineering faculty and members of the advising staff prior to the initiation of classes. This department orientation is typically held a few days before classes start (week zero). You will be notified of

the exact date/time.

STRUCTURAL ENGINEERING ADVISING STAFF: The Structural Engineering undergraduate advisor assists students with their program of study and is most helpful in finding answers to questions of the type: “When will SE 3 be offered again? Can SE 160A be used as a technical elective? Can I petition for courses taken at a community college?” etc.

Please see our website for advisor appointment info including the appointment request form:
<http://se.ucsd.edu/academics/undergraduate-program/undergraduate-advising/advisor-information>

The Structural Engineering advising program runs parallel to the function of college advisors who assist students with the general-education requirements for each college. **The Structural Engineering advisor assists students with Structural Engineering major requirements, and students should not rely upon their college advisors for Structural Engineering major requirements.**

FACULTY ADVISOR: Every incoming Structural Engineering student is assigned a faculty advisor who will continue in that role until the student graduates. The faculty advisors assist students in the planning of their professional career and academic opportunities, as well as serve as mentors through their academic career at UCSD. Assigned faculty advisors and their contact information may be found on the web at
<http://se.ucsd.edu/academics/undergraduate-program/undergraduate-advising/advisor-information>

WHEN TO SEE YOUR FACULTY ADVISOR

- Discuss problems which affect academic performance
- Explore career options
- Assess academic progress
- Ask about research opportunities

- Creating an academic plan
- Discuss any problem which affect academic progress
- Finding out about scholarship information or co-curricular opportunities

HOW YOU AND YOUR ADVISOR SHOULD PREPARE

YOU NEED TO:

- Contact and keep in touch with your advisor ● Come with specific questions in mind and be prepared (pen, class schedule, all necessary forms)
- Review your academic plan on a quarterly basis ● Be open concerning school work, study habits, academic progress, etc
- Make decisions concerning careers, choice of major, and selection of courses

YOUR SE ADVISOR WILL:

- Post office hours
- Listen and help provide solutions to any problems you are experiencing
- Provide accurate and specific information ● Suggest other sources of information
- Check your schedule for appropriate selection of courses

WHEN TO SEE THE SE UNDERGRADUATE ADVISOR

- When filing a petition

DEGREE PROGRAM AND REQUIREMENTS

The Department of Structural Engineering offers students a Bachelor of Science degree in Structural Engineering. The B.S. in Structural Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. Specific course requirements for the program are outlined in this section. In addition to the required technical courses specifically indicated, a suggested scheduling of

humanities and social science courses are distributed in the plan for students to use to meet college general education requirements. To graduate, students must maintain an overall GPA of at least a 2.0, and the department requires at least a C- grade in each course required for the major. **All courses required for the major (lower-division and upper-division, including Math, Physics and Chemistry) must be taken for a letter grade.** The B.S. program requires a minimum of 145 units plus college requirements.

Students are **strongly encouraged** to follow the course plan appearing on page 13. Deviations from the program of study should be discussed with the Structural Engineering Undergraduate Advisor **prior** to taking alternative courses. In addition to specific courses that are required, a number of Technical Elective (TE) and Focus Sequence (FS) courses are required. Further information regarding Technical Electives and Focus Sequences can be found starting on page 15.

Students with different academic preparation may vary the scheduling of lower-division courses such as math, physics and chemistry, but should consult the department prior to doing so. Deviations in scheduling lower-division Structural Engineering courses are discouraged due to scheduling constraints. A tentative schedule of course offerings is available from the SE Department each spring for the following academic year. This schedule is posted on the SE Department website at

<http://se.ucsd.edu/academics/undergraduate-program/course-offerings>

4-YEAR PROGRAM IN STRUCTURAL ENGINEERING

Structural Engineering is concerned with the design and analysis of aerospace, civil, marine, mechanical, electromechanical, and offshore structures. Examples include bridges, dams, buildings, aircraft, spacecraft, ships, oil platforms, automobiles, other transportation vehicles, and even microchips and biological tissue. This field requires a thorough knowledge of the behavior of solids (metals, plastics, concrete, soils, and composite materials), fluid mechanics as it relates to structural loads, dynamics as it relates to structural response, mathematics for the generation of theoretical structural models and numerical analysis, and computer science for simulation purposes associated with computer-aided design, response analyses, and data acquisition. The basic understanding of materials behavior and structural performance is enhanced by laboratory courses involving static and dynamic testing of structural models, and the investigation of response of structural systems. Within this area, students can specialize in the Focus Sequences: (a) civil structures (b) aerospace structures, (c) structural health monitoring/non-destructive evaluation, or (d) geotechnical engineering.

FOUR-YEAR PLAN

Four-Year Course Schedule for Structural Engineering Degree Program

<u>FALL</u>	<u>WINTER</u>	<u>SPRING</u>
	Freshman Year	
MATH 20A SE 1 CHEM 6A GE	MATH 20B PHYS 2A MATH 18/GE GE	MATH 20C SE 3 PHYS 2B + 2BL MATH 18/GE
	Sophomore Year	
MATH 20D SE 101A PHYS 2C + 2CL GE	SE 9 SE 101B SE 110A GE	MATH 20E SE 110B SE 105 GE
	Junior Year	
SE 101C SE 125 SE 130A GE	SE 102 SE 115 FS GE	SE 131A SE 130B FS GE
	Senior Year	
SE 131B FS TE GE	FS CAPSTONE* FS TE GE	FS CAPSTONE* TE GE GE

Note: Students who have a 3-course writing class for their college requirements may take MATH 18 in the Winter quarter of their 1st year to leave space for a GE in Spring.

1: GE is a general education/college requirement.

2: FS is a focus sequence course.

3: TE is a technical elective course.

4: FS CAPSTONE: Most students take either SE 140A/B or SE 143A/B depending on their chosen FS with the exception of students completing the Structural Health Monitoring/Non-Destructive Evaluation (SHM/NDE) focus sequence.

THREE-YEAR (TRANSFER) PLAN

Transfer students should meet with the Structural Engineering Undergraduate Advisor for an individualized academic plan that takes into account possible transfer course petitions.

Plans will vary based on whether students 1) have any transfer credit for statics (SE 101A), dynamics (SE 101B), vibrations (SE 101C), materials (SE 105), AutoCad and/or Solidworks (SE 3), MatLab (SE 9) and Vector Calculus (Math 20E) as these classes do not automatically transfer in and students must petition them, 2) which focus sequence they want to complete, and 3) if they want to graduate in 2 or 3 years and are able to take summer classes. **For all of these reasons transfer students are encouraged to meet with SE advising to get an individualized plan the summer before they start at UCSD**

FALL WINTER SPRING

First Year		
SE 3	GE	GE
SE 9		SE 101B
SE 110B	Notes:	SE 110A
SE 105	MATH 20E SE 101A SE 1	
Second Year		
SE 130B		SE 115
SE 131A	SE 101C SE 125	SE 102
FS	SE 130A	FS
Third Year		
FS CAPSTONE		FS CAPSTONE
TE	SE 131B FS	FS
	TE	TE

1: GE is a general education/college requirement.

2: FS is a focus sequence course.

3: TE is a technical elective course.

4: FS CAPSTONE: Most students take either SE 140A/B or SE 143A/B depending on their chosen FS with the exception of students completing the Structural Health Monitoring/Non-Destructive Evaluation (SHM/NDE) focus sequence.

FOCUS SEQUENCES/TECHNICAL ELECTIVES

Students enrolled in the Structural Engineering degree program should note that four course slots must be filled by focus sequence (FS) courses. The department currently offers four focus sequences, as listed below, and students must complete one of the focus sequences of their choice. Students should also note that the focus sequence they choose will determine which capstone sequence they will take (either SE 140A & SE 140B or SE 143A & SE 143B).

It is possible that focus sequence courses may not be offered every year. Students should consult the department Undergraduate Affairs Office in the spring quarter of the year before they begin taking focus sequence classes to ensure that the appropriate courses will be offered.

Sequence Name	Courses in Sequence	Capstone Sequence
Civil Structures (CS)	SE 103 Conceptual Structural Design SE 150A Design of Steel Structures SE 151A Design of Reinforced Concrete SE 181 Geotechnical Engineering	SE 140A & SE 140B (Design of Civil Structures I & II)
Aerospace Structures (AS)	SE 160A Aerospace Structural Mechanics I SE 160B Aerospace Structural Mechanics II SE 142 Design of Composite Structures SE 171 Aerospace Structures Renewal	SE 143A & SE 143B (Aerospace Structural Design I & II)
Geotechnical Engineering (GE)	SE 151A Design of Reinforced Concrete SE 181 Geotechnical Engineering SE 182 Foundation Engineering SE 184 Ground Improvement	SE 140A & SE 140B (Design of Civil Structures I & II)

Structural Health Monitoring/ Non-destructive Evaluation (SHM/NDE)

SE 163 Non-destructive Evaluation SE &
164 Sensors and Data Acquisition SE^{TE}
167 Signal Processing & Spectral
Analysis for Structural Engineering
SE 168 Structural System
Testing/Model Correlation
SE 165 Structural Health Monitoring

TECHNICAL ELECTIVES

Students are required to pick three technical electives from courses outside their focus area. These courses can be selected from other focus sequences or from a list of pre-approved upper division or graduate courses. The rationale behind technical electives is to enable students to either learn more about specific topics or to gain specialized knowledge in subject areas outside the selected focus sequence. A course cannot be taken both as part of a focus sequence and as a TE. Courses such as SE 195, SE 197 and SE 198 are not allowed as technical electives in meeting the upper-division major requirements. SE 199 can be used as a technical elective only under restrictive conditions. Policies regarding these conditions are listed on page 17 of this handbook. Students are discouraged from deviating from the pre-approved list, but students who wish to do so are required to submit a petition to the SE Undergraduate Advisor **before** taking the course.

Students taking courses other than those on the list or petitioning for changes after taking an unapproved course cannot be guaranteed that the course is acceptable. Students wishing to take graduate courses (200 level) must have a minimum 3.0 overall GPA, instructor approval and department approval via an [EASy Request](#).

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Preapproved Technical Elective (TE) Courses

- ENG 100D/100L* TIES program (6 units)
- SE 103 Conceptual Structural Design
- SE 132 Machine Learning for Structural Engineering
- SE 142 Design of Composites Structures
- SE 150A Design of Steel Structures
- SE 150B Design of Steel Structures II
- SE 151A Design of Reinforced Concrete
- SE 151B Design of Prestressed Concrete
- SE 154 Design of Timber
- SE 160A-B Aerospace Structural Design
- SE 163 Nondestructive Evaluation and Design
- SE 164 Sensors and Data Acquisition
- SE 165 Structural Health Monitoring
- SE 167 Signal Processing and Spectral Analysis for Structural Engineering
- SE 168 Structural System Testing and Model Correlation
- SE 171 Aerospace Structures Repair
- SE 180 Earthquake Engineering
- SE 181 Geotechnical Engineering
- SE 182 Foundation Engineering
- SE 184 Ground Improvement
- SE 200-289** Graduate Courses
- MAE 101B Advanced Fluid Mechanics
- MAE 101C Heat Transfer
- MAE 104 Aerodynamics
- MAE 105 Introduction of Mathematical Physics
- MAE 110 Thermodynamics
- MAE 118 Introduction to Energy Systems
- MAE 119 Introduction to Renewable Energy
- MAE 120 Introduction to Nuclear Energy
- MAE 122 Flow and Transport in the Environment

MAE 124 Environmental Challenges: Science and Solutions
 MAE 143A Signals and Systems
 MAE 143B Linear Control
 MAE 145 Introduction to Robotic Planning and Estimation
 MAE 149 Sensor Networks
 MAE 160 Mechanical Behavior of Materials
 MAE 165 Fatigue and Failure Analysis of Engineering Components
 MAE 166 Nanomaterials
 MAE 167 Wave Dynamics of Materials
 MAE 180A Spacecraft Guidance I
 MAE 181 Space Mission Analysis and Design
 MAE 184 Flight Simulation Techniques
 USP 100-191*** Upper Division USP Courses

* ENG 100D and one ENG 100L course must be taken together for a total of 6 units to count as one technical elective. TIES can only be used for a total of one TE. Please send the SE advisor a note via the VAC if you complete these so your degree audit can be updated.

** Students wishing to take graduate courses must have a minimum 3.0 overall GPA and obtain instructor approval prior to enrolling. Graduate students will have priority enrollment. You may not count a graduate course as a TE if you took the undergraduate equivalent and vice versa (i.e. – SE 160A/SE 260A, SE 160B/SE 260B, SE 163/263, SE 164/264, SE 165/SE 265, SE 168/SE 268, SE 171/SE 262, SE 182/SE 242, SE 184/SE 247).

***Students are able to take ONE upper division USP course as a TE

All Technical Elective courses must be taken for letter grade and only grades of C- or better count for the major. 16

SE 199 AS A TECHNICAL ELECTIVE

SE students may take SE 199, Independent Study for Undergraduates, under the guidance of an SE faculty member. **SE 199s may not replace ABET approved courses.** This course is taken as an elective on a P/NP basis. Under the following restrictive conditions, however, it may be petitioned to satisfy one upper-division technical course requirement for the major. Minimum qualifications are the student must be in the SE major and the course must be taken for at least 4 units (can also be over 2 quarters for 2 units each).

Students interested in taking an SE 199 course must identify a faculty member with whom they wish to work and propose a research or study topic. After obtaining the faculty member’s concurrence on the topic and scope of the study, the student must submit an EASY request (easy.ucsd.edu). To seek technical elective credit students must also petition to have the SE 199 count as a TE.

COURSE PREREQUISITES:

REQUIRED COURSES	
CHEM 6A	See UCSD General Catalog
MATH 20A	See UCSD General Catalog
MATH 20B	See UCSD General Catalog
MATH 20C	See UCSD General Catalog
MATH 20D	See UCSD General Catalog
MATH 18 (formerly Math 20F)	See UCSD General Catalog
MATH 20E	See UCSD General Catalog
PHYS 2A	See UCSD General Catalog

PHYS 2B	See UCSD General Catalog
PHYS 2BL	See UCSD General Catalog
PHYS 2C	See UCSD General Catalog
PHYS 2CL	See UCSD General Catalog
SE 1 Introduction to Structures and Design	SE Major
SE 3 Graphical Communication for Eng. Design	SE 1
SE 9 Algorithms and Programming	Math 20A and Math 20B
SE 101A Mechanics I: Statics	Math 20C and Phys 2A
SE 101B Mechanics II: Dynamics	SE 101A
SE 101C Mechanics III: Structural Dynamics	Math 18 and SE 101B
SE 102 Intro to Computing for Engineers (formerly SE 121A)	SE 9 and SE 101A
SE 105 Structural Materials (formerly SE 104/104L)	SE 1 and SE 101A
SE 110A Solid Mechanics I	Math 20D and SE 101A
SE 110B Solid Mechanics II	C– or higher in SE 110A

SE 115 Fluid Mechanics	Phys 2A and Math 20D
SE 125 Statistics, Probability and Reliability	Math 20D and Math 18
SE 130A Structural Analysis I	C– or higher in SE 110A
SE 130B Structural Analysis II	SE 130A and Math 18
SE 131A Finite Element Analysis (formerly SE 131)	MATH 20E, SE 3, and SE 110B - Coreq: SE 130B
SE 131B Finite Element Analysis II	SE 131A (or SE 131), SE 101C, and SE 130B
SE 140A Design of Civil Structures I	SE 130B and SE 150A
SE 140B Design of Civil Structures II	SE 140A, SE 151A and SE 181
SE 143A Aerospace Structural Design I	SE 3, SE 142 and SE 160B
SE 143B Aerospace Structural Design II	SE 143A
FOCUS SEQUENCE AND TECHNICAL ELECTIVE COURSES	
SE 103 Conceptual Structural Design SE 3, SE 9 (or MAE 8), SE 101A, SE 105 (or SE 104L) SE 132 Machine Learning for Structural Engineering SE 9 (or MAE 8), SE 110A (or MAE 131A), and SE 125 (or MAE 108)	
SE 142 Design of Composite Structures	SE 110A and SE 110B
SE 150A Design of Steel Structures	SE 110B and SE 130A
SE 150B Design of Steel Structures II	SE 150A

SE 151A Design of Reinforced Concrete	SE 130A - Coreq: SE 103
SE 151B Design of Prestressed Concrete	SE 151A
SE 154 Timber Design	SE 103 and SE 130A
SE 160A Aerospace Structural Design	SE 105 (or MAE 21 or SE 104L) , SE 101B (or MAE 130B or MAE 30B), and SE 110A (or MAE 131A)
SE 160B Aerospace Structural Design	SE 160A
SE 163 Nondestructive Evaluation and Design	SE 110A and SE 110B
SE 164 Sensors & Data Acquisition for SE	SE 101C and SE 110A
SE 165 Structural Health Monitoring	SE 101C
SE 167 Signal Processing & Spectral Analysis for SE	SE 101C
SE 168 Struct. System Testing and Model Correlation	SE 101C and SE 131A (or SE 131)
SE 171 Aerospace Structures Repair	SE 110A (or MAE 131A) and SE 110B (or MAE 131B)
SE 180 Earthquake Engineering	C– or higher in SE 110A and SE 130A
SE 181 Geotechnical Engineering	C– or higher in SE 110A (or MAE 131A)
SE 182 Foundation Engineering	SE 181
SE 184 Ground Improvement	SE 181

TRANSFER STUDENTS

Students transferring into Structural Engineering from outside UCSD have unique circumstances that do not always fit neatly into the course plans provided. Nonetheless, all of the same course requirements apply equally to all transfer students. Even though students may enter UCSD with junior-level standing, most transfer students should expect to take up to three years to complete all department requirements. Students transferring from California community colleges have typically planned for their transfer by using the ASSIST program (<http://www.assist.org>) that shows how various community college courses translate into UCSD courses. **Transfer students are strongly encouraged to meet with the SE Undergrad Advisor to create an individualized academic plan the summer prior to starting at UCSD.**

TRANSFER STUDENT FREQUENTLY-ASKED QUESTIONS:

- **Do I have to take SE 1 and SE 3 since I am a transfer student?**
Yes, SE 1 and SE 3 are required for ALL students and serve as an important introduction to the program of study at UCSD.
- **Is there an equivalent course to SE 1 at the community colleges?**
No, there is not an equivalent course for SE 1. This course is designed to be unique to the UCSD Structural Engineering major.
- **Do I have to take SE 1 my first year at UCSD?**

Yes. It is critical to follow the course plan listed on page 14. Courses in the curriculum are designed to support the knowledge from the previous course. Consult with the SE undergraduate advisor if you have any concerns/questions.

- **Can I take my lower division courses for Pass/No Pass?**

No, ALL courses for the major must be taken for letter grade.

- **If I receive a D grade, is that considered passing?**

No, you must receive a C- or better for the major.

- **Can I receive credit for Statics and Dynamics if I took it at a community college?** You may submit a petition to have the course reviewed for credit, and the Undergraduate Affairs Committee Chair will review the petition.

- **Will my grades transfer from my community college?**

No, your grades do not transfer, only the units carry over.

- **I got AP credit for Physics 2A and 2B. Do I have to take the 2BL lab?**

Yes, lab experience is critical to experiential learning.

GENERAL EDUCATION/COLLEGE REQUIREMENTS

UCSD undergraduate students enroll in one of seven colleges: Revelle, John Muir, Thurgood Marshall, Earl Warren, Eleanor Roosevelt, Sixth, and Seventh. The colleges are distinguished by their particular educational philosophy and environment. The choice of college is independent of the choice of major; all colleges are open to all majors.

Each student must satisfy general-education course requirements determined by the college, as well as the major requirements determined by the department. The seven colleges have widely different general education course requirements. Please visit the college websites listed below to view the general education requirements for each college. Consult your college advisor if you have any questions about these requirements.

REVELLE: <http://revelle.ucsd.edu/academics/general-education/index.html>

MUIR: http://muir.ucsd.edu/academics/degree_reqs.html

MARSHALL: <http://marshall.ucsd.edu/academics/general-education-requirements.html>

WARREN: <https://warren.ucsd.edu/academics/general-education/index.html>

ROOSEVELT: <http://roosevelt.ucsd.edu/academics/gen-ed/index.html>

SIXTH: <http://sixth.ucsd.edu/academics/requirements/index.html>

SEVENTH: <https://seventh.ucsd.edu/academics/degree-requirements/index.html>

EIGHTH: <https://eighth.ucsd.edu/academics/degree-requirements/index.html>

The Structural Engineering program allows for a maximum of 13 general education courses if a full schedule is taken. Depending on the number of Advanced Placement credits, students from certain colleges may not be able to graduate in the four-year schedule presented in the Structural Engineering curriculum table.

In the Structural Engineering program, ABET accreditation requires students to take a total of at least twenty-four units in the arts, humanities, and social sciences, not including subjects such as accounting, industrial management, finance, or personnel administration. This requirement is typically satisfied by the general education requirements of all colleges.

INTEGRATED BACHELOR'S/MASTER'S DEGREE PROGRAM

An integrated program leading to a Bachelor of Science and a Master of Science Degree in Structural Engineering is offered to UCSD undergraduate students seeking to obtain the Master's degree within one year of completion of the baccalaureate degree.

The Structural Engineering Department accepts applications at the end of the spring quarter of the student's junior year. The deadline is in May, usually the end of the 2nd week. Students should receive an email in the junior year from the SE Graduate Advisor notifying them of the exact date. The applicant must have completed at least 145 quarter units with a cumulative 3.25 GPA. The applicant must also be in the major. Students accepted into the program by the department must follow the department and college requirements for the remainder of their undergraduate work in addition to the requirements of the integrated program.

Formal application to graduate study is made during the student's senior year of undergraduate study. At that time, the graduate application, the non-refundable application fee, original transcripts, and statement of purpose, are submitted to the graduate coordinator/department via the online application. GREs and letters of recommendation are not required for the BS/MS program. For more information, please visit: <http://se.ucsd.edu/academics/bs-ms-program>.

For students interested in pursuing graduate study in engineering after graduating from UCSD, information may be found at the Career Services Center special web page:

<http://career.ucsd.edu/undergrads/interest-areas/deciding-finding-programs.html>.

COMPUTER RESOURCES FOR UNDERGRADUATES

ETS ACCOUNTS AVAILABLE TO STUDENTS

Educational Technology Services (ETS, formerly ACMS) provides computer and media resources for UCSD faculty, staff, and students. If you are enrolled (not just accepted) as a regular UCSD student you may register yourself with ETS for basic computing services. New students have accounts created automatically when they accept admission. Go to the following page on the ETS website to see how to activate and access your account: <https://ucsd servicedesk.service-now.com/its>

OPEN COMPUTING ENVIRONMENT ACCOUNT

OCE accounts are designed to provide students with on-going access to computers labs and servers that are dedicated to supporting their major or division. OCE accounts support both personal computing and coursework. They receive additional resource allocations depending on the student's enrollment in corresponding courses. It is important to be aware that disk space allocations are reduced again when courses end.

Structural Engineering students automatically qualify to upgrade to an OCE account. This will allow you access to the PFBH 161 Linux Lab as well as all ETS general purpose computer labs. For instructions on how to upgrade to an OCE account, please see the ETS student webpage at:

<https://support.ucsd.edu/services>.

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ACADEMIC ENRICHMENT OPPORTUNITIES

A number of additional educational opportunities, not formally required in the curriculum, are available to undergraduates interested in exploring facets of engineering in more detail. These opportunities include participation in research, industrial internships, student societies, course instruction, and seminars. More on academic enrichment may be found online at <http://aep.ucsd.edu/>.

UNDERGRADUATE RESEARCH AND INDEPENDENT STUDY

Undergraduates may participate in engineering research at UCSD through a number of informal and formal mechanisms. Many students first become familiar with research by participating 5-10 hours per week during the academic year or 10-20 hours per week in the summer on a volunteer basis. Other students are involved in research through the more formal programs described below.

Independent Study for Undergraduates: SE 199 courses offer qualified and motivated students the opportunity to work closely with faculty and graduate students and gain first hand experience in conducting research. Structural Engineering students may take SE 199, Independent Study for Undergraduates, under the guidance of a Structural Engineering faculty member. This course can only be taken as an elective on a P/ NP basis under restricted conditions (see page 17).

The Faculty Mentor Program: The Faculty Mentor Program (FMP) offers research experience to any junior or senior with at least a 2.7 GPA who wants to prepare for graduate school. Participants work as research assistants to UCSD faculty members for at least 10 hours per week for two quarters. Students receive 4 units of SE 199 (Independent Study) credit for each quarter, learn how to write a research proposal and paper, receive graduate school and fellowship information, and present their research at the annual Faculty Mentor Program Research Symposium at the end of the academic year. For further information, visit <http://students.ucsd.edu/sponsor/fmp>.

UCSD ACADEMIC INTERNSHIP PROGRAM (AIP)

The Academic Internship Program is an academic course that offers students of all majors the opportunity to intern and conduct research in diverse corporate and community settings while earning 4, 8 or 12 units of P/ NP academic credit over the course of the quarter. Through the academic internship experience students enhance their research, critical thinking, problem-solving, and writing skills by bringing an academic lens to a question or issue related to the internship experience. Students are required to intern a minimum number of hours based on the number of elected AIP 197 units. Students receive guidance from AIP counselors in identifying appropriate internships; résumé, cover letter and interview preparation; securing an internship; and identifying a faculty advisor for the research paper/project.

In order to participate in AIP 197, students must have completed 90 units and have a minimum GPA of 2.5 at the time of application. Transfer students must have completed one quarter of course work prior to the time of application. For further information please, visit <http://aip.ucsd.edu>.

UCSD'S UNDERGRADUATE RESEARCH CONFERENCE

Undergraduates who have written outstanding papers have the opportunity to present their findings in a formal setting at the annual UCSD Undergraduate Research Conference. Students are invited to participate in the conference after being nominated by a faculty member. The conference is typically held in May. <https://students.ucsd.edu/sponsor/urc>.

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STUDY ABROAD

Engineering is already a global field offering jobs throughout the world. You can prepare yourself for these opportunities with an exciting study or internship experience abroad. Through the Programs Abroad Office, students may receive credit for international study through a variety of programs. Two categories of programs, both of which offer transferable credit pending approval by UCSD are offered: Education Abroad Program - EAP (UC sponsored exchanges with over 100 universities abroad) and Opportunities Abroad Program - OAP (all other study, internship, and work abroad programs sponsored by other universities, of which thousands exist). Financial Aid can be used with EAP and OAP academic programs, and scholarships are also available for study abroad.

For information on Study Abroad programs, first contact the Study Abroad Office (858) 534-1123, abroad@ucsd.edu, <http://studyabroad.ucsd.edu/> or visit the Study Abroad Office in Matthews Quad UCtr 409, suite 120.

After meeting with an advisor at the Programs Abroad Office, you will need to take your Academic Planning Form to the SE Dept., where the Undergraduate Advisor and the Undergraduate Chair will advise you on major-credit courses. Upon receiving approval from the Undergraduate Chair, you must file a general petition. Final approval of petitions will be considered only after the courses have been completed and posted on your UCSD transcript. Students are advised to keep all of their coursework and a copy of the

course syllabi for review. **Students interested in studying abroad are strongly encouraged to plan their academic careers well in advance to ensure that coursework abroad is approved and to understand how credits will transfer in order to keep themselves on track for graduation in Structural Engineering.**

READER/GRADER POSITIONS

Students may work as graders or readers for courses that they have completed and in which they have received a grade of B or better. Other qualifications include being a full-time student (12 units or more), having at least junior standing, and a minimum GPA of 3.0.

ENGINEERING AIDE POSITIONS

Throughout the year Structural Engineering employs undergraduate students as Engineering Aides who assist faculty members with their research. These positions give students a hands-on opportunity to apply the concepts and methods taught in class. Many of our Engineering Aides assist with the construction and testing of large-scale structures in the Powell Labs while others provide computer analysis. Engineering Aide positions are available during the academic year as well as during summer. Available positions are posted on Handshake at the following link: <https://ucsd.joinhandshake.com/login>.

GORDON SCHOLARS PROGRAM

The Gordon Engineering Leadership Center was established by the Jacobs School of Engineering with generous support from the Bernard and Sophia Gordon Foundation. The center provides leadership and training curricula for students at the high school, undergraduate and graduate levels, as well as for professionals working in the technology fields. Each year the Gordon Center selects a total of about 30 students at the undergraduate, graduate, and professional levels to become Gordon Scholars. The students learn the principles, theory, attitudes, and skill sets required to be an engineering leader through a progressive education, training, and practice program. For additional information on the program, including how to apply, please visit <https://jacobsschool.ucsd.edu/gordoncenter/gordon-scholars>.

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TRITON ENGINEERING STUDENT COUNCIL (TESC)

The Jacobs School of Engineering currently recognizes and supports twenty-four student chapters of various professional and honorary engineering societies. These organizations and other interested undergraduate engineering students form TESC, which helps to identify and address engineering student needs and concerns. TESC is a critical component of the School and it is supported through the Dean's Office. TESC coordinates school-wide student events such as E-Week, DECaF, and the Ring Ceremony for graduating seniors. TESC also hosts engineering K-12 outreach events and supports other undergraduate student organizations. TESC may be found on the web at <http://tesc.ucsd.edu> or they can be contacted by electronic mail at hello@tesc.ucsd.edu.

ENGINEERING STUDENT EMPLOYMENT OPPORTUNITIES

In a coordinated effort, Engineering Student Services assists Career Services, the Academic Internship Program, interested companies, faculty and staff in disseminating information about job opportunities for engineering students. These opportunities include permanent employment, part-time employment during the academic year, summer employment and contract work. This information can be found on the web at <https://jacobsschool.ucsd.edu/students/career-resources>. If you have additional questions about this service, you may contact the coordinator through email (idea@eng.ucsd.edu), or by phone (858) 534-6105.

TEAM INTERNSHIP PROGRAM (TIP)

Summer Team Internships are part of the Jacobs School's effort to enhance students' education through real-world engineering experiences in a team setting. Students work on-site with industry partners as a multi-disciplinary team focused on a clearly defined and significant project. This is a paid internship program which will last 10-12 weeks over the summer and requires 40 hours per week. Additional information can be found on the web at <https://jacobsschool.ucsd.edu/cap/tip>.

TEAMS IN ENGINEERING SERVICE (TIES)

TIES is an innovative service-learning academic program putting UCSD undergraduates and their technical and creative skills to work for San Diego non-profit organizations. Multi-disciplinary teams of UCSD students design, build and deploy projects that solve technology-based problems for community partners. TIES projects can range from working with orthopedists and physical therapists to develop and build mechanical tools or prosthetics for the developmentally disabled, to working with agriculture to develop new irrigation solutions for local farming communities. Information on current TIES projects, how to apply, and the course structure, can be found on the web at <http://globalties.ucsd.edu>.

STUDENT SOCIETIES AND ORGANIZATIONS

The [Center for Student Involvement \(CSI\)](#) office coordinates the formation of student clubs that are run by and for students. All of these groups are represented at the Engineers on the Green (EOTG), usually held in mid-October. Structural Engineering students participate in student chapters of the American Institute of Aeronautics and Astronautics (AIAA), the Society of Civil and Structural Engineers (SCSE), a student chapter of the American Society of Civil Engineers (ASCE), Earthquake Engineering Research Institute (EERI), and the Construction Management Association of America (CMAA). These student chapters invite external speakers, organize trips to local companies, visit local projects, and participate in regional and national design competitions. A number of other engineering societies are active at UCSD. These student groups sponsor talks, provide workshops, and distribute information about opportunities in engineering.

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS (AIAA) For over 70 years, the American Institute of Aeronautics and Astronautics has served as the principal society of the aerospace engineer and scientist. Formed in 1963 through a merger of the American Rocket Society (ARS) and the Institute of Aerospace Sciences (IAS), the purpose was, and still is, "to address the professional needs and interests of the past, current, and future aerospace workforce and to advance the state of aerospace science, engineering,

technology, operations, and policy to benefit our global society." Both ARS and IAS brought to the relationship a long and eventful history – stretching back to 1930 and 1932, respectively – and each left its mark on the Institute. The merger combined the imagination, opportunistic, and risk-taking desire of those rocket, missile, and space professionals with the more established, well-recognized achievers from the aviation community. Today, AIAA has more than 35,000 professional members and more than 5,000 student members in over 190 branches. The Institute's membership roster is also enhanced by its nearly 100 domestic and international corporate members. In short, AIAA offers a broad and diversified menu of programs to meet the ever-changing needs of the aerospace professional. More info: <http://aiaa.ucsd.edu/>.

SOCIETY OF CIVIL AND STRUCTURAL ENGINEERS (SCSE) The Society of Civil and Structural Engineers (SCSE) is the UC San Diego student chapter of the American Society of Civil Engineers (ASCE) and the Structural Engineers Association of San Diego (SEAOSD). The ASCE is the oldest engineering society in the United States (formed in 1852), and it has over 140,000 professional members. The purpose of the SCSE is to supplement the engineering education of UCSD students, promote the personal and professional development of our members, and improve the community through outreach and service. The society aims too accomplish this mission through various professional and social events, project teams, and outreach programs. More info: <http://scse.ucsd.edu>.

THE EARTHQUAKE ENGINEERING RESEARCH INSTITUTE (EERI) The Earthquake Engineering Research Institute, founded in 1949, is the principal U.S. society for engineers, geoscientists, architects, planners, public officials, and social scientists concerned about earthquakes and their effects. The objective of EERI is to reduce earthquake risk by advancing the science and practice of earthquake engineering by improving understanding of the impact of earthquakes on the physical, social, economic, political and cultural environment, and by advocating comprehensive and realistic measures for reducing the harmful effects of earthquakes. The Institute is best known for its field investigation and reconnaissance reports detailing the effects of destructive earthquakes. EERI members include the leading earthquake professionals throughout the world. Information on the effects of destructive events is published in the Newsletter and in the Earthquake Spectra, EERI's quarterly professional journal. EERI sponsors major conferences in the USA and abroad, and organizes technical seminars and workshops, all of which provide forums for the exchange of information between researchers and practitioners in all the earthquake-related disciplines. EERI membership is open to all

individuals interested in earthquake hazard reduction. More info: <https://sites.google.com/ucsd.edu/eeriuscd>.

AUVSI AUTONOMOUS AIRCRAFT COMPETITION The AUVSI Foundation is dedicated to increasing interest in autonomous vehicles. The UCSD Triton Unmanned Aerial Systems team competes annually in Lexington, Maryland where the competition challenges them to design, integrate, report on, and demonstrate a UAS capable of autonomous flight and navigation, remote sensing via onboard payload sensors, and execution of a specific set of tasks. It is an international competition which hosts teams from around the globe and gives students a chance to network with professionals of the unmanned systems industry. The overall team score is determined by three criteria: a journal paper, flight readiness review, and flight demonstration. More info: <http://tuas.ucsd.edu/>.

CONSTRUCTION MANAGEMENT ASSOCIATION OF AMERICA (CMAA) The Mission of CMAA is to promote the profession of Construction Management and the use of qualified Construction Managers on capital projects and programs. CMAA is leading the growth and acceptance of construction management as a professional discipline that can add significant value to the entire construction process, from conception to ongoing operation. Membership in CMAA includes more than 14,000 firms and individuals including owners, engineers, architects, contractors, educators, and students – everyone with a stake in the construction

industry's success. More info: <https://cmaaatucsd.wixsite.com/cmaaucsd>.

HUMAN POWERED SUBMARINE COMPETITION The Human Powered Submarine team designs and builds a fast, safe, and reliable fiberglass submarine that competes at international submarine races, which take place in Bethesda, Maryland and Gosport, UK. Scuba-certified students control the submerged and flooded submarine with human-powered propulsion. Students working on this project learn essential CAD, machining, and programming skills and gain a deeper understanding of the concepts that they learn in their classes. The most recent submarine, completed in 2018, is "Vaquita," named for an endangered species of dolphin. Competing in the one-person non-propellor division, Vaquita featured an up-down tail for propulsion, a unique six-bar linkage, and the team's very first pneumatics systems. This team is part of the American Society of Mechanical Engineers (ASME) student organization. More info: <https://hps-ucsd-2020.github.io/Home.html>.

SEDS ROCKET DEVELOPMENT Students for the Exploration and Development of Space (SEDS) at UCSD is an undergraduate student-run research group that aims to advance the future of space exploration and development technology. They have been known for their groundbreaking, 3D-printed engines. Every year SEDS USA and SSPI partner to present a design competition focused on challenging university students to create innovative solutions to technical problems. The 2018 challenge was to develop a multi-purpose space vehicle capable of performing one of several possible tasks, e.g. cargo transport or space debris clean-up. The UCSD team designed Argo which is a space-tug designed to provide safe, reliable, consistent, and cost-effective transportation of cargo from low Earth orbit to any cis-lunar or low-lunar orbits. Its cargo missions may range from satellite deployment to delivering of cargo to a base in lunar orbit and earned first place in the competition. More info: <https://sedsucsd.org/>.

TRITON RACING Triton Racing is UCSD's Formula SAE team dedicated to the design, fabrication, and testing of an open-wheel prototype race car for the Formula Society of Automotive Engineers (FSAE) competition held annually in Lincoln, Nebraska. The Formula SAE series competitions challenge teams of university undergraduate and graduate students to conceive, design, fabricate, develop, and compete with small, formula-style vehicles. The competition itself consists of both static and dynamic events. More info: <http://sae.eng.ucsd.edu/>.

TAU BETA PI (TBP) Tau Beta Pi (TBP) at UCSD is a member of the National TBP engineering honor society. 26 Engineering students who rank in the top 1/8 of juniors and the top 1/5 of seniors are contacted by TBP for possible membership. These students are eligible for membership in TBP if they complete an interview process as well as pass the exemplary character criteria. Throughout the year, TBP invites speakers to club meetings and organizes tours of companies. More info: <http://tbp.ucsd.edu>.

NATIONAL SOCIETY OF BLACK ENGINEERS (NSBE) NSBE is committed to supporting diverse programs that enrich underrepresented engineering students professionally and academically. NSBE also promotes programs that encourage and influence young students in impoverished urban communities to pursue science and engineering degrees. NSBE's outreach programs create more dynamic interactive pre-college outreach programs that target minorities into science and engineering study. More info: <https://nsbe.ucsd.edu/>.

OUT IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (oSTEM) Out in Science, Technology, Engineering, and Mathematics (oSTEM) is a nationally recognized organization that is geared towards the personal and professional development of queer or LGBTQIA+ students who are interested in Science, Technology, Engineering, and Mathematics through social, educational, professional, philanthropic, and outreach programming. It is also focused on helping students throughout UCSD and San Diego connect to a broader community of queer folks (students and professionals) whose academic interests lie in similar fields.

More info: <http://ostem.ucsd.edu/>.

SOCIETY OF ASIAN SCIENTISTS AND ENGINEERS (SASE) The Society of Asian Scientists and Engineers (SASE) is a pre-professional organization which is devoted to promoting professional development and preparing undergraduates for their future. SASE provides members with resources such as resume workshops, networking opportunities, professional exposure, and company visits. More info: <https://saseatucsd.weebly.com/>.

SOCIETY OF HISPANIC PROFESSIONAL ENGINEERS (SHPE) The Society of Hispanic Professional Engineers (SHPE) was founded in Los Angeles, California, in 1974 by a group of engineers employed by the city of Los Angeles. Their objective was to form a national organization of professional engineers to serve as role models in the Hispanic community. Networking was the key basis for the organization. Today SHPE enjoys a strong but independent network of professional and student chapters throughout the nation with over 10,500 members. More info: <https://www.shpeatucsd.com/>.

SOCIETY OF WOMEN ENGINEERS (SWE) The Society of Women Engineers is a not-for-profit educational and service organization that empowers women to succeed and advance in the field of engineering, and to be recognized for their life-changing contributions as engineers and leaders. Founded in 1950, SWE is the driving force that establishes engineering as a highly desirable career for women through an exciting array of training and development programs, networking opportunities, scholarships, outreach, and advocacy activities. More info: <https://swe-ucsd.netlify.app/>.

Additional information on undergraduate student organizations related to engineering:
<https://jacobsschool.ucsd.edu/idea/current-undergraduates/undergraduate>

OFFICE OF ACADEMIC SUPPORT AND INSTRUCTIONAL SERVICES (OASIS) 27

OASIS provides a variety of services to maximize student performance and retention at the University of California, San Diego. OASIS provides activities that support and contribute to the improvement of teaching and learning. Programs range from services to help students overcome past academic deficiencies to programs to help them excel in a subject matter or skill.

TUTORING PROGRAMS

All UCSD students are eligible for free, course-specific tutoring programs in math and science through OASIS. OASIS offers two types of math and science tutoring each quarter: Via appointment and via workshops. Workshops are structured group study sessions led by a tutor. Most are course-specific and relate to a particular instructor. You must register in advance for these workshops. Workshops are offered for all of the lower division Math, Chemistry and Physics courses that are required for the Structural Engineering major. For more information on the OASIS Tutorial Program, including schedules and information on how to enroll, please call (858) 534-3760 or visit <https://oasis.ucsd.edu/academic-services/mstp-folder/index.html>.

LANGUAGE ARTS TUTORIAL SERVICES PROGRAM (LATS)

Through individual tutoring sessions and workshops, LATS enhances ESL students' English writing and composition strategies, knowledge and usage of grammar, and verbal skills. The program also helps students

taking beginning or advanced classes in Spanish and French. This program is open to all UCSD undergraduate students. More info: <https://oasis.ucsd.edu/academic-services/lats-folder/index.html>.

OASIS TRANSITION PROGRAMS

OASIS offers opportunities for academic enrichment and growth for selected freshmen, sophomores, first-year transfer students, and current and former foster youth.

- **Summer Bridge:** A year-long transition program for incoming freshman students that begins with an intensive 4 or 5 week residential & academic component in August. Summer Bridge continues throughout the academic year, providing academic & personal support throughout your first year at UC San Diego.
- **TRIO Student Support Services Program & Summer Experience** (freshmen and transfers): This program designed for freshmen and transfer students offers tutoring, workshops, mentoring, and extracurricular activities throughout your entire career at UC San Diego.
- **2Excel** (sophomores): 2Excel is a retention program serving second-year students. The program is a year long commitment starting Fall through Spring quarter.
- **Hope Scholars Program:** The Hope Scholars Program is committed to supporting current and former foster youth at UCSD through a variety of holistic services that aid the students in achieving a college degree. The Hope Scholars Program understands that there are many hardships that foster youth endure and strives to be a resource and advocate for all its students.

Any incoming undergraduate UC San Diego freshman or transfer can apply to the OASIS Transition Programs. For more information, including how and when to apply, visit <http://oasis.ucsd.edu/programs/>.

TEACHING + LEARNING COMMONS

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The Teaching + Learning Commons offers programs and services which create a contiguous, multi-layered network of support that jointly enhance learning and increase academic success. At the Teaching + Learning Commons, students can get support for challenging courses, subjects, and projects. Whether in a group setting or through one-on-one assistance, in person or online, these support services help students develop effective learning and problem-solving strategies to be successful at UC San Diego and beyond.

- [Content Tutoring](#) (including for Math 3C, 4C, 20A-E and 18; Chem 6A; Phys 2A-C)
- [Supplemental Instruction](#)
 - [Strategies for Learning Remotely](#)
- [Study Group Sessions](#) (including for Math 20A-E and 18; Chem 6A; Phys 2A-C; and sometimes SE 101A and SE 101B)
- [Summer Bridge](#)
- [Writing Tutoring and Workshops](#) - for both undergraduate & graduate students

IDEA STUDENT CENTER (ENGINEERING STUDENT SERVICES)

The Jacobs School of Engineering supports several programs and services that promote academic and professional development for undergraduate students across all engineering departments. Students are encouraged to contact the IDEA (Inclusion, Diversity, Excellence and Advancement) Student Center about these programs by email (idea@eng.ucsd.edu), by phone (858) 534-6105, or by person in Jacobs Hall 1st floor. Some of these programs and services are discussed briefly below. Students may access the web at <http://jacobsschool.ucsd.edu/idea/> for a complete listing of opportunities and services provided by the IDEA Student Center.

ADDITIONAL ACADEMIC SUPPORT

- [Math Specific Resources](#): The Mathematics Department keeps a list of options for math tutoring including specific resources for MATLAB (Math 18, 20D).
- [MAE Math Open House](#): Supplemental help for mathematics in curriculum, geared towards MAE students but also open to SE students since there is a lot of crossover. Help with applications of calculus, differential equations, and other topics. Tutors are MAE PhD students. Students should bring in class materials to give tutors sufficient context to the math problems.

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS)

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CAPS is committed to promoting student mental health and well-being at an individual and organizational level, as well as the preservation and sustainability of an environment conducive to growth and lifelong learning.

CAPS provides individual, group, couples, and family psychotherapy to registered undergraduate and graduate students, including telehealth options. Services are **free of charge to currently enrolled students who have paid their registration fees. During the summer, students who were enrolled the previous Spring quarter and are intending to return in the Fall quarter are eligible for services.**

In keeping with ethical standards of the mental health profession and the law, all services provided by the staff of CAPS are kept confidential. They do, however, consult as needed within the staff of CAPS (and Student Health Service if they are collaborating in your care) about the best way to provide the assistance based on client need. No information is released to outside parties without the client's prior, written consent. Neither the fact that you seek counseling nor any information about the counseling sessions will appear in your student academic record unless you direct CAPS to communicate with other staff and faculty at the university.

If you notice that you have certain patterns of thinking and behavior that interfere with your success and the enjoyment of certain endeavors then you should consider making an appointment. Students also consult with CAPS about a variety of more specific personal, academic and relationship problems such as:

- Depression and suicidal thoughts
- Stress and anxiety
- Poor academic performance and study skills
- Roommate conflicts
- Homesickness and difficulty adjusting to the university
- Disappointing social relationships
- Alcohol and other substance use and abuse
- Difficulty in love relationships
- Loneliness and isolation
- Eating and body image problems
- Depression and suicidal thoughts
- Cultural identity
- Sexuality and sexual identity
- Family conflict
- Grief and loss

For more information about CAPS and the services they provide, please visit <https://caps.ucsd.edu/>.

For appointments and after-hours assistance: (858) 534-3755

National Suicide Hotline: (800) 273-8255

CAPS Central Office and Urgent Care location: Galbraith Hall 190 (Revelle College)

STEPS TO A PROFESSIONAL ENGINEERING LICENSE

Whether you design power plants, consumer goods, buildings, or aerospace vehicles, whether you work in private industry, for the U.S. government, or for the public and whether your efforts are theoretical or practical, you (as an engineer) have a significant responsibility.

Engineers of all types perform exciting and rewarding work, often stretching new technologies to their limits. But those limits are often incomprehensible to non-engineers. As the ambient level of technological sophistication increases, the public depends increasingly and unhesitatingly on engineers. That is where professional licensing and the [National Society of Professional Engineers \(NSPE\)](#) become important.

[NSPE](#), the leading organization for licensed engineering professionals, is dedicated to serving the engineering profession by supporting such activities as continuing educational programs for its members, lobbying and legislative efforts on local and national levels and promoting guidelines for ethical service. From local, community-based projects that encourage top-scoring high school students to choose engineering as a career, to hard-hitting lobbying efforts in the nation's capital to satisfy the needs of all engineers, NSPE is committed

to you and your profession.

Engineering licensing is a two-way street: it benefits you personally while it also benefits the public and the profession. For you, licensing offers a variety of advantages, ranging from peer recognition to greater advancement and career opportunities. If you wish to become an *independent engineering consultant*, it is required by law that you are registered. Some states require registration as a Professional Engineer if you wish to use the title engineer. A court of law generally will not recognize an individual as an engineer unless one is registered. For the profession, licensing establishes a common credential by which engineers can be compared. For the public, a professional engineering license is an assurance of a recognizable standard of competence.

The requirements for professional engineering registration prevailing in most of the states include a combination of education, exam(s), and engineering experience.

The first exam is generally known as the “Fundamental Examination” (FE) (sometimes referred to as the “Engineering-in-Training” exam or the EIT) and the second exam, as the “Professional Examination,” (sometimes referred to as the PE exam or the “Principles and Practices” exam). Persons who successfully pass these examinations are entitled to use the title “Professional Engineer” and to place the initials “P.E.” after their names. It is illegal for unregistered persons to use the title. Nearly all states have made provisions for an FE/EIT status and will allow persons to take the first (EIT or “Fundamentals”) portion of the written examination as early as the end of your junior (third) year of an ABET accredited program. EIT status conveys no legal privileges and is offered primarily as a convenience to new graduates so that they can take the examination in fundamentals at a time when the material is still fresh in their minds. Almost all of the states use a uniform national EIT examination, administered through the [National Council Engineering Examination \(NCEE\)](#), and a great majority uses a uniform national examination for the “Professional” portion.

The EIT exam is offered multiple times per year. The Structural Engineering department is not affiliated with administering the exam.

For EIT registration and exam information visit the [National Society of Professional Engineers](#). Students may also go online to the [California Board for Professional Engineers and Land Surveyors](#) website to find further information regarding the [California PE exam](#).

DIRECTORY OF IMPORTANT PROGRAMS AND OFFICES

- **Academic Internship Program The Teaching + Learning Commons @ Geisel**
858-534-4355 <http://aip.ucsd.edu/>
- **California Society of Professional Engineers**
888-285-6773 <https://www.nspe-ca.org/home>
- **Campus Emergency Status**
888-308-8273 <https://ucsd.edu/about/emergency.html>
- **Career Services Center: Career and Graduate School Exploration and Preparation**
858-534-3750 <http://career.ucsd.edu/>
- **Counseling and Psychological Services (CAPS) Galbraith Hall 190**
858-534-3755 <https://caps.ucsd.edu/>
- **Financial Aid Office Student Services Center, 3rd floor north**

858-534-4480 <http://students.ucsd.edu/finances/financial-aid/>

- **IDEA Student Center (Engineering Student Services) Jacobs Hall, 1st floor**
858-534-6105 <https://jacobsschool.ucsd.edu/idea/>
- **International Students Office**
858-534-3730 <http://ispo.ucsd.edu/>
- **Office for Students with Disabilities (OSD) University Center 202**
858-534-4382 <https://osd.ucsd.edu/>
- **Office for the Prevention of Harassment & Discrimination**
858-534-8298 <http://ophd.ucsd.edu/>
- **Student Health Services**
858-534-3300 <https://studentwellbeing.ucsd.edu/>
- **Student Legal Services**
858-534-4374 <https://students.ucsd.edu/sponsor/student-legal/>
- **Study Abroad Office Matthew's Quad, Building 409**
858-534-1123 <http://studyabroad.ucsd.edu/>
- **Society of Civil and Structural Engineers (SCSE) – UCSD Chapter**
scse.ucsd@gmail.com <http://scse.ucsd.edu>
- **Structural Engineering Undergraduate Advising Offices SME 340**
858-822-2273 & 858-534-4185 <http://vac.ucsd.edu>
- **Structural Engineers Association of San Diego (SEAOSD)**
619-733-2734 <http://www.seaosd.org>
- **The Hub Basic Needs: Assistance with food, housing, and financial resources**
858-246-2632 <https://basicneeds.ucsd.edu/>
- **UCSD Police Emergency: 911**
Non-emergency: 858-534-4357 <https://police.ucsd.edu/>
- **UCSD Service Portal: Services and Support**
<https://support.ucsd.edu/services>