

Engineering

In the College of Engineering

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Associateships

Graduate teaching associateships and graduate assistantships in engineering are available to a limited number of qualified students. Application forms and additional information may be secured from the chair of the appropriate department.

General Information

The College of Engineering offers graduate study leading to the Ph.D. degrees in engineering sciences (bioengineering; electrical and computer engineering; mechanical and aerospace engineering; structural engineering) and Master of Science degrees in bioengineering, aerospace, civil, electrical, and mechanical engineering. The Ph.D. degree programs are offered jointly with the University of California, San Diego. These curricula are designed to augment the student's undergraduate training by advanced study in one of the various fields of engineering. Recognizing the increasing importance in modern technology of the engineer-scientist team, San Diego State University has developed an academic program which offers to individuals holding a first degree in engineering, an opportunity to pursue advanced study in a specialized area of knowledge. The graduate degree may also prepare students for a teaching career.

Section I. Master's Degree Programs

Master of Science Degree

Admission to Graduate Study

All students must satisfy the general requirements for admission to the Division of Graduate Affairs with classified graduate standing as described in Part Two of this bulletin. Candidates for admission to aerospace engineering, civil engineering, electrical engineering and mechanical engineering programs must have attained a grade point average of at least 2.85 (where A equals 4) in the last 60 semester (90 quarter) units of technical study attempted in the undergraduate degree program. In addition, applicants must have a bachelor's degree in a field of engineering appropriate to the field in which they desire to earn an advanced degree or in a field closely related thereto from an institution acceptable to the College of Engineering and the Division of Graduate Affairs. If undergraduate preparation is deemed insufficient, the student will be required to take specified courses for the removal of the deficiency. Such courses may be in addition to the minimum of 30 units for the master's degree in engineering. Students graduating from foreign universities need a cumulative grade point average of 3.0 or better.

Students should contact their specific engineering department for GRE test requirements. Letters of recommendation for graduate study are helpful but optional.

Students applying for admission should electronically submit the university application available at <http://www.calstate.edu/apply> along with the \$55 application fee.

All applicants must submit admissions materials separately to SDSU Graduate Admissions and to the College of Engineering (refer to the appropriate department section for the address to submit additional information).

Graduate Admissions

The following materials should be submitted as a complete package directly to:

Graduate Admissions
Enrollment Services
San Diego State University
San Diego, CA 92182-7416

- (1) Official transcripts (in sealed envelopes) from all postsecondary institutions attended;

NOTE:

- Students who attended SDSU need only submit transcripts for work completed since last attendance.
- Students with international coursework must submit both the official transcript and proof of degree. If documents are in a language other than English, they must be accompanied by a certified English translation.

- (2) GRE scores (<http://www.ets.org> SDSU institution code 4682);
- (3) English language score, if medium of instruction was in a language other than English (<http://www.ets.org> SDSU institution code 4682).

College of Engineering

The following materials should be mailed or delivered to the appropriate address listed in each department section:

- (1) Personal statement of graduate program goals;
- (2) Letters of recommendation (optional).

Advancement to Candidacy

All students must meet the general requirements for advancement to candidacy as described in Part Four of this bulletin.

Specific Requirements for the Master of Science Degrees

In addition to meeting the requirements for classified graduate standing as stated above, the student must satisfy the basic requirements for the master's degree as described in Part Four of this bulletin. With the approval of the appropriate department, the student working toward the master of science degree may elect either Plan A, requiring a thesis and an oral defense, or Plan B, requiring a comprehensive written examination.

Students shall arrange their coursework, in conference with their graduate adviser, according to the following requirements for the specific degree.

Aerospace Engineering (Major Code: 09021) (SIMS Code: 441001)

General information: The Department of Aerospace Engineering offers graduate study leading to the Master of Science degree in aerospace engineering.

Students are encouraged to engage in thesis research or special study projects. Available areas of research include experimental, theoretical and computational aerodynamics and fluid mechanics, structural analysis and design, composite materials and structures, fluid-structure interactions, structural dynamics, aeroelasticity, and aircraft and spacecraft stability and control.

The following materials should be mailed or delivered to:

Dr. Satchi Venkataraman, Graduate Adviser
Department of Aerospace Engineering
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1308

- (1) Personal statement of graduate program goals;
- (2) Letters of recommendation (optional).

Specific requirements for the degree: The student's program prepared in conference with and approved by the graduate adviser, must satisfy the following requirements:

1. Twenty-one units of 600-700 numbered courses in aerospace engineering. At least six units must be taken in the Aerospace Engineering specialization. At least one course must be taken outside the student's area of specialization.
2. Nine additional units of 500-, 600- and 700-numbered courses approved by the graduate adviser.

Areas of Specialization in Aerospace Engineering

1. **Aerodynamics/Astronautics**
(Major Code: 09021) (SIMS Code: 441003)
A E 601 Computational Fluid Mechanics (3)
A E 612 Compressible Fluid Flow (3)
A E 620 Incompressible Aerodynamics (3)
A E 644 Turbulent Flow (3)
2. **Structural Mechanics**
(Major Code: 09021) (SIMS Code: 441070)
A E 600 Seminar (1-3)
A E 611 Vibration of Elastic Solids (3)
A E 621 Theory of Elasticity (3)
A E 641 Structural Optimization (3)
A E 651 Theory of Elastic Stability (3)
A E 731 Aeroelasticity (3)

Bioengineering

(Major Code: 09051) (SIMS Code: 446001)

General information: The College of Engineering offers graduate study leading to the Master of Science degree in bioengineering. The M.S. in bioengineering seeks to provide both an advanced degree for students to enter the biotechnology and medical device industries as well as preparation for further study in bioengineering or medicine. Current areas of specialization are biomechanics, biomaterials, and bioinstrumentation.

The following materials should be mailed or delivered to:

Bioengineering Graduate Adviser
College of Engineering, Room 326
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1323

- (1) Personal statement of graduate program goals;
- (2) Letters of recommendation (optional).

Specific requirements for the degree: The student's program will be prepared in conference with and approved by the bioengineering graduate adviser. Students take a "core" of courses required for their specialization, and additional courses and electives as listed below. Students without prerequisites for the required courses may need to take additional courses outside the 30 units needed for the degree. The student's program of study must satisfy the following requirements:

1. Students select a specialization in biomechanics, biomaterials, or bioinstrumentation in consultation with the bioengineering graduate adviser.
2. A total of 30 units, consisting of five required 500-, 600-, and 700- level core courses (15-16 units) corresponding to the specialization, 6-9 units of Research (M E 797/E E 797), Thesis (M E 799A/E E 799A), or Special Study (M E 798/E E 798), and electives selected from the list below.
3. A thesis project is required.
4. Demonstration of prior coursework equivalent to a core course will enable substitution of an elective chosen in consultation with the bioengineering graduate adviser.
5. At least 15 units of coursework (excluding 797, 798, 799 courses) must be from Engineering.
6. At least 12 units of coursework (excluding 797, 798, 799 courses) must be 600- or 700-level courses.

Core Courses:

Biomechanics

(Major Code: 09051) (SIMS Code: 446002)

- BIOL 590 Physiology of Human Systems (4)
- M E 580 Biomechanics (3)
- M E 610 Finite Element Methods in Mechanical Engineering (3)
- M E 681 Biomaterials (3)
- M E 685/ E E 685 Micro-Electro-Mechanical Systems (MEMS) Design and Applications (3)

Biomaterials

(Major Code: 09051) (SIMS Code: 446003)

- BIOL 585 Cellular and Molecular Immunology (3)
- M E 540 Nonmetallic Materials (3)
- M E 681 Biomaterials (3)
- M E 685/ E E 685 Micro-Electro-Mechanical Systems (MEMS) Design and Applications (3)

Bioinstrumentation

(Major Code: 09051) (SIMS Code: 446004)

- BIOL 590 Physiology of Human Systems (4)
- E E 503 Biomedical Instrumentation (3)
- M E 685/ E E 685 Micro-Electro-Mechanical Systems (MEMS) Design and Applications (3)
- M E 580 Biomechanics (3)

Electives:

- A E 601 Computational Fluid Mechanics (3)
- A E 621 Theory of Elasticity (3)
- BIOL 585 Cellular and Molecular Immunology (3)
- BIOL 590 Physiology of Human Systems (4)
- BIOL 597A Univariate Statistical Methods in Biology (3)
- CHEM 712 Chemical Kinetics (3)
- CHEM 751 Separations Science (3)
- E E 502 Electronic Devices for Rehabilitation (3)
- E E 503 Biomedical Instrumentation (3)
- ENS 610 Biomechanics: Measurement Techniques I-Kinematics (3)
- ENS 611 Biomechanics: Measurement Techniques II-Kinetics (3)
- ENS 612 Biomechanics: Measurement Techniques III-EMG (3)
- ENS 613 Motor Control and Rehabilitation Science (3)
- ENV E 554 Process Fundamentals of Environmental Systems (3)
- ENV E 648 Biological Processes and Bioremediation Engineering (3)
- M E 540 Nonmetallic Materials (3)
- M E 580 Biomechanics (3)
- M E 585 Fundamentals of Micro-Electro-Mechanical Systems (MEMS) (3)
- M E 610 Finite Element Methods in Mechanical Engineering (3)
- M E 645 Mechanical Behavior of Engineering Materials (3)
- M E 656 Conduction Heat and Transfer (3)
- M E 681 Biomaterials (3)
- M E 683 Design of Medical Devices (3)
- PHYS 670A Medical Physics I (3)
- PHYS 670B Medical Physics II (3)

**B.S. in Mechanical Engineering and M.S. in Bioengineering
BS/MS 4+1 Degree Program
(Major Code: 09051) (SIMS Code: 446005)**

Students must complete 158 units to be simultaneously awarded the Bachelor of Science degree in mechanical engineering and the Master of Science degree in bioengineering. Students can apply for admission to the BS/MS 4+1 degree program (B.S. in mechanical engineering and M.S. in bioengineering) when they have successfully completed a minimum of 90 units or a maximum of 115 units. These units must count towards one or the other of the two SDSU degree programs (BS or MS) that will ultimately be awarded in the dual degree program. All students must have a satisfactory score [minimum of 308 for combined verbal and quantitative on the Graduate Record Examination (GRE) General Test] and a minimum overall GPA of 3.0.

To satisfy the requirements for the BS/MS 4+1 degree program (B.S. in mechanical engineering and M.S. in bioengineering), students must achieve at least a 3.0 average in the 30 units of courses used to satisfy the graduate program of study. Of the 30 units, a maximum of nine units may be in 500-numbered mechanical engineering electives and all other program requirements must be satisfied. Three 500-level courses may be used to fulfill the elective requirements for the BS/MS 4+1 degree program at the same time as serving as prerequisite courses for graduate study. For the BS/MS 4+1 degree program (B.S. in mechanical engineering and M.S. in bioengineering), students must take M E 580 and 585 for the biomechanics specialization; M E 580, 540 or 543, and 585 for the biomaterials specialization. The bioinstrumentation specialization is not open to students in the BS/MS 4+1 degree program (B.S. in mechanical engineering and M.S. in bioengineering). Upon successful completion of the BS/MS 4+1 degree program, students will receive the B.S. degree in mechanical engineering with an emphasis in bioengineering and M.S. degree in bioengineering.

**Civil Engineering
(Major Code: 09081) (SIMS Code: 442001)**

General information: The Department of Civil, Construction, and Environmental Engineering offers graduate study leading to the Master of Science degree in civil engineering. Available areas of study include a concentration in environmental engineering and specializations in construction engineering, geotechnical engineering, structural engineering, transportation engineering, and water resources engineering. Programs of study may also include combinations of the above areas and related courses from other disciplines subject to the approval of the graduate adviser. Selected students in the program may be offered graduate teaching associateships. Experience as a graduate teaching associate can help prepare students for part-time or full-time teaching careers.

Applicants with a bachelor's degree in an approved non-engineering curriculum must make up the deficiencies in biology, calculus, chemistry, computer skills, differential equations, fluid mechanics and hydraulics, physics, statics and dynamics, statistics, and thermodynamics, as determined by the graduate adviser.

The following materials should be mailed or delivered to:
Dr. Temesgen Garoma Ararssso, Graduate Adviser
Department of Civil, Construction, and
Environmental Engineering
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1324

- (1) Personal statement of graduate program goals;
- (2) Letters of recommendation (optional).

Specific requirements for the degree: The student's program, prepared in conference with and approved by the graduate adviser, must satisfy the following requirements:

1. General requirements: 21 units of coursework.
 - a. A minimum of 12 units selected from one of the areas of specialization in civil engineering; in exceptional cases, this requirement may be waived at the discretion of the graduate adviser, provided the substitute course is in the College of Engineering and enhances a coherent program in a specific professional area.

- b. Eighteen units of 600- and 700-level courses in civil engineering and/or construction engineering. No more than three units from courses numbered 797, 798, and 799 may be used to satisfy this requirement.
2. Culminating experience (nine additional units):
 - a. Thesis students: Three units of 797, three units of 798, and three units of 799A.
 - b. Non-thesis students: Six units of 500-, 600-, or 700-level courses and three units of 797 or 798 (additional units of 797 or 798 may be completed with approval of graduate adviser).
3. The total number of 500-, 600-, or 700-level units may not exceed 12 units outside the department.

Areas of Specialization in Civil Engineering

1. **Construction Engineering
(Major Code: 09081) (SIMS Code: 442030)**
 - CON E 650 Construction Labor Productivity (3)
 - CON E 651 Project Production System Design in Construction (3)
 - CON E 652 Construction Operations Modeling and Technology (3)
 - CON E 654 Construction Claims (3)
 - CON E 655 Project Design and Portfolio Management (3)
2. **Geotechnical Engineering
(Major Code: 09081) (SIMS Code: 442025)**
 - CIV E 640 Advanced Soil Mechanics (3)
 - CIV E 641 Advanced Foundation Engineering (3)
 - CIV E 642 Groundwater Seepage and Earth Dams (3)
 - CIV E 644 Soil Dynamics (3)
3. **Structural Engineering
(Major Code: 09081) (SIMS Code: 442075)**
 - CIV E 605 Prestressed Concrete Structures (3)
 - CIV E 607 Dynamics of Structures (3)
 - CIV E 608 Earthquake Engineering (3)
 - CIV E 610 Finite Element Analysis of Structures (3)
 - CIV E 612 Advanced Concrete Materials (3)
4. **Transportation Engineering
(Major Code: 09081) (SIMS Code: 442085)**
 - CIV E 620 Traffic Flow and Control (3)
 - CIV E 621 Transportation Demand Analysis (3)
 - CIV E 622 Mass Transit Engineering (3)
 - CIV E 781 Seminar in Transportation Engineering (2 or 3)
5. **Water Resources Engineering
(Major Code: 09081) (SIMS Code: 442096)**
 - CIV E 631 Spatial Hydrology (3)
 - CIV E 632 Computational Hydraulics and Hydrology (3)
 - CIV E 633 Environmental Hydrology (3)
 - CIV E 634 Surface Water Hydrology (3)
 - CIV E 638 Sedimentation Engineering (3)

**Concentration in Environmental Engineering
(Major Code: 09221) (SIMS Code: 442005)**

Specific requirements for the concentration: The student's program, prepared in conference with and approved by the graduate and environmental engineering adviser, must satisfy the following requirements:

1. General requirements: 21 units of coursework.
 - a. Fifteen units selected from the required courses listed below; in exceptional cases, this requirement may be waived at the discretion of the graduate adviser, provided the substitute course is in the College of Engineering and enhances a coherent program in a specified professional area.
 - b. Eighteen units of 600- and 700-level courses in civil engineering and environmental engineering. No more than three units in Environmental Engineering 797 and no more than three units in Environmental Engineering 798.
2. Culminating experience (nine additional units):
 - a. Thesis students: Three units of Environmental Engineering 797, three units of Environmental Engineering 798, and three units of Environmental Engineering 799A.
 - b. Non-thesis students: Six units of 500-, 600-, or 700-level courses and three units of Environmental Engineering 797 or 798 (additional units of Environmental Engineering 797 or 798 may be completed with approval of graduate adviser).
3. The total number of 500-, 600-, or 700-level units may not exceed 12 units outside the department.

Required courses (15 units):

- ENV E 554 Process Fundamentals of Environmental Systems (3)
- ENV E 645 Aquatic Chemistry for Environmental Engineers (3)
- ENV E 647 Physical and Chemical Processes of Water Pollution Control (3)
- ENV E 648 Biological Processes and Bioremediation Engineering (3)

Prescribed Electives (six units):

- ENV E 556 Air Pollution Engineering (3)
- ENV E 558 Solid and Hazardous Waste Engineering (3)
- ENV E 637 Process Design for Industrial and Hazardous Waste Treatment (3)
- ENV E 797 Independent Research (1-3) Cr/NC/RP
- ENV E 798 Special Study (1-3) Cr/NC/RP
- CIV E 631 Spatial Hydrology (3)
- CIV E 632 Computational Hydraulics and Hydrology (3)
- CIV E 633 Environmental Hydrology (3)
- CIV E 634 Surface Water Hydrology (3)
- CIV E 638 Sedimentation Engineering (3)

Electives: Nine units selected in consultation with the graduate adviser:

A statistics course equivalent to Civil Engineering 160 and an introductory course in environmental engineering equivalent to Environmental Engineering 355 must be taken before or during the early stages of the program.

Electrical Engineering

(Major Code: 09091) (SIMS Code: 443001)

General information: The Department of Electrical and Computer Engineering offers graduate study leading to a Master of Science degree in Electrical Engineering. The program provides balanced opportunities to study practical engineering design and do research.

Specific requirements for the degree: Completion of 30 units of 500-, 600-, or 700-level courses to include one of two options: Plan A (Thesis) or Plan B (Comprehensive Examination). Students cannot use more than 12 units of 500-level courses. Students are required to plan their program of study and have it approved by the graduate adviser to satisfy the depth and breadth course requirements.

1. Depth Requirement: Students are required to declare their depth area and complete a specific set of approved courses. The depth area includes but is not limited to communication systems, computer networks, digital signal processing, electromagnetic systems, embedded systems, energy systems and controls, and VLSI and digital systems.
2. Breadth Requirement: Students are required to complete a specific number of approved courses from areas other than the declared depth area.
3. Requirements for Plan A (Thesis): Students are required to take six units of Electrical Engineering 797 (Research) and three units of Electrical Engineering 799A (Thesis). The remaining 21 units can be taken from the selected depth area or from breadth courses, subject to the approval of the thesis adviser and graduate adviser. Credit for Electrical Engineering 797 will be given only after completing the thesis. Credit cannot be given for Electrical Engineering 798 for students in Plan A.
4. Requirements for Plan B (Comprehensive Examination): Students are required to take 18 units from a selected depth area and nine units of breadth courses. The remaining three units can be taken from the depth area or from a breadth course. Electrical Engineering 797 (Research) cannot be used as one of the required courses. Students taking Plan B must pass a comprehensive examination. The examination tests the understanding and mastery of fundamental principles and ability to apply them to engineering problems. Faculty from the Department of Electrical and Computer Engineering will grade the comprehensive examination for technical correctness, completeness, and clarity of expression. After two unsuccessful

attempts, the student may not take the examination without written permission from the graduate adviser. The graduate adviser may require the student to successfully complete certain additional courses before taking the comprehensive examination for a third and final time. Plan B students intending to take the comprehensive examination, but no course, must register in Electrical Engineering 799C during the semester.

For the availability of the courses, research areas, and other information related to the graduate program, refer to the Department of Electrical and Computer Engineering website at <http://electrical.sdsu.edu>.

Mechanical Engineering

(Major Code: 09101) (SIMS Code: 447001)

General information: The Department of Mechanical Engineering offers graduate study leading to the Master of Science degree in mechanical engineering.

Available opportunities for thesis research and special study projects include heat transfer, thermodynamics, fluid mechanics, mechanics of materials, vibration, controls, CAD/CAM and robotics, materials, optimization and bioengineering.

The following materials should be mailed or delivered to:

Mechanical Engineering Graduate Adviser
Department of Mechanical Engineering, Room 326
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1323

- (1) Personal statement of graduate program goals;
- (2) Letters of recommendation (optional).

Specific requirements for the degree: The student's program, prepared in conference with and approved by the graduate adviser, must satisfy the following requirements:

1. Twenty-one units of coursework:
 - a. Twelve units in one area of specialization (designated as Group A,B,C, or D), with no more than six units of 500-level courses.
 - b. Nine additional units of 500-, 600-, or 700-level courses (excluding M E 797, 798, 799A, 799B, 799C) selected in consultation with the graduate adviser.
 - c. At least 15 units of coursework (excluding M E 797, 798, 799A, 799B, 799C) from mechanical engineering.
2. Nine additional units:
 - a. Thesis students: Six units of M E 797 and three units of 799A or 799B (thesis).
 - b. Non-thesis students: Three units of M E 797 and six units of 500-, 600-, or 700-level courses from mechanical engineering.
3. The total number of units from 500-level courses should not exceed nine.

Group A: Design and Manufacturing

(Major Code: 09101) (SIMS Code: 447071)

- M E 543 Powder-Based Manufacturing (3)
- M E 555 Energy and Thermal Systems Analysis and Design (3)
- M E 580 Biomechanics (3)
- M E 585 Fundamentals of Micro-Electro-Mechanical Systems (MEMS) (3)
- M E 596 Advanced Mechanical Engineering Topics (related to Design and Manufacturing) (3)
- M E 610 Finite Element Methods in Mechanical Engineering (3)
- M E 645 Mechanical Behavior of Engineering Materials (3)
- M E 646 Mechanics of Sintering (3)
- M E 683 Design of Medical Devices (3)
- M E 685/ E E 685 Micro-Electro-Mechanical Systems (MEMS) Design and Applications (3)
- M E 696 Advanced Topics in Mechanical Engineering (related to Design and Manufacturing) (3)
- A E 621 Theory of Elasticity (3)
- A E 641 Structural Optimization (3)

Group B: Dynamics and Control
(Major Code: 09101) (SIMS Code: 447072)

M E 520	Introduction to Mechanical Vibrations (3)
M E 530	Automatic Control Systems (3)
M E 596	Advanced Mechanical Engineering Topics (related to Dynamics and Control) (3)
M E 696	Advanced Topics in Mechanical Engineering (related to Dynamics and Control) (3)

Group C: Energy and Thermofluids
(Major Code: 09101) (SIMS Code: 447073)

M E 555	Energy and Thermal Systems Analysis and Design (3)
M E 556	Solar Energy Conversion (3)
M E 596	Advanced Mechanical Engineering Topics (related to Energy and Thermofluids) (3)
M E 651	Advanced Thermodynamics (3)
M E 653	Combustion (3)
M E 656	Conduction Heat and Transfer (3)
M E 657	Convection Heat Transfer (3)
M E 658	Radiation Heat Transfer (3)
M E 661	Gas Dynamics (3)
M E 696	Advanced Topics in Mechanical Engineering (related to Energy and Thermofluids) (3)
A E 601	Computational Fluid Mechanics (3)
A E 612	Compressible Fluid Flow (3)
A E 644	Turbulent Flow (3)

Group D: Materials and Mechanics
(Major Code: 09101) (SIMS Code: 447074)

M E 520	Introduction to Mechanical Vibrations (3)
M E 540	Nonmetallic Materials (3)
M E 543	Powder-Based Manufacturing (3)
M E 580	Biomechanics (3)
M E 596	Advanced Mechanical Engineering Topics (related to Materials and Mechanics) (3)
M E 610	Finite Element Methods in Mechanical Engineering (3)
M E 645	Mechanical Behavior of Engineering Materials (3)
M E 646	Mechanics of Sintering (3)
M E 681	Biomaterials (3)
M E 696	Advanced Topics in Mechanical Engineering (related to Materials and Mechanics) (3)
A E 621	Theory of Elasticity (3)
A E 641	Structural Optimization (3)

Mechanical Engineering
BS/MS 4+1 Degree Program
(Major Code: 09101)

Students must complete 155 units to be simultaneously awarded the Bachelor of Science degree in mechanical engineering and the Master of Science degree in mechanical engineering. Students can apply for admission to the BS/MS 4+1 degree program when they have successfully completed a minimum of 90 units or a maximum of 115 units. These units must count towards one or the other of the two SDSU degree programs (BS or MS) that will ultimately be awarded in the dual degree program. All students must have a satisfactory score [minimum of 308 for combined verbal and quantitative on the Graduate Record Examination (GRE) General Test] and a minimum overall GPA of 3.0.

To satisfy the requirements for the BS/MS 4+1 degree program (B.S. and M.S. in mechanical engineering), students must achieve at least a 3.0 average in the 30 units of courses used to satisfy the graduate program of study. Of the 30 units, a maximum of nine units may be in 500-level mechanical engineering electives and all other program requirements must be satisfied. Three 500-level courses may be used to fulfill the elective requirements for the BS/MS 4+1 degree program (B.S. and M.S. in mechanical engineering) at the same time as serving as prerequisite courses for graduate study. The

BS/MS 4+1 degree program (B.S. and M.S. in mechanical engineering) allows students to use any three 500-level mechanical engineering courses toward their graduate degree. Students in the BS/MS 4+1 degree program (B.S. and M.S. in mechanical engineering) must follow the thesis option. Upon successful completion of the BS/MS 4+1 degree program, students will receive the B.S. degree in mechanical engineering and M.S. degree in mechanical engineering.

Master of Engineering Degree
(Major Code: 09134) (SIMS Code: 444050)

General Information

The Master of Engineering degree is a practice-oriented, interdisciplinary degree designed to meet the needs of students who are interested in furthering a career in engineering with a business/management emphasis. The student will select his/her own program in consultation with the program adviser of the respective department subject to the guidelines listed below. In addition to the course requirements, the student is required to complete a design project and a final written report. This phase of the program introduces the student to the problems and solutions faced by practicing engineers. The program is designed for both the industrial professional who is seeking a career enhancement and also to the new baccalaureate graduate who wants to continue to study in order to be able to enter the work force with well-defined and honed professional skills.

This program is administered by the graduate adviser. The faculty responsible for directing this program are:

Dr. Janusz C. Supernak, Professor and Interim Chair, Department of Civil, Construction, and Environmental Engineering

Dr. Chunting Mi, Chair, Department of Electrical and Computer Engineering

Dr. John Abraham, Chair, Department of Mechanical Engineering

Dr. Ping Lu, Chair, Department of Aerospace Engineering

In addition to sending materials to Graduate Admissions, the following should also be mailed or delivered to:

Graduate Adviser
 Master of Engineering Program
 College of Engineering
 San Diego State University
 5500 Campanile Drive
 San Diego, CA 92182-1326

(1) Personal statement of graduate program goals;

(2) Letters of recommendation (optional).

Admission to Graduate Study

All students must satisfy the general requirements for admission to the Division of Graduate Affairs with classified graduate standing as described in Part Two of this bulletin. Candidates must have attained an undergraduate grade point average of at least 2.85 (4 point scale) in the last 60 semester (90 quarter hours) of technical study. In addition, applicants must have a bachelor's degree in engineering or a closely related discipline. If undergraduate preparation is deemed insufficient, the student will be required to take specified undergraduate courses to remove this deficiency. Such courses may be in addition to the 36 units required. Admission to the program will be limited to applicants whose background, interest, and expertise are consistent with the demands of the design projects.

Specific Requirements for Master of Engineering Degree

In addition to meeting the requirements for classified graduate standing, the student must satisfy the basic requirements for the master's degree as described in Part Four of this bulletin. The student must also complete a graduate program of 36 units to include 18 units of graduate engineering courses, 12 units of graduate business courses, and six units of project registered under Engineering 798. The courses in engineering and business administration are selected in consultation with the graduate adviser. With the consent of the

adviser, one unit of 798, with appropriate content, may be substituted for one unit in business administration. No more than a total of seven units of 798 will be accepted for credit towards the degree.

The industry-oriented design project is to be selected in cooperation with the graduate adviser in the area of interest. Typically, the students take this project at the end of the program of study as a culminating experience integrating engineering and business knowledge attained through coursework and experience. A formal written report of project findings will be submitted and approved by a committee of two engineering faculty members and one faculty member from business administration.

Section II.
Doctoral Programs
http://www.engineering.sdsu.edu/engineering/joint_doctoral_program.aspx

Engineering Sciences

(Bioengineering)

(Major Code: 09051) (SIMS Code: 446006)

(Electrical and Computer Engineering)

(Major Code: 09095) (SIMS Code: 443050)

(Mechanical and Aerospace Engineering)

(Major Code: 19020) (SIMS Code: 444021)

(Structural Engineering)

(Major Code: 09084) (SIMS Code: 442501)

The cooperating faculties of the College of Engineering at San Diego State University and the Jacobs School of Engineering at the University of California, San Diego offers joint doctoral programs in bioengineering, electrical and computer engineering, mechanical and aerospace engineering, and structural engineering. The Doctor of Philosophy degree is awarded jointly by the Trustees of the California State University and the Regents of the University of California in the names of both cooperating institutions.

The Ph.D. degree is a research degree and represents both attainment of advanced knowledge and demonstration of research skills. It is not awarded solely for the fulfillment of technical requirements such as academic residence and coursework. A typical student with an appropriate bachelor of science degree in engineering may complete the joint program in five to six years of full-time study and research. A student with advanced standing may complete the program in a shorter period of time.

The joint Doctor of Philosophy degree allows research specialties in the following: bioengineering (molecular biomechanics and cell/tissue engineering with a focus in cell-matrix engineering); electrical and computer engineering (communication theory and systems; computer engineering; electronic circuits and systems; intelligence systems, robotics and control; photonics; and signal and image processing); mechanical and aerospace engineering (applied mechanics, materials science, materials processing, computational fluid mechanics, combustion, experimental fluid mechanics); structural engineering (finite element methods in structural analysis, soil mechanics).

Program Administration

San Diego State University:

Program Director: Eugene A. Olevsky

University of California, San Diego:

Program Director: Enrique Luco

Financial Support

Students admitted to the program will be eligible for teaching assistantships and graduate assistantships. It is the policy of SDSU College of Engineering to support doctoral students during their entire tenure as long as they are in good standing, are making satisfactory progress toward their degree, and are in residence at one of the two institutions.

For further information, the student should write to the director of the Engineering Sciences Joint Doctoral Program at the College of Engineering, San Diego State University, San Diego, CA 92182-1326.

Program

Preparation for Admission

Applicants must have an acceptable bachelor's degree or master's degree and must meet the requirements for admission to both SDSU and UCSD. A minimum grade point average of 3.0 in the major field for students with the B.S. degree or 3.5 for students with the M.S. degree is required. Students are expected to have engineering degrees in the classical engineering sciences/applied mechanics areas (i.e. aerospace, chemical, civil, environmental, mechanical). Students with degrees in one of the allied fields (i.e., physics, mathematics, and engineering physics) will be required to remove any academic deficiencies by completing a series of courses normally required of the students who have academic degrees in the applied mechanics areas.

APPLICATIONS FOR THE PH.D. PROGRAM IN ENGINEERING SCIENCES MUST BE RECEIVED NO LATER THAN FEBRUARY 15.

Application

The faculty of the joint doctoral program on each campus will recommend admission of acceptable applicants to the graduate deans at SDSU and UCSD. Entry occurs when the student is formally accepted by both graduate deans and the student is officially notified of the acceptance.

Students applying for admission should electronically submit the university application available at <http://www.calstate.edu/apply> along with the \$55 application fee.

All applicants must submit admissions materials separately to SDSU Graduate Admissions and to the College of Engineering.

Graduate Admissions

The following materials should be submitted as a complete package directly to:

Graduate Admissions
Enrollment Services
San Diego State University
San Diego, CA 92182-7416

- (1) Official transcripts (in sealed envelopes) from all postsecondary institutions attended;

NOTE:

- Students who attended SDSU need only submit transcripts for work completed since last attendance.
- Students with international coursework must submit both the official transcript and proof of degree. If documents are in a language other than English, they must be accompanied by a certified English translation.

- (2) GRE scores (<http://www.ets.org> SDSU institution code 4682);

- (3) English language score, if medium of instruction was in a language other than English (<http://www.ets.org> SDSU institution code 4682).

College of Engineering

The following materials should be mailed or delivered to:

Director, Engineering Joint Doctoral Program
College of Engineering
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1326

- (1) Three letters of recommendation.

Residency Requirements

The student must spend at least one academic year in full-time residence at each of the two institutions. The definition of such residence must be in accord with the regulations of the Divisions of Graduate Affairs of SDSU and UCSD.

Advising Committee

When a student is admitted to the joint doctoral program, the director of the joint doctoral programs in engineering at UCSD and the director of the joint doctoral programs in engineering at SDSU will appoint a three-member advising committee consisting of at least one member from each institution. It is the responsibility of this committee to develop in consultation with the student a course of study and a plan of preparation for the doctoral qualifying examination, which should be taken as soon as possible after the two years of

study at the two institutions. Students with advanced standing may be capable of taking the examination earlier. Upon the student's successful completion of the examination, the advising committee will recommend to the director of the joint doctoral program at UCSD and the director of the joint doctoral program at SDSU, the membership of the student's doctoral committee. Upon appointment, this committee will supersede the advising committee and be responsible for the student's program of study and dissertation research.

Course Requirements

The Doctor of Philosophy degrees in engineering sciences (bioengineering; electrical and computer engineering; mechanical and aerospace engineering; structural engineering) are research degrees and represent both attainment of advanced knowledge and demonstration of research skills. Therefore, no specific course requirements for the joint doctoral programs exist; however, the doctoral qualifying examination is based on a certain level of competence in the general areas of each degree. Preparation for the examination is normally done through coursework in these areas.

Qualifying Examinations

Joint Qualifying Committee

The doctoral program qualifying examination is administered by the student's advising committee supplemented, if appropriate, by faculty appointed by the director of the joint doctoral programs in engineering at UCSD and the director of the joint doctoral programs in engineering at SDSU. The examination will be oral and will be at the level and content of the SDSU and UCSD graduate courses. The specific areas will be approved in advance by the director of the joint doctoral programs in engineering at UCSD and the director of the joint doctoral programs in engineering at SDSU. One of the areas may be satisfied by completing a series of courses in the area with at least a B grade in each course.

Joint Doctoral Committee

Upon successful completion of the doctoral qualifying examination, a doctoral committee shall be appointed by the graduate deans of SDSU and UCSD upon the recommendation of the director of the joint doctoral programs in engineering at UCSD and the director of the joint doctoral program in engineering at SDSU. The doctoral committee shall supervise the continued study and research programs of the student. The chair of the committee is the primary adviser of the student's dissertation research. The dissertation committee will consist of three members from each institution; one of the three will be from outside of the respective UCSD department and one from outside the student's major area.

Senate Qualifying Examination

The major requirement for the doctorate is the completion of a dissertation based on original research, which contributes new knowledge to the fields. The Senate Qualifying Examination consists of a presentation of initial dissertation results and plans for future research. The chair of the doctoral committee will determine in consultation with the student when the Senate Qualifying Examination will be held. Approval of a student's dissertation topic by the doctoral committee implies that the committee believes that the work will contain the potential for one or more articles publishable in refereed journals.

Dissertation

The doctoral committee will administer the final examination, which will consist of the student's presentation and defense of the dissertation, with particular emphasis on the principal findings and areas of future research. The first part of this examination is open to the public; a concluding portion involves appropriate questioning of the student by the committee.

The detailed requirements concerning the preparation of the dissertation, the number of copies, the editorial style, etc., are set forth in the UCSD document entitled "Instructions for the Preparation and Submission of Doctoral Dissertations and Masters' Theses." Acceptance of the dissertation by the University Librarian at UCSD and the Division of Graduate Affairs at SDSU represents the final step in completion of the student's degree requirements.

Satisfactory Progress

The students admitted to this program are expected to make continuous, satisfactory progress and to remain in good standing at both institutions.

Award of the Degree

The Doctor of Philosophy degrees in engineering sciences/applied mechanics, bioengineering, electrical and computer engineering, and structural engineering will be awarded jointly by the Trustees of the California State University and the Regents of the University of California in the names of both cooperating institutions.

Faculty

The following faculty members of the cooperating institutions participate in the joint doctoral programs in engineering and are available for direction of research and as members of joint doctoral committees.

San Diego State University:

Program Director: Eugene A. Olefsky

Committee Members, Mechanical and Aerospace Engineering:

L. Demasi, G. Jacobs, J. Katz, X. Liu, A. Plotkin, S. Venkataraman (Aerospace Engineering), J. Abraham, A. Beyene, S. Bhattacharjee, K.A. Hamed, S. Kassegne, P. Katira, R. Kline, P. Naseradinmousavi, K. May-Newman, M. Mehrabadi, F. Miller, K. Moon, K. Morsi, E. Olefsky, G. Youseff (Mechanical Engineering).

Committee Members, Bioengineering:

S. Kassegne, K. May-Newman.

Committee Members, Electrical and Computer Engineering:

A. Ashrafi, E. Engin, M. Gupta, f. harris, K. Huang, S. Kumar, C. Mi, S. Nagaraj, Y. Ozturk, M. Sarkar, S. Seshagiri, S. Sharma, A. Szeto, L. Tummala

Committee Members, Structural Engineering: Z. Bayasi,

L. Demasi, R. Dowell, T. Garoma, G. Jacobs, J. Katz, A. Plotkin, V. Ponce, J. Valdes, S. Venkataraman.

University of California, San Diego:

Program Director: Enrique Luco

Committee Members, Mechanical and Aerospace Engineering:

R. Bitmead, J. Goddard, S. Krasheninnkov, X. Markenscoff, J. McKittrick, M. Meyers, C. Pozrikidis, J. Talbot, F. Williams (Mechanical and Aerospace Engineering).

Committee Members, Bioengineering:

J. Hasty, M. Heller, A. McCulloch, R. Sah, J. Watson.

Committee Members, Electrical and Computer Engineering:

P. Asbeck, P. Cosman, R. Cruz, T. Javidi, L. Larson, B. Rao, G. Rebeiz, C. Schurgers, P. Yu.

Committee Members, Structural Engineering:

S. Ashford, D. Benson, T. Hutchinson, J. Kosmatka, Q. Zhu.

Section III. Certificate Program

Rehabilitation Technology Certificate

(SIMS Code: 444070)

The purpose of this certificate is to train interested engineers and non-engineers in the field of rehabilitation technology using formal classroom instruction, project design and fabrication, and internship. Enrollment in this certificate program will provide interested engineering students exposure to rehabilitation technology. For non-engineering rehabilitation professionals (e.g. vocational rehabilitation counselors, special education teachers, transition and supported employment specialists), the certificate program will provide specialty training in the application of rehabilitation technology. Specifically, the certificate program will do the following:

1. Expose graduate engineering students to the problems and promises of rehabilitation engineering as a field of specialization.
2. Provide a number of interrelated training activities that will improve the professional competence of employed rehabilitation workers.

3. Provide opportunities for extensive training, in the form of extended internships with knowledgeable rehabilitation professionals whose backgrounds are in such specializations as biomechanics, physical and occupational therapy, prosthetics and orthotics, rehabilitation counseling, rehabilitation electronics, rehabilitation engineering, special education, speech, language, and hearing sciences, etc.
4. Offer both formal classroom instruction and guided problem solving opportunities in designing, building, customizing, and delivering rehabilitation technology for enhancing the integration of individuals with disabilities into school, residential, community, and employment settings.

This is an advanced trans-disciplinary academic certificate at the postbaccalaureate level. Admission requirements include a bachelor's degree in engineering, rehabilitation, or special education, or a related allied health field. Students admitted into the program must maintain a minimum grade point average of 3.0 in all certificate coursework with no less than a grade of C in all courses. Depending on the background and work experience, students may be required to remove deficiencies through additional coursework as part of the certificate requirements.

Students in the certificate program will complete 12 units of formal coursework and one semester of internships as described below unless alternative courses are approved by the program advisers.

Electrical Engineering 502 (Electronic Devices for Rehabilitation - 3 units) will acquaint students with the design and application of electronic devices used in rehabilitation; explain the problems of the disabled; and present possible solutions for some of their needs. This is a non-traditional and practical electrical engineering course that requires student involvement in the collaborative assessment (with students in Speech, Language, and Hearing Sciences 676) of disabled persons for their cognitive, communicative, and physical abilities at the SDSU Communications Clinic.

Administration, Rehabilitation and Postsecondary Education 607 (Applications of Rehabilitation Technology - 3 units) will provide an overview of assistive technology in the areas of assessment, accessibility, mobility, communication, employment, and more. Students will collaborate on transdisciplinary teams to design and construct an adaptation or modification which will enable a person with disabilities to participate more fully in school, work and/or community environments.

Administration, Rehabilitation and Postsecondary Education 685A or 685B (Medical and Psychological Aspects of Disability - 3 units) will cover the impact of different disabilities (e.g. visual and sensory impairments, orthopedic impairments, burns, amputation, chronic pain, cancer, developmental and learning disabilities, traumatic brain injuries, and spinal cord injuries) in terms of functional limitations, rehabilitative services needed, and environmental adjustments required.

Electrical Engineering 798 (Special Study in Rehabilitation Technology Design - 3 units) will provide students hands-on opportunities to work with rehabilitation professionals, occupational and physical therapists, and other non-engineers on technology teams in the design and fabrication of customized adaptations for persons with disabilities.

Internships (one semester) will provide guided field experience through placement with knowledgeable practicing rehabilitation professionals in settings as the Sharp Rehabilitation Center, Assistive Device Assessment Program within the SDSU Communications Clinic-Alvarado, Access Center of San Diego, and San Diego schools.

For application and additional information, contact the program adviser Dr. Andrew Szeto in the Department of Electrical and Computer Engineering or Dr. Caren L. Sax in the Department of Administration, Rehabilitation and Postsecondary Education.

Courses Acceptable for Master's and Doctoral Degree Programs in Engineering (ENGR)

Refer to *Courses and Curricula and Regulations of the Division of Graduate Affairs sections of this bulletin for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.*

GRADUATE COURSES

NOTE: In addition to the courses listed below, a number of other graduate level courses are acceptable for the doctoral degree. For a description of these courses, see individual department listings (e.g., aerospace, civil, construction, and environmental, or mechanical), and contact the director of the doctoral program.

ENGR 795. Internship/Practicum (1) Cr/NC

Prerequisites: Twenty-seven units of graduate level coursework in the Master of Engineering program and consent of graduate adviser.

Supervised internship or practicum experience with approval of graduate adviser. Not applicable to an advanced degree. Maximum credit three units.

ENGR 797. Research (1-3) Cr/NC/RP

Prerequisite: Consent of instructor.

Research in engineering. Maximum credit six units applicable to a master's degree.

ENGR 798. Special Study (1-6) Cr/NC/RP

Prerequisites: Graduate standing and consent of Associate Dean of College of Engineering.

Individual study. Maximum credit six units applicable to Master of Engineering degree.

ENGR 799A. Project (3) Cr/NC/RP

Prerequisites: An officially appointed project committee and advancement to candidacy.

Preparation of a project for the master's degree.

ENGR 799B. Project Extension (0) Cr/NC

Prerequisite: Prior registration in Project 799A with an assigned grade symbol of RP.

Registration required in any semester or term following assignment of RP in Course 799A in which the student expects to use the facilities and resources of the university; also student must be registered in the course when the completed project is granted final approval.

ENGR 799C. Comprehensive Examination Extension (0) Cr/NC

Prerequisite: Completion or concurrent enrollment in degree program courses.

Registration required of students whose only requirement is completion of the comprehensive examination for the master's degree.

DOCTORAL COURSES

ENGR 800. Seminar (1) Cr/NC

Prerequisite: Admission to the doctoral program.

Doctoral students are expected to attend a weekly seminar dealing with current topics in different areas of applied mechanics. Course is to be taken every semester.

ENGR 810. Colloquium in Engineering Sciences (1) Cr/NC/RP

Prerequisite: Admission to the doctoral program.

Discussions on advances in research in engineering science/applied mechanics conducted by SDSU and UCSD faculty.

ENGR 897. Doctoral Research (1-15) Cr/NC/RP

Prerequisite: Admission to the doctoral program.

Independent research in general areas of applied mechanics. Content to be determined after consultation with adviser.

ENGR 898. Doctoral Special Study (1-3) Cr/NC/RP

Prerequisite: Advancement to candidacy.

Individual study leading to study and research required for doctoral dissertation.

ENGR 899. Doctoral Dissertation (3-15) Cr/NC/RP

Prerequisites: An officially constituted joint doctoral committee and successful completion of Senate Qualifying Examination.

Final research and preparation of dissertation for doctoral degree. Enrollment required during term in which dissertation is approved.