

Engineering

In the College of Engineering

OFFICE: Engineering 203
TELEPHONE: 619-594-6061
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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. degree in engineering science/applied mechanics and Master of Science degrees in bioengineering, aerospace, civil, electrical, and mechanical engineering. The Ph.D. degree program is 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.

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 higher.

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.csumentor.edu> 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) TOEFL 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 Two 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 Two 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)

General information: The Department of Aerospace Engineering and Engineering Mechanics 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 mechanics, fracture mechanics, composite structures, random vibrations, fluid-structure interactions, acoustics, and aircraft and spacecraft stability and control.

The following materials should be mailed or delivered to:

Professor S. Venkataraman, Graduate Adviser
 Department of Aerospace Engineering and
 Engineering Mechanics
 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- and 700-numbered courses in aerospace engineering and/or engineering mechanics. At least one course must be 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 and Engineering Mechanics

1. Aerodynamics/Astronautics

- | | |
|--------|-----------------------------------|
| AE 601 | Computational Fluid Mechanics (3) |
| AE 612 | Compressible Fluid Flow (3) |
| AE 620 | Incompressible Aerodynamics (3) |
| AE 643 | Laminar Flow (3) |
| AE 644 | Turbulent Flow (3) |

2. Structural Mechanics

- | | |
|--------|---------------------------------|
| EM 600 | Seminar (1-3) |
| EM 603 | Theory of Vibrations (3) |
| EM 611 | Vibration of Elastic Solids (3) |
| EM 621 | Theory of Elasticity (3) |
| EM 711 | Structural Acoustics (3) |
| EM 724 | Theory of Plates and Shells (3) |
| EM 727 | Theory of Elastic Stability (3) |

Bioengineering (Major Code: 09051)

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:

Dr. Karen May-Newman
 College of Engineering
 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 (ME 797/EE 797), Thesis (ME 799A/EE 799A), or Special Study (ME 798/EE 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

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

Biomaterials

- | | |
|---------------|-----------------------------------|
| BIOL 585 | Cell and Molecular Immunology (3) |
| ME 540 | Nonmetallic Materials (3) |
| ME 681 | Biomaterials (3) |
| ME 685/EE 685 | MEMS Design and Applications (3) |

Bioinstrumentation

- | | |
|---------------|----------------------------------|
| BIOL 590 | Physiology of Human Systems (4) |
| EE 503 | Biomedical Instrumentation (3) |
| EE 539 | Instrumentation Circuits I (3) |
| EE 685/ME 685 | MEMS Design and Applications (3) |
| ME 580 | Biomechanics (3) |

Electives:

- | | |
|-----------|---|
| AE 601 | Computational Fluid Dynamics (3) |
| BIOL 585 | Cell and Molecular Immunology (3) |
| BIOL 590 | Physiology of Human Systems (4) |
| BIOL 597A | Univariate Statistical Methods in Biology (3) |
| CHEM 711 | Chemical Thermodynamics (3) |
| CHEM 712 | Chemical Kinetics (3) |
| CHEM 751 | Separations Science (3) |
| EE 503 | Biomedical Instrumentation (3) |
| EE 539 | Instrumentation Circuits I (3) |
| EM 585 | Fundamentals of Micro-Electro-Mechanical Systems (MEMS) (3) |
| EM 621 | Theory of Elasticity (3) |
| ENS 630 | Advanced Biomechanics: Kinematics (3) |
| ENS 631 | Advanced Biomechanics: Kinetics (3) |
| ENS 660 | Advanced Kinesiology (3) |
| ENS 673 | Advanced Principles of Motor Control (3) |
| ENV E 554 | Process Fundamentals of Environmental Systems (3) |
| ENV E 648 | Biological Processes and Bioremediation Engineering (3) |
| ME 540 | Nonmetallic Materials (3) |
| ME 580 | Biomechanics (3) |
| ME 610 | Finite Element Methods in Mechanical Engineering (3) |
| ME 645 | Mechanical Behavior of Engineering Materials (3) |
| ME 656 | Conduction of Heat and Mass Transfer (3) |
| ME 681 | Biomaterials (3) |
| PHYS 670A | Medical Physics I (3) |
| PHYS 670B | Medical Physics II (3) |

RA 601	Pharmaceutical, Biotechnology, and Medical Device Industries (3)
RA 602	Food and Drug Law (3)
RA 770	Current Good Manufacturing Practice – General Concepts (3)

Civil Engineering

General information: The Department of Civil 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 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.

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. Julio R. Valdes, Graduate Adviser
Department of Civil 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).

Concentration in Environmental Engineering (Major Code: 09221)

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

1. A minimum of 21 units of coursework, and up to nine combined units of Research (ENV E 797), Thesis (ENV E 799A), and Special Topics (ENV E 798).
2. Eighteen units of 600- and 700-numbered courses in civil and environmental engineering.

Required courses:

ENV E 554	Process Fundamentals of Environmental Systems (3)
ENV E 645	Aquatic Chemistry for Environmental Engineers (3)
ENV E 646	Microbiological Principles for Environmental Engineering (3)
ENV E 647	Physical and Chemical Processes of Water Pollution Control (3)
ENV E 648	Biological Processes and Bioremediation Engineering (3)

Electives:

ENV E 553	Environmental Engineering Laboratory (3)
ENV E 556	Air Pollution Engineering (3)
ENV E 558	Solid and Hazardous Waste Engineering (3)
ENV E 637	Process Design for Industrial Waste 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
ENV E 799A	Thesis or Project (3) Cr/NC/RP
ENV E 799B	Thesis or Project Extension (0) Cr/NC
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 and River Engineering (3)

Other electives may be arranged on an individual basis by the faculty adviser and the student.

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.

Specializations in Civil Engineering (Major Code: 09081)

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

1. Eighteen units of 600- and 700-numbered courses in civil engineering. A total of no more than three units from courses numbered 797, 798, and 799 may be used to satisfy this requirement.
2. A minimum of four courses should be selected from one of the specialty areas 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 specific professional area.
3. At least twelve additional units of 500-, 600- or 700-numbered courses, approved by the graduate adviser.

Areas of Specialization in Civil Engineering

1. Geotechnical Engineering

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)

2. Structural Engineering

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)

3. Transportation Engineering

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)

4. Water Resources Engineering

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 and River Engineering (3)

Electrical Engineering (Major Code: 09091)

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. Research assistantships are available in the research areas of computer engineering, digital system design, VLSI design, digital signal processing and communications systems, electro-optic system design and instrumentation, applied electron and molecular spectroscopy, power systems, and biomedical/rehabilitation engineering.

The following materials should be mailed or delivered to:

Graduate Adviser
Department of Electrical and Computer Engineering
San Diego State University
5500 Campanile Drive
San Diego, CA 92182-1309

- (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. Eighteen units of 600- and 700-numbered courses in electrical engineering. Students in Plan B cannot use Electrical Engineering 797 as one of the courses required for graduation.
 2. At least six additional units of 500-, 600- or 700-numbered courses in the College of Engineering or, with the prior approval of the graduate adviser, in the College of Sciences.
 3. Six elective units of 500-, 600- or 700-numbered courses approved by the graduate adviser.
 4. Prerequisites for all courses taken for the degree must be completed with a grade of C or better.
 5. As a breadth requirement, each classified graduate student is required to complete, with approval of the graduate adviser, at least one course from four of the following specialty areas: Communications, Computers, Electronics/Networks, Physical Electronics, Power/Control Systems. If the course content is appropriate, the graduate adviser may approve certain Electrical Engineering 596 courses to satisfy part of the breadth requirement.
- Disciplines and related courses:**
- Communications:** Computer Engineering 560, 565; Electrical Engineering 553, 556, 558, 650, 652, 653, 654, 655, 656, 657, 658, 705, 750.
- Computers:** Computer Engineering 561, 572; Electrical Engineering 660, 672, 675, 678, 679, 706, 770.
- Electronics:** Electrical Engineering 502, 503, 530, 534, 539, 631, 634, 730.
- Physical Electronics:** Electrical Engineering 540, 541, 546, 641, 642, 645, 740.
- Power/Control Systems:** Electrical Engineering 580, 581, 620, 622, 720.
6. Students selecting Plan B must pass a written comprehensive examination. The examination tests the students' understanding and mastery of *fundamental principles* and their ability to apply them to engineering problems. Members of the ECE faculty will grade the comprehensive examination for technical correctness, completeness, and clarity of expression. After two unsuccessful attempts, the student may not take the examination again without written permission from the graduate adviser. The adviser may require the student to successfully complete certain additional courses before taking the comprehensive examination a third and final time. Students in Plan A will be given credit in Electrical Engineering 797 only after completing the thesis.

Mechanical Engineering (Major Code: 09101)

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, mechanical design, vibration, controls, CAD/CAM and robotics, materials, optimization and bioengineering.

The following materials should be mailed or delivered to:

Dr. Subrata Bhattacharjee, Graduate Adviser
Department of Mechanical Engineering
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 600- and 700-numbered courses in mechanical engineering to include 12 units in one area of specialization (designated as Group A and Group B) and Mechanical Engineering 797 or alternative courses subject to approval of graduate adviser.
2. Nine additional units of 500-, 600- and 700-numbered courses approved by the graduate adviser.

Areas of Specialization in Mechanical Engineering

Group A: Thermal Sciences

ME 651	Advanced Thermodynamics (3)
ME 656	Conduction of Heat and Mass Transfer (3)
ME 658	Radiation Heat Transfer (3)
ME 661	Gas Dynamics (3)

Group B: Engineering Design

ME 610	Finite Element Methods in Mechanical Engineering (3)
ME 614	Engineering Design: Analytical Methods (3)
ME 621	Mechanical Vibrations (3)
ME 632	Advanced Topics in Automatic Controls (3)
ME 645	Mechanical Behavior of Engineering Materials (3)

Master of Engineering Degree

(Major Code: 09134)

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.

The program is administered by the associate dean of Graduate Studies and Research in the College of Engineering. The faculty responsible for directing this program are:

- Dr. R. Lal Tummala, Professor and Chair, Department of Electrical and Computer Engineering
- Dr. Ronald A. Kline, Professor, Department of Mechanical Engineering
- Dr. Kenneth D. Walsh, Associate Professor, Department of Civil and Environmental 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

The student's program, prepared with the approval of the graduate adviser, consists of 36 units to include 30 units of coursework and six units of design project. The courses are selected from an approved list in consultation with the adviser and the following six units to complete the project.

ENGR 797 Research (3) Cr/NC/RP
ENGR 799A Thesis or Project (3) Cr/NC/RP

The industry-oriented design project to be selected in cooperation with the graduate adviser in the area of interest. The project will be specifically designed to address both the technical and economic aspects in the solution of an engineering problem. A formal written report of project findings will be submitted to and approved by a committee of two engineering faculty members and one faculty member from business administration.

**Section II.
Doctoral Program**
<http://attila.sdsu.edu/jdp/>

Engineering Sciences/Applied Mechanics

(Major Code: 09012)

The cooperating faculties of the College of Engineering at San Diego State University and the Department of Mechanical and Aerospace Engineering at the University of California, San Diego offer a joint doctoral program in engineering sciences/applied mechanics. 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 research interests of the participating faculty members cover a wide range of subjects including: acoustics, biomechanics, boundary layer separation, boundary layer stability, computational fluid mechanics, combustion, experimental fluid mechanics, finite element methods in structural analysis, flow field acoustic interaction, gas physics, hydrology, hypersonic flow field, low speed aerodynamics, material science, material processing, soil mechanics, structural fluid interaction, and two phase flows, and all aspects of environmental engineering, including development and application of air, water, and soil pollution control methods.

At SDSU, the major areas of research at the graduate level and the participating faculty members that constitute the Graduate Group in Applied Mechanics include:

Acoustics: M. Pierucci

Aerodynamics: J. Katz, A. Plotkin

Bioengineering: K. May-Newman, A. Szeto

Combustion: S. Bhattacharjee

Computational Mechanics: T. Impelluso, J. Katz, R. Kline, E. Olevsky, V. Ponce, S. Venkataraman

Design Optimization: S. Venkataraman

Environmental Engineering: M. Guroi

Experimental Mechanics: Z. Bayasi, R. Kline

Fluid Mechanics: J. Katz, N. Nosseir, A. Plotkin

Hydrology: H. Chang, V. Ponce

Material Engineering: Z. Bayasi, J. Burns, R. Kline, K. Morsi, E. Olevsky, B. Westermo

Robotics and Controls: G. Lee, L. Tummala

Soil Mechanics: B. Westermo

Structure and Fluid Interactions: M. Pierucci, B. Westermo

Structural Mechanics: Z. Bayasi, M. Pierucci, S. Venkataraman, B. Westermo

Thermal Sciences: S. Bhattacharjee

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/Applied Mechanics 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 3.4 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, electrical engineering, 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/APPLIED MECHANICS 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.csumentor.edu> 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) TOEFL 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 of the Engineering Sciences/Applied
Mechanics 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 chair of the Department of Mechanical and Aerospace Engineering at UCSD and the director of the joint doctoral program in engineering sciences/applied mechanics 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 chair of the Department of Mechanical and Aerospace Engineering 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 degree in engineering sciences/applied mechanics is a research degree and represents both attainment of advanced knowledge and demonstration of research skills. Therefore, no specific course requirements for the joint doctoral program exist; however, the doctoral qualifying examination is based on a certain level of competence in the general areas of (1) fluid mechanics, (2) solid mechanics, and (3) applied mathematics. 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 chair of the Department of Mechanical and Aerospace Engineering at UCSD and the director of the joint doctoral program at SDSU. The examination will be oral, will cover at least four areas selected to ensure appropriate competence in the general area of applied mechanics, 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 chair of the Department of Mechanical and Aerospace Engineering at UCSD and the director of the joint doctoral program 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 chair of the Department of Mechanical and Aerospace Engineering at UCSD and the director of the joint doctoral program 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 Department of Mechanical and Aerospace Engineering 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 degree in engineering sciences/applied mechanics 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 program in engineering sciences/applied mechanics and are available for direction of research and as members of joint doctoral committees.

San Diego State University:

Program Director: Gordon K. F. Lee

Committee Members:

J. Katz, N. Nossair, M. Pierucci, A. Plotkin, S. Venkataraman (Aerospace Engineering and Engineering Mechanics).
 B. Badriyha, Z. Bayasi, H. Chang, M. Guroi, V. Ponce,
 B. Westermo (Civil and Environmental Engineering). M. Gupta,
 A. Szeto, L. Tummala (Electrical and Computer Engineering).
 J. Castillo, M. Tarokh (Computer Science). S. Bhattacharjee,
 J. Burns, T. Impelluso, R. Kline, M. Lambert, K. May-Newman,
 K. Morsi, E. Olevsky (Mechanical Engineering).

University of California, San Diego:

Program Director: P. Linden

Committee Members:

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

Section III. Other Programs

Rehabilitation Technology Certificate

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 from the SDSU Communications Clinic-Alvarado.

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 on Master's 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.

UPPER DIVISION COURSE**ENGR 510. Methods of Analysis (3)**

Prerequisite: Engineering 280 with minimum grade of C.

Selected topics from vector calculus, partial differential equations, and complex analysis, with engineering applications.

Courses Acceptable on Doctoral Degree Program in Engineering (ENGR)

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 and environmental, or mechanical), and contact the director of the doctoral program.

GRADUATE COURSES**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 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.

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.

