Mechanical Engineering

In the College of Engineering

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The undergraduate program in Mechanical Engineering is accredited by the Engineering Accreditation Commission (EAC) of ABET, http://www.abet.org.

Faculty

Emeritus: Bailey, German, Hoyt, Hussain, Impelluso, Lybarger, Mansfield, Murphy
Chair: Abraham
Professors: Abraham, Beyene, Bhattacharjee, Kassegne, Kline, May-Newman, Moon, Morsi, Olevsky
Associate Professors: Miller, Youssef
Assistant Professors: Bhalla, Camacho, Kang, Katira, Naseradinmousavi, Park, Wood, Xu, Yang

Offered by the Department

Doctor of Philosophy degree in engineering sciences: (bioengineering), (electrical and computer engineering), (mechanical and aerospace engineering), (structural engineering).

Master of Engineering.

Master of Science degree in bioengineering.

Master of Science degree in mechanical engineering.

Major in mechanical engineering with the B.S. degree. Emphasis in bioengineering.

Transfer Credit

No credit will be given for upper division engineering coursework taken at an institution having an engineering program which has not been accredited by the Engineering Accreditation Commission (EAC) of ABET, unless the student successfully completes the first 12 units of engineering work attempted at this university. At that time, and upon recommendation of the department, credit will be given for the unaccredited work.

The Major

Global engineering challenges include the pressing need to deliver healthcare effectively and efficiently, generate and deliver clean energy and water, and make the environment that we live in sustainable. Mechanical engineers are actively involved in finding solutions to address these challenges. Finding solutions requires the integration of science, engineering, and socioeconomic knowledge. Mechanical engineering students study a broad range of topics to prepare them for successful engineering careers. Upon graduation, mechanical engineering students will be able to apply principles of basic science, engineering, and mathematics (including differential equations and multivariate calculus) to analyze and interpret data; analyze, design, model, and realize physical systems, components or processes; apply techniques, skills, and modern engineering tools necessary for engineering practice; collaborate on multidisciplinary teams; communicate effectively; design a system, component, or process to meet desired needs; design and conduct experiments; formulate, identify, solve engineering problems; identify contemporary issues; recognize the need for an ability to engage in life-long learning; understand impacts of engineering solutions in a global and societal context; understand professional and ethical responsibility; work professionally in both thermal and mechanical systems areas.

Jobs in mechanical engineering include designing farm equipment to improve crop yield throughout the world, developing systems for biological research as well as lifesaving medical equipment, developing products to generate efficient energy sources that minimize environmental impact, and improving air and water quality. A mechanical engineer, now more than ever, is someone who can translate scientific theories into real products and processes to improve the quality of life.

Design methodology and design projects are integrated throughout the curriculum, culminating in a capstone design experience in the senior year where students work on a design project as part of a design team.

The emphasis in bioengineering prepares students for employment in industry, or for higher professional degrees in bioengineering, engineering, or medicine.

In addition to the majors in mechanical engineering with the B.S. degree and emphasis in bioengineering, the department offers two BS/MS 4 +1 degrees: The BS/MS 4+1 degree program with B.S. and M.S. in Mechanical Engineering and the BS/MS 4+1 degree program with B.S. in Mechanical Engineering and M.S. in Bioengineering. These degrees are for SDSU mechanical engineering students who wish to gain expertise in a specialization of mechanical engineering or bioengineering prior to employment in industry, government, or as preparation for further training.

Program Educational Objectives

The educational objectives of the mechanical engineering program are to prepare students who, after they graduate with a Bachelor of Science degree, are committed to:

1. Applying an open-minded but critical approach to the analysis of problems and the design of innovative and sustainable engineering solutions while employed in industry, government organizations, research and development, or in entrepreneurial efforts (professional practice);
2. Actively participating in ongoing professional development opportunities (professional development);
3. Conducting themselves responsibly, professionally, and ethically with a broad appreciation of the world and the role that engineering plays in society (service and citizenship).

Retention Policy

The engineering program expects all majors will make reasonable academic progress toward the degree. Engineering premajors who have either (1) completed major preparatory courses, earned 60 units, but have less than a 2.7 cumulative GPA; or (2) earned 60 units but have not completed major preparatory courses and/or have less than a 2.7 cumulative GPA may be removed from the premajor and placed in undeclared.

Impacted Program

The mechanical engineering major is an impacted program. To be admitted to the mechanical engineering major, students must meet the following criteria:

a. Complete with a grade of C (2.0) or better: Mechanical Engineering 200 [or Aerospace Engineering 200]; Chemistry 202 (or 200); Mathematics 150, 151; Physics 195, 196. These courses cannot be taken for credit/no credit (Cr/NC);
b. Have an overall cumulative GPA of 2.7.

To complete the major, students must fulfill the degree requirements for the major described in the catalog in effect at the time they are accepted into the premajor at SDSU (assuming continuous enrollment).

Major Academic Plans (MAPs)

Visit http://www.sdsu.edu/mymap for the recommended courses needed to fulfill your major requirements. The MAPs website was created to help students navigate the course requirements for their majors and to identify which General Education course will also fulfill a major preparation course requirement.

Mechanical Engineering Major

With the B.S. Degree

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

This program requires 138 units to include general education. In addition, the total number of units specified in each elective category represents a minimum requirement.

All students in mechanical engineering pursue a common program of basic sciences, engineering, and mechanical engineering fundamentals. Students are provided with the opportunity to select a pattern of study to satisfy their areas of interest. This pattern of study is indicated in the sequence known as "professional electives" and may be selected from available courses in controls, energy conversion, gas dynamics, heat transfer, machine design, materials, thermodynamics, vibrations, and other areas.

Students must complete all upper division courses in the major within seven years prior to graduation. Students who will have completed any of those courses more than seven years before the projected date of graduation must contact the department chair for information about ways to certify knowledge of current course content.

Preparation for the Major. Mechanical Engineering 190, 200 [or Aerospace Engineering 200], 202, 220 [or Aerospace Engineering 220], 240, 241; Aerospace Engineering 280; Biology 100 or 101; Chemistry 202 (or 200); Electrical Engineering 204; Mathematics 150, 151, 252; Physics 195, 195L, 196, 196L, 197. (51 units)

The following courses: Mechanical Engineering 200 [or Aerospace Engineering 200]; Chemistry 202 (or 200); Mathematics 150, 151; Physics 195, 196 must be completed with a grade of C (2.0) or better. These courses cannot be taken for credit/no credit (Cr/NC).

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See "Graduation Requirements" section for a complete listing of requirements.

Major. A minimum of 48 upper division units to include Mechanical Engineering 304 (or Civil Engineering 301), 310, 314, 330, 350, 351, 360, 452, 490A, 490B, 495, 520, 555; Aerospace Engineering 341. Professional electives: Nine units of additional coursework may be selected from any 400- or 500-level mechanical engineering course, Aerospace Engineering 515, 535 [or Mechanical Engineering 535], or approved courses from other departments.

Master Plan. The master plan provides an advising record for mechanical engineering majors and should be initiated by the student with their faculty adviser during the second semester of the freshman year. All students must have a master plan on file in the department prior to enrollment in Mechanical Engineering 310. The master plan must be reviewed each semester with the faculty adviser before registration. All course substitutions must be approved by the department chair.

Emphasis in Bioengineering

(SIMS Code: 447002)

This program requires 138 units to include general education. In addition, the total number of units specified in each elective category represents a minimum requirement.

Preparation for the Major. Mechanical Engineering 190, 200 [or Aerospace Engineering 200], 202, 220 [or Aerospace Engineering 220], 240, 241; Aerospace Engineering 280; Biology 203; Chemistry 202 (or 200); Electrical Engineering 204; Mathematics 150, 151, 252; Physics 195, 195L, 196, 196L. Three to five units selected from: Biology 212, Chemistry 201, Chemistry 232 and Chemistry 232L, or Physics 197. (51-54 units)

The following courses: Chemistry 202 (or 200); Mathematics 150, 151; Physics 195, 196; Mechanical Engineering 200 [or Aerospace Engineering 200] must be completed with a grade of C (2.0) or better. These courses cannot be taken for credit/no credit (Cr/NC).

General Education. Students with this emphasis are required to take Biology 336 to satisfy three units of upper division Natural Sciences, IV.A.

Graduation Writing Assessment Requirement. Passing the Writing Placement Assessment with a score of 10 or above or completing one of the approved upper division writing courses (W) with a grade of C (2.0) or better. See "Graduation Requirements" section for a complete listing of requirements.

Major. A minimum of 51 upper division units to include Mechanical Engineering 304 (or Civil Engineering 301), 310, 314, 330, 350, 351, 360, 452, 490A, 490B, 499 (three units), 520, 555, 580, 585; Aerospace Engineering 341; Biology 336, 436. Biology 336 will also satisfy three units of the General Education requirement in IV.A.

BS/MS 4+1 Degree Program
B.S. and M.S. in Mechanical Engineering

(SIMS Code: 447012)

Students must complete 159 units to be simultaneously awarded the B.S. degree in mechanical engineering and the M.S. degree in mechanical engineering. Students can apply for admission to the BS/MS 4+1 (B.S. and M.S. in Mechanical Engineering) 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-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 4+1 BS/MS 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 M E 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.

BS/MS 4+1 Degree Program
B.S. in Mechanical Engineering and M.S. in Bioengineering

(SIMS Code: 447013)

Students must complete 159 units to be simultaneously awarded the B.S. degree in mechanical engineering and the M.S. 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.

Courses (M E)

Refer to Courses and Curricula and University Policies sections of this catalog for explanation of the course numbering system, unit or credit hour, prerequisites, and related information.

LOWER DIVISION COURSES

M E 101. Solid Modeling I (2)

Six hours of laboratory.

Introduction to 3-D computer-aided mechanical design. Creation of basic to intermediate solid parts, assemblies, and drawings to include orthographic, pictorial, section, and detail views. Dimensioning, dimensional tolerancing, and thread notation per ASME Y14.5M-1994. CREO and SolidWorks software.

M E 102. Solid Modeling II (2)

Six hours of laboratory.

Prerequisite: Mechanical Engineering 101.

Continuation of 3-D computer-aided mechanical design. Creation of advanced solid parts, assemblies, and drawings. Standard fits and geometric tolerancing per ASME Y14.5M-1994. CREO and SolidWorks software. Finite element analysis of mechanical components using CREO and SolidWorks simulation software. Computer numerical controlled manufacturing using HSMWorks software.

M E 190. Computer-Aided Design (2)

One lecture and three hours of laboratory.

Introduction to 3-D computer-aided mechanical design. Creation of basic to intermediate solid parts, assemblies, and drawings to include orthographic, pictorial, section, and detail views. Dimensioning, dimensional tolerancing, and thread notation per ASME Y14.5M-2009. SolidWorks software. Not open to students with credit in Mechanical Engineering 102.

M E 200. Statics (3)
(Same course as Aerospace Engineering 200)

Prerequisites: Mathematics 150 and Physics 195 with a grade of C (2.0) or better in each course. **Proof of completion of prerequisites required**: Copy of transcript.

Force systems, equilibrium, structures, distributed forces, friction, virtual work, moments of inertia, vector algebra.

M E 202. Computer Programming and Applications (3)

Two lectures and three hours of activity.

Prerequisite: Mathematics 151.

Principles of programming using Matlab. Syntax topics to include arrays, control flow, data types, functions, and loops. Numerical methods to include curve fitting, Gauss reduction, interpolation, matrix operations, Newton-Raphson, numerical differentiation, and numerical integration. Matlab implementations. Application areas in mechanical engineering to include dynamic systems, finite element analysis, graphical user interfaces, and image analysis.

M E 220. Dynamics (3)
(Same course as Aerospace Engineering 220)

Prerequisites: Mechanical Engineering 200 [or Aerospace Engineering 200] and Mathematics 151 with a grade of C (2.0) or better in each course. **Proof of completion of prerequisites required**: Copy of transcript.

Kinetics of a particle; central force motion; systems of particles; work and energy; impulse and momentum; moments and products of inertia; Euler's equations of motion; vibration and time response; engineering applications.

M E 240. Introduction to Engineering Materials (3)

Prerequisite: Chemistry 202 (or 200). **Proof of completion of prerequisite required**: Copy of transcript.

Atomic and molecular structure of materials utilized in engineering. Analysis of the relationships between structure of materials and their mechanical, thermal, electrical, corrosion, and radiation properties. Examples of material structure relevant to civil, electrical, aerospace, and mechanical engineering applications.

M E 241. Materials Laboratory (1)

Three hours of laboratory.

Prerequisite: Mechanical Engineering 240.

Experimental methods used to characterize engineering materials and their mechanical behavior.

M E 296. Experimental Topics (1-4)

Selected topics. May be repeated with new content. See *Class Schedule* for specific content. Limit of nine units of any combination of 296, 496, 596 courses applicable to a bachelor's degree.

UPPER DIVISION COURSES

(Intended for Undergraduates)

NOTE: Proof of completion of prerequisites required for all Mechanical Engineering 300-, 400-, and 500-level courses: Copy of transcript.

M E 304. Mechanics of Materials (3)

Prerequisite: Mechanical Engineering 200 [or Aerospace Engineering 200] or Civil Engineering 225 with a grade of C (2.0) or better.

Concepts of stress and strain. Generalized Hooke's law. Formulations for axial, shear, bending, torsion, and combined stresses applied to tension members, pinned joints, beams, and shafts. Euler buckling criteria for columns. Energy methods. Not open to students with credit in Civil Engineering 301.

M E 310. Engineering Design: Introduction (3)

Two lectures and three hours of guided design activities.

Prerequisites: Mechanical Engineering 190, 202, and 220 [or Aerospace Engineering 220]. Every mechanical engineering student must have a master plan on file before enrolling in Mechanical Engineering 310.

Professional approach to engineering design problems. Problem definition, information gathering, feasibility studies, analysis, final design and communication. Several design studies and projects are completed.

M E 314. Engineering Design: Mechanical Components (3)

Prerequisites: Mechanical Engineering 190, 202, 241, 304 (or Civil Engineering 301).

Application of mechanics, physical properties of materials, and solid mechanics to the design of machine elements. Student design projects.

M E 330. Mechatronics Laboratory (3)

Two lectures and three hours of laboratory.

Prerequisites: Mechanical Engineering 202, 220 [or Aerospace Engineering 220]; Electrical Engineering 204; Aerospace Engineering 280 and Physics 196L.

Actuating devices, data acquisition systems, hardware controllers, machine and process control applications, sensors and transducers, transducer signal processing and conditioning.

M E 350. Thermodynamics (3)

Prerequisites: Mechanical Engineering 200 [or Aerospace Engineering 200] or Civil Engineering 225; Mathematics 252.

Basic concepts and principles of thermodynamics with emphasis on simple compressible substances. First and second law analysis, entropy, exergy analysis and state relations. Not open to students with credit in Mechanical Engineering 352.

M E 351. Engineering Thermodynamics (3)

Prerequisite: Mechanical Engineering 350.

Analysis and design of gas and vapor power cycles, and refrigeration systems. Generalized property relations for gases and gas-vapor. Air-conditioning. Combustion and chemical equilibrium. Design of engineering systems and processes.

M E 360. Fluids Engineering (3)
Prerequisites: Mechanical Engineering 220 [or Aerospace Engineering 220] and Aerospace Engineering 280.
Fluid mechanics with applications to mechanical engineering systems. Statics and dynamics of fluids. Conservation laws of mass, momentum and energy analysis in control volume and differential form. Real life applications of these fundamental concepts and systems to include turbomachinery. Not open to students with credit in Aerospace Engineering 340.

M E 420. Fundamentals of Manufacturing (3)
Prerequisite: Mechanical Engineering 314.
Applications of mechanics of materials and systems in product design and fabrication. Design challenges and constraints of various fabrication technologies. Fabrication technologies and processes.

M E 430. System Modeling and Analysis (3)
Prerequisite: Mechanical Engineering 330.
System-level lumped parameter modeling of dynamic systems using first principles. Predict performance of engineered systems based on its dynamic response. Feedback control to achieve closed loop stability and specified system performances.

M E 452. Principles of Heat Transfer (3)
Prerequisites: Mechanical Engineering 350 and 360.
Analytical and numerical solutions of steady and transient one- and two-dimensional conduction problems, forced and natural convection in external and internal flows, and thermal radiation. Applications.

M E 490A. Engineering Design: Senior Project (3)
One lecture and six hours of guided design activities.
Prerequisites: Mechanical Engineering 304 (or Civil Engineering 301), 310, 314, 452. Every mechanical engineering student must have a master plan on file before enrolling in Mechanical Engineering 490A.
Applications of engineering principles and design techniques to the designing, building, and testing of an engineering system. Part one of a single project is completed in this two-course sequence and is judged completed upon presentation of an oral and a written report. In addition, issues related to ethics and engineering practice are discussed.

M E 490B. Engineering Design: Senior Project (3)
One lecture and six hours of guided design activities.
Prerequisites: Mechanical Engineering 490A and 495.
Applications of engineering principles and design techniques to the designing, building, and testing of an engineering system. Part two of a single project is completed in this two-course sequence and is judged completed upon presentation of an oral and a written report. In addition, issues related to ethics and engineering practice are discussed.

M E 495. Mechanical and Thermal Systems Laboratory (2)
One lecture and three hours of laboratory.
Prerequisites: Mechanical Engineering 310, 330, 351, 452.
Data acquisition theory, instrumentation, sensors, data reduction, statistical and uncertainty analysis, and design of experiments. Experience in designing, performing, and reporting experiments on mechanical and thermal systems, mechanisms, vibrations, structures, thermodynamics, heat transfer.

M E 496. Advanced Mechanical Engineering Topics (1-3)
Prerequisite: Consent of instructor.
Modern developments in mechanical engineering. See *Class Schedule* for specific content. Maximum credit nine units for any combination of Mechanical Engineering 496, 499 and 596.

M E 499. Special Study (1-3)
Prerequisite: Consent of instructor.
Individual study. Maximum credit nine units for any combination of Mechanical Engineering 496, 499 and 596.

UPPER DIVISION COURSES

(Also Acceptable for Advanced Degrees)

NOTE: Proof of completion of prerequisites required for all Mechanical Engineering 300-, 400-, and 500-level courses: Copy of transcript.

M E 520. Introduction to Mechanical Vibrations (3)
Prerequisites: Mechanical Engineering 304 (or Civil Engineering 301) and Mechanical Engineering 330.
Analysis of mechanical vibration; single- and multi-degree of freedom systems; free and forced vibrations; vibration isolation; vibration absorbers. Theory of vibration measuring instruments.

M E 530. Automatic Control Systems (3)
Prerequisite: Mechanical Engineering 330.
Dynamic characteristics of control components and systems. Stability and response of closed loop systems. Design of control systems.

M E 532. Robot Modeling and Control (3)
Prerequisite: Mechanical Engineering 330.
Analysis, computer programming, modeling, motion planning, and design of control systems for robots.

M E 535. Mechanics of Composite Structures (3)
(Same course as Aerospace Engineering 535)
Prerequisites: Aerospace Engineering 280 and Aerospace Engineering 310 or Mechanical Engineering 314.
Micro- and macro-mechanics of composite materials, classical lamination theory, initial failure prediction and progressive failure analysis of laminates, analysis of beam and plate structures, stiffness and strength based design of composites.

M E 540. Mechanics of Polymers (3)
Prerequisite: Mechanical Engineering 314.
Polymeric materials, mechanics, and properties. Mechanical mechanics and properties essential for design. Stress-Strain behavior theories and models to include hyperelasticity and viscoelasticity. Design and analysis methodologies and techniques.

M E 543. Powder-Based Manufacturing (3)
Prerequisite: Mechanical Engineering 240.
Manufacturing of micro and nano-structured engineering components and composites starting with metal and/or ceramic powders. Powder production methods, characterization, powder shaping and compaction, sintering, hot consolidation, design considerations, and finishing operations.

M E 552. Heating, Ventilating, and Air-Conditioning (3)
Prerequisites: Mechanical Engineering 351 and 452.
Fundamentals of air conditioning processes, psychrometrics, and building cooling load calculations. Design and analysis of HVAC systems. Equipment selection. Design codes and standards. Computerized cooling load calculations.

M E 554. Automotive Power (3)
Prerequisites: Mechanical Engineering 351 and 452.
Conventional and emerging energy conversion devices for automotive applications to include fuel-cell, hybrid, and internal combustion engines. Alternative fuels to include biofuels, cleaner fossil fuels, hydrogen, and natural gas. Well-to-wheel energy and cost analysis of prime mover designs/fuels.

M E 555. Energy and Thermal Systems Analysis and Design (3)
Prerequisites: Mechanical Engineering 351 and 452.
Analysis, design, and optimization of thermal systems using microcomputers. Modeling of thermal systems and components. Thermal system component characteristics and their effect on overall system performance. Relationship among thermal sciences in design process. Introduction to thermoeconomic optimization.

M E 556. Solar Energy Conversion (3)
Prerequisites: Mechanical Engineering 351 and 452.
Application of thermodynamics, fluid mechanics and heat transfer to the thermal design of solar energy conversion systems. Computer simulations utilized.

M E 580. Biomechanics (3)

Prerequisites: Mechanical Engineering 304 (or Civil Engineering 301) and 360.

Application of engineering methodologies for quantitative understanding of biological/physiological phenomena. Continuum mechanics principles. Cardiovascular system and its components viewed from a mechanistic standpoint.

M E 585. Fundamentals of Micro-Electro-Mechanical Systems (MEMS) (3)

One lecture and four hours of laboratory.

Prerequisites: For aerospace engineering majors: Mechanical Engineering 220 [or Aerospace Engineering 220], Electrical Engineering 204, and Mechanical Engineering 240. For electrical engineering majors: Electrical Engineering 330 and Mechanical Engineering 240. For mechanical engineering majors: Mechanical Engineering 240 and Mechanical Engineering 220 [or Aerospace Engineering 220].

Microfabrication techniques, microsensors and microactuators, and scaling laws. A design project of a micro-device including schematic creation, test of performance, layout generation, and layout versus schematic comparison.

M E 596. Advanced Mechanical Engineering Topics (1-3)

Prerequisite: Consent of instructor.

Modern developments in mechanical engineering. May be repeated with new content. See *Class Schedule* for specific content. Maximum credit of nine units for any combination of Mechanical Engineering 496, 499 and 596 applicable to a bachelor's degree. Credit for 596 and 696 applicable to a master's degree with approval of the graduate adviser.

GRADUATE COURSES

Refer to the *Graduate Bulletin*.