Mechanical Engineering

In the College of Engineering

OFFICE: Engineering 323L
TELEPHONE: (619) 594-6067
EMAIL: me@engineering.sdsu.edu

Faculty

Joseph Katz, D.Sc., Professor of Aerospace Engineering and Engineering Mechanics, Interim Chair of Department

Subrata Bhattacharjee, Ph.D., Professor of Mechanical Engineering (Graduate Adviser)

Ronald A. Kline, Ph.D., Professor of Mechanical Engineering

James S. Burns, Ph.D., Associate Professor of Mechanical Engineering

Eugene A. Olevsky, Ph.D., Associate Professor of Mechanical Engineering

Thomas J. Impelluso, Ph.D., Assistant Professor of Mechanical Engineering

Michael A. Lambert, Ph.D., Assistant Professor of Mechanical Engineering

Karen D. May-Newman, Ph.D., Assistant Professor of Mechanical Engineering

Courses Acceptable on Master's Degree Programs in Mechanical Engineering (M E)

UPPER DIVISION COURSES

NOTE: Proof of Completion of prerequisites required for all Mechanical Engineering 300-, 400-, and 500-level courses: Copy of transcript. In addition, Mechanical Engineering 390, 450, 490A, and 530 require evidence of concurrent registration in appropriate courses.

510. Advanced Machine Design (3) I, II
Prerequisites: Mechanical Engineering 314 and 340.
Application of advanced mechanics of materials to the design and analysis of mechanical elements. Introduction to probabilistic design and to finite element methods and applications. Design projects involve extensive use of finite element programs.

512. Simulation of Engineering Systems (3) I, II
Prerequisites: Mechanical Engineering 290, 314, 350; Engineering Mechanics 340; Engineering 280; C programming language.
Modeling, simulation, analysis, and design of mechanical engineering dynamic, vibration, electromechanical, heat transfer, thermodynamic, fluid mechanics, and control systems.

520. Introduction to Mechanical Vibrations (3)
Prerequisites: Mechanical Engineering 512 and Civil Engineering 301.
Analysis of mechanical vibration; single- and multi-degree of freedom systems; free and forced vibrations; vibration isolation; vibration absorbers. Theory of vibration measuring instruments.

530. Automatic Control Systems (3)
Prerequisites: Engineering 280 with a grade of C or better, and credit or concurrent registration in Mechanical Engineering 512.
Analysis of the dynamic characteristics of control components and systems. Stability and response of closed loop systems. Design of control systems.

540. Nonmetallic Materials (3)
Prerequisites: Mechanical Engineering 314 and 340.
Fundamentals of ceramics, polymers, and composite materials. Materials design and selection. Statistical methods of brittle materials design, appropriate for ceramic materials, and rheological modeling of polymeric materials. Stress and strain analysis using classical lamination theory of multi-ply composite laminates.

542. Manufacturing with Nonmetallic Materials (3)
Prerequisites: Mechanical Engineering 340 and Engineering 280 with a grade of C or better.
Engineering polymers and composites, processes, and manufacturing techniques. Polymer flow in extrusion, compression molding, RTM, and calendaring. Hands-on fabrication and test exercises included along with a capstone manufacturing project.

546. Computer Aided Manufacturing (3)
Prerequisites: Mechanical Engineering 314, 340; Engineering 280 with a grade of C or better; and Engineering 195.
Computer controlled manufacturing and assembly techniques and devices. Databases and special languages. Agile manufacturing soft ware programs and technologies.

570. Thermal Systems Analysis and Design (3)
Prerequisites: Mechanical Engineering 450 and 470.
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.

582. Heating, Ventilating, and Air-Conditioning (3)
Prerequisites: Mechanical Engineering 450 and 470.
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.

586. Solar Energy Conversion (3)
Prerequisites: Engineering Mechanics 340, Mechanical Engineering 450 and 470.
Application of thermodynamics, fluid mechanics and heat transfer to the thermal design of solar energy conversion systems. Computer simulations utilized.

590. Biomechanics (3)
Prerequisites: Civil Engineering 301 and Engineering Mechanics 340.
Application of engineering methodologies for quantitative understanding of biological/physiological phenomena. Continuum mechanics principles. The cardiovascular system and its components viewed from a mechanistic standpoint.

596. Advanced Mechanical Engineering Topics (1-3) I, II
Prerequisite: Consent of instructor. **Proof of completion of prerequisite required:** Copy of transcript.
Modern developments in mechanical engineering. See Class Schedule for specific content. Maximum credit of six units for any combination of Mechanical Engineering 496, 499 and 596 applicable to a bachelor's degree. Maximum combined credit of six units of Mechanical Engineering 596 and 696 applicable to a 30-unit master's degree.

GRADUATE COURSES

610. Finite Element Methods in Mechanical Engineering (3)
Prerequisites: Engineering 280 with a grade of C or better and Mechanical Engineering 510.
Development of finite elements and an introduction to solution methods. Problems from various fields of study in mechanical engineering such as stress analysis, vibrations and heat transfer. Introduction to finite element programs such as NASTRAN.

614. Engineering Design: Analytical Methods (3)
Prerequisites: Mechanical Engineering 512 and Engineering 510.
Classical optimization techniques, digital computer methods of optimization, design decision theory, reliability in design.

621. Mechanical Vibrations (3)
Prerequisites: Mechanical Engineering 512, 520 and Engineering 510.
Topics in vibration relating to mechanical design such as nonlinear vibrations, distributed mass systems, random vibrations, mobility analysis, isolator design.

632. Advanced Topics in Automatic Controls (3)
Prerequisite: Mechanical Engineering 530.
Analysis and synthesis of sample data systems. State space analysis of multivariable systems, optimal control systems.

645. Mechanical Behavior of Engineering Materials (3)
Prerequisites: Mechanical Engineering 314, 340, and 350.
Elastic and plastic deformation of monolithic engineering materials and composites. Dislocation theory and plasticity of crystalline solids. Linear elastic and elastic-plastic fracture mechanics. Failure analysis of engineering components. Design optimization based on materials and service environment variables.

651. Advanced Thermodynamics (3)
Prerequisites: Engineering 280 with a grade of C or better and Mechanical Engineering 450.
Advanced concepts of macroscopic thermodynamics are developed including entropy generation, irreversibility, effectiveness, availability, and chemical availability of fuels. Concepts applied to power and refrigeration cycles using computer software.

661. Gas Dynamics (3)
Prerequisites: Mechanical Engineering 450 and Engineering 510.
Thermodynamics of high velocity compressible fluid flow. Adiabatic and diabatic flow; shock phenomena; imperfect gases; multidimensional flow. Applications to the propulsive duct and turbomachinery.

663. Boundary Layers in Internal Flows (3)
Prerequisites: Mechanical Engineering 470 and Engineering 510.
Conservation laws applied to boundary layers in viscous, heat conducting fluids; analysis of the boundary layer equations; applications to internal flows.

671. Conduction of Heat and Mass Transfer (3)
Prerequisites: Mechanical Engineering 470 and Engineering 510.
Conduction heat transfer analysis of multi-dimensional and transient processes using both classical analysis and numerical methods. Analogous transport problems involving mass transfer by diffusion.

673. Convection Heat Transfer (3)
Prerequisites: Mechanical Engineering 470 and Engineering 510. Recommended: Concurrent registration in Mechanical Engineering 663.
Convection heat transfer processes under laminar and turbulent conditions. Mass transfer. Scaling arguments, analytical and numerical modeling.

675. Radiation Heat Transfer (3)
Prerequisites: Mechanical Engineering 470 and Engineering 510.
Radiation heat transfer processes. Radiative properties of surfaces and gases. Absorption, emission, and scattering phenomena. Numerical modeling.

685. Micro-Electro-Mechanical Systems (MEMS) Design and Applications (3)
(Same course as Electrical Engineering 685.)
Prerequisite: Engineering Mechanics 585.
Design and manufacturing technology for micro- and nano-scale devices. Topics include solid state transducers, microscale physics, biomedical microelectronics, microfluidics, biosensors, and hybrid integration of microfabrication technology. Emphasis on biomedical applications.

691. Biomaterials (3)
Prerequisites: Mechanical Engineering 260 and 590.
Structure and properties of metallic, ceramic, and polymer biomaterials. Chemical interaction with physiological environment. Thrombosis and hemostasis on synthetic surfaces. Sterilization and packaging. Ethics and regulatory approval process. Applications discussed in cardiovascular, pulmonary, renal, orthopedic and dental medicine.

696. Advanced Topics in Mechanical Engineering (2 or 3)
Intensive study in specific areas of mechanical engineering. May be repeated with new content. See Class Schedule for specific content. Maximum credit six units applicable to a master's degree. Maximum combined credit of six units of Mechanical Engineering 596 and 696 applicable to a 30-unit master's degree.

797. Research (1-3) Cr/NC/RP
Prerequisites: Consent of graduate adviser and advancement to candidacy.
Research in engineering. Maximum credit six units applicable to a master's degree.

798. Special Study (1-3) Cr/NC/RP
Prerequisite: Consent of staff; to be arranged with department chair and instructor.
Individual study. Maximum credit three units applicable to a master's degree.

799A. Thesis or Project (3) Cr/NC/RP
Prerequisites: An officially appointed thesis committee and advancement to candidacy.
Preparation of a project or thesis for the master's degree.

799B. Thesis or Project Extension (0) Cr/NC
Prerequisite: Prior registration in Thesis or 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 thesis or project is granted final approval.