

MECHANICAL ENGINEERING (MECHENG)

MECHENG 5000 Engineering Communications 3 Credits

Emphasizes methods of communication in the engineering workplace, including the development and writing of proposals, technical manuals, design reports, and business presentations. Effective teamwork communication strategies for virtual and co-located project teams will be addressed.

Components: Class

MECHENG 6560 Computational Fluid Dynamics 3 Credits

Introduction to computational fluid dynamics (CFD) with an emphasis on a commercial software package. Concepts of consistency, stability, convergence, scheme order, and turbulence modeling from the practitioner's viewpoint are covered. Simulations of steady and unsteady flows, compressible and incompressible flows, forced and natural convection heat transfer, and conduction in solids are performed.

Components: Laboratory, Class

Prereqs/Coreqs: P. Student must be in the Engineering Design Emphasis area to enroll in course or Consent of the Program Coordinator/Instructor

MECHENG 6750 Computational Methods in Engineering 3 Credits

Use of digital computers to solve equations encountered in mechanical engineering problems. Numerical integration and differentiation, solution of linear and nonlinear equations, ordinary and partial differential equations (finite element and finite difference methods), systems of equations (matrix equations). Programming using MATLAB. How to choose the proper numerical method, and pitfalls that lead to bad solutions.

Components: Laboratory, Class

Prereqs/Coreqs: P. Student must be in the Engineering Design Emphasis area to enroll in course or Consent of the Program Coordinator/Instructor

MECHENG 6820 Advanced Manufacturing Processes 3 Credits

Additive manufacturing (AM) also known as 3D printing, comprises manufacturing technologies in which 3D objects are fabricated layer-by-layer using digital files. It has grown from being just a prototyping platform to product manufacturing technologies for end-use parts. It is redefining how products are made. Products once thought to be impossible are now made. Product development lead times are also shorter thanks to the technologies. This course seeks to introduce students to the fundamentals AM processes and materials. Its unique benefits and applications as well as challenges and opportunities will be discussed. Topics on laser welding, friction stir welding, electro-chemical, electrical discharge machining, and wire cutting will also be discussed.

Components: Class

Prereqs/Coreqs: P. Student must be in the Engineering Design Emphasis area to enroll in course or Consent of the Program Coordinator/Instructor

MECHENG 7510 Design of Experiments 3 Credits

This course on Design of Experiments (DOE) provides experiences in planning, conducting, and analyzing statistically designed experiments. The methods of DOE may be applied to design or improve products and processes. Analysis of variance (ANOVA), test of hypothesis, confidence interval estimation, response surface methods, and other statistical methods are applied in this course to set values for design, process, or control factors so that one or more responses will be optimized, even when noise factors are present in the system. This course is designed to teach the nuts and bolts of DOE as simply as possible.

Components: Class

Prereqs/Coreqs: P. ENGRG 6050 or a calculus-based statistics course or consent of the instructor

MECHENG 7520 Design for Manufacturability 3 Credits

A major portion of the costs and in turn the profitability of manufacturing organizations are affected by the quality of the design of their products. Building quality into the design will call upon engineers to systematically design a product and/or process so that it can be produced with lowest costs, rapid response time, and meet customers' expectations. This will require the integration of design, manufacturing, management, and economic principles. The course will address this overall integration and focus on the design for manufacturing aspects so as to provide faster time to market, productive utilization of equipment, faster delivery, improved quality, reduced cost, and effective continuous improvement. Students will be able to systematically design a product and/or process so that it can be produced with lowest costs, rapid response time, and meet customers' expectations. In doing so, they will be able to identify opportunity for design, address technical considerations of design manufacturing, and make a business decision on feasibility of design.

Components: Class

Prereqs/Coreqs: P. Student must be in the Engineering Design Emphasis area to enroll in course or Consent of the Program Coordinator/Instructor

MECHENG 7530 Design for Usability 3 Credits

This course explores the ergonomic aspects of usability within the product design, work design, and manufacturing or service environment. Ergonomic principles which apply to the design of physical work as well as the tools and products of production will be investigated. The impact of cognitive demands of the user will be investigated for applicability to the design of products and processes. The macroergonomic aspects of the built environment necessary for inclusive design will be discussed with respect to minimize operational error and maximize safety for a wide range of expected users.

Components: Class

MECHENG 7540 Advanced Finite Element Method 3 Credits

Introduces the finite element method. Emphasizes beam and frame analysis, plane strain, axisymmetric, and three-dimensional stress analysis. Includes dynamic analysis and field problems, such as heat transfer. Utilizes readily available finite element computer programs to solve stress analysis, heat transfer, thermal stresses, etc.

Components: Class

MECHENG 7550 Product Design and Development 3 Credits

This course examines the front end of the product development process. Topics include: organization and management issues associated with the product development process; the identification of customer needs and the translation of these needs into product performance specifications; methodologies for the generation and selection of concepts; developing the product architecture with emphasis on creating interfaces, prototyping and design for manufacturing.

Components: Class

MECHENG 7560 Sustainability in Engineering Design 3 Credits

This course explores the engineering management systems and design frameworks necessary to understand the interrelated issues of environmental quality, sustainability principles, engineering best practices, and emerging manufacturing technologies. The engineering viewpoint of sustainability starts with the systems engineering life-cycle process and includes the systems design evaluation processes for producibility, maintainability, disposability, and life-cycle costing. Key supporting engineering management processes include trade-off studies and risk-based decision making.

Components: Class

MECHENG 7900 Thesis & Capstone Preparation 1 Credit

Prepares student for either the Thesis or Capstone experience. Focus is placed on the skills necessary to undertake the Thesis or Capstone work. This includes writing a project proposal that is supported by scholarly literature, preparing a project timeline, budgeting for the proposed project, recognizing project stakeholders, and identifying specific deliverables from the project. Course culminates in a written Thesis/Capstone proposal for committee approval. This course is a pre-requisite for ENGRG 7990 and ENGRG 7970.

Components: Research

Cross Offering: CIVILENG 7900, ELECTENG 7900, INDSTENG 7900

Prereqs/Coreqs: P. Full admittance as a degree-seeking graduate student; C: MECHENG 5000

MECHENG 7910 Thesis & Capstone Extension 1 Credit

Course is a 1-credit extension of a student's thesis research or capstone project design course. Cannot be taken until the maximum six credits of Thesis Research or Capstone Design Project have been completed. Will require approval of the Faculty Advisor and Program Coordinator before permission for this course will be granted and students allowed to register. Will not count toward degree requirements.

Components: Thesis Research

Cross Offering: CIVILENG 7910, ELECTENG 7910, INDSTENG 7910

Prereqs/Coreqs: P. CIVILENG/ELECTENG/INDSTENG/MECHENG 7990 - Thesis Research OR CIVILENG/ELECTENG/INDSTENG/MECHENG 7970 - Capstone Design Project

MECHENG 7970 Capstone Design Project 3 Credits

Students will draw upon and synthesize knowledge and skills learned throughout the program by applying it to an industry-sponsored project. Capstone work (minimum 150 hours) will be completed in partnership with industry and academic mentor/supervisors. A substantive work project deliverable demonstrating summative application of coursework taken in the program will be expected. The project is expected to be completed in the student's last semesters in residence. Three credits can be taken in a single semester. Can be repeated but only a total of six credits can be applied to degree completion. (Contact advisor for prior approval and registration instructions)

Components: Research

Cross Offering: CIVILENG 7970, ELECTENG 7970, INDSTENG 7970

Prereqs/Coreqs: P. CIVILENG/ELECTENG/INDSTENG/MECHENG 7900 - Thesis/Capstone Preparation

MECHENG 7990 Thesis Research 3 Credits

Completion and defense of a carefully delineated scholarly work advancing an original point of view as a result of research. The topic chosen must reflect the student's area of emphasis and must be approved by a thesis committee. Three credits taken in a single semester. Can be repeated but only a total of six credits can be applied to degree completion. Thesis work is expected to be completed in the student's last semesters in residence. (Contact advisor for prior approval and registration instructions)

Components: Thesis Research

Cross Offering: CIVILENG 7990, ELECTENG 7990, INDSTENG 7990

Prereqs/Coreqs: P. CIVILENG/ELECTENG/INDSTENG/MECHENG 7900 - Thesis/Capstone Preparation