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Undergraduate Courses

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ME 221L(83L). Structure and Properties of Solids. Introduction to materials science and engineering, emphasizing the relationships between the structure of a solid and its properties. Atomic and molecular origins of electrical, mechanical, and chemical behavior are treated in some detail for metals, alloys, polymers, ceramics, glasses, and composite materials. Prerequisites: Chemistry 20(18), 21(19), or 101DL(31) and Engineering 201L(75L) or Biomedical Engineering 110L. Instructor: Curtarolo, Lazarides, or Zauscher. One course.

QUICK LINKS

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ME 321L(131). Mechanical Engineering Analysis for Design. Calculation of 3D stresses, strains, and deflections encountered in mechanical designs. Types of problems include: curved beams, contact stresses, press/shrink fits, etc. Reliability and uncertainty analysis, failure theories, fatigue, and fracture mechanics. Computational methods of

analysis, such as finite elements analysis are covered. Prerequisites: EGR 20L, EGR 201L(75L), EGR 244L(123L), Mechanical Engineering 221L(83L), and Math 353(108). Instructor: Franzoni, Howle, Laursen. One course.

ME 331L(101L). Thermodynamics. The principal laws of thermodynamics for open and closed systems and their application in engineering. Properties of the pure substance, relationships among properties, mixtures and reactions. Power and refrigeration cycle analysis. Prerequisite: Mathematics 212(103) and Physics 151L(61L). Instructor: Bejan, Marszalek, or Tan. One course.

ME 336L(126L). Fluid Mechanics. An introductory course emphasizing the application of the principles of conservation of mass, momentum, and energy in a fluid system. Physical properties of fluids, dimensional analysis and similitude, viscous effects and integral boundary layer theory, subsonic and supersonic flows, normal shockwaves. Selected laboratory work. Prerequisites: Engineering 244L(123L) and Mechanical Engineering 331L(101L). Co-requisite or prerequisite: Mathematics 353(108). Instructor: Bliss, Knight, Shaughnessy, or Zhong. One course.

ME 344L(125L). Control of Dynamic Systems. Model dynamic systems and characterize time and frequency domain response with respect to particular inputs. Characterize systems in terms of rise-time, settling-time and bandwidth. Identify the difference between stable and unstable system. Apply feedback control to modify the response of dynamic systems based upon specified design objectives. Develop methods of designing compensators for single-input, single-output, and multiple-input, multiple-output dynamic systems based upon classical and modern control approaches. Introduce optimal control theory, the linear quadratic regulator (LQR) problem, and the linear quadratic Gaussian (LQG) problem. Gain a physical understanding of what can be accomplished with feedback control in modifying the dynamics of a system. Prerequisites: Engineering 224L(119L) and Math 216(107). Instructor: Ferrari, Garg. One course.

ME 391(187). Undergraduate Projects in Mechanical Engineering. Individual projects arranged in consultation with a faculty member. Open to students who show special aptitude for research and design. Taught in the Fall. Consent of director of undergraduate studies. Instructor: Staff. Variable credit.

ME 392(188). Undergraduate Projects in Mechanical Engineering. Individual projects arranged in consultation with a faculty member. Open to students who show special aptitude for research and design. Taught in the Spring. Consent of director of

undergraduate studies. Instructor: Staff. Variable credit.

ME 394(172). Engineering Undergraduate Fellows Projects. Intensive research project in Mechanical Engineering by students selected as Engineering Undergraduate Fellows. Course credit is contingent upon satisfactory completion of ME 493(173) and ME 494(174). Consent of instructor and program director required. Instructor: Staff. One course.

ME 415L(115L). Failure Analysis and Prevention. A study and analysis of the causes of failure in engineering materials and the diagnosis of those causes. Elimination of failures through proper material selection, treatment, and use. Case histories. Examination of fracture surfaces. Laboratory investigations of different failure mechanisms. Prerequisites: Engineering 201L(75L) and Mechanical Engineering 336L(83L). Instructor: Cocks. One course.

ME 416(170). Experimental Materials Science. Exposure to experimental methods used in the preparation and evaluation of alloys, intermetallic compounds, crystals, and ceramics. Extensive work with x-ray diffraction and scanning electron microscopy methods. Includes vacuum and arc melting processes. Instructor: Cocks. One course.

ME 421L(141L). Mechanical Design. A study of practical aspects of mechanical design including conceptualization, specifications, and selection of mechanical elements. The design and application of mechanical components such as gears, cams, bearings, springs, and shafts. Practice in application of process through design projects. Prerequisite: Engineering 244L(123L) and Mechanical Engineering 321L(131L). Instructor: Franzoni, Howle, or Knight. One course.

ME 424L(160L). Mechanical Systems Design. An integrative design course addressing both creative and practical aspects of the design of systems. Development of the creative design process, including problem formulation and needs analysis, feasibility, legal, economic and human factors, aesthetics, safety, synthesis of alternatives, and design optimization. Application of design methods through several projects including a term design project. Prerequisites: Mechanical Engineering 344L(125L), 421L(141L), and 431L(150L). Instructor: Kielb or Knight. One course.

ME 425(175). Analytical and Computational Solid Mechanics. One course. C-L: see Civil Engineering 175; also C-L: Modeling Biological Systems

ME 431L(150L). Heat and Mass Transfer. A rigorous development of the laws of mass and energy transport as applied to a continuum. Energy transfer by conduction,

convection, and radiation. Free and forced convection across boundary layers. Application to heat exchangers. Selected laboratory work. Prerequisites: Mechanical Engineering 331L(101L), Mechanical Engineering 336L(126L), and Mathematics 353(108) Instructor: Chen, Howle, or Knight. One course.

ME 438(166). Constructal theory and design. Flow configuration in nature and engineering emerges from the constructal law of increase of flow access in time, when the flow system is endowed with freedom to morph. The course brings together the basic principles of fluid mechanics, heat transfer and thermodynamics, and teaches how to generate (to 'discover') shape and structure for energy flow systems. The course teaches design as science, and presents a paradigm that is applicable across the board, from engineering to biology, geophysics and social dynamics. Instructor: Bejan and Lorente. One course.

ME 442(142). Introduction to Robotics and Automation. One course. C-L: see Electrical and Computer Engineering 383(142); also C-L: Information Science and Information Studies

ME 445(135). Introduction to Vibrations. Mechanical vibrations are studied primarily with emphasis on application of analytical and computational methods to machine design and vibration control problems. A single degree-of-freedom system is used to determine free vibration characteristics and response to impulse, harmonic and periodic excitations. The study of two and three degree-of-freedom systems includes the determination of the eigenvalues and eigenvectors, and introduction to modal analysis. The finite element method is used to conduct basic vibration analysis of systems with a large number of degrees of freedom. The student learns how to balance rotating machines, and how to design suspension systems, isolation systems, vibration sensors, and tuned vibration absorbers. Prerequisite: ME 344L(125L). Instructor: Kielb. One course.

ME 461(121). Energy Engineering and the Environment. Efficiencies of both new and established energy sources and conversion methods. Evaluation of alternative energy technologies by statistical information and by modeling using principles of fluid mechanics, thermodynamics and heat transfer. Electricity generation by fossil fuels, nuclear, solar, wind and hydro. Space heating and cooling by traditional methods and by solar. Transportation energy in automobiles, mass transit and freight. Environmental consequences of energy choices on local, national and global scales, including toxic emissions, greenhouse gases and resource depletion. Prerequisite: ME 331L(101L) Thermodynamics. Instructors: Cocks and Knight. One course. C-L: Energy and the Environment

ME 462(183). Power Generation. Basic concepts of thermodynamics, heat transfer, and fluid flow applied to power generation processes. Nuclear reaction theory and reactor technology; fossil fuel combustion theory and modern boiler practice. Power plant ancillary equipment and processes. Design considerations and analyses include economic and environmental factors. Instructor: Staff. One course.

ME 463(149L). Electric Vehicle Project. One course. C-L: see Electrical and Computer Engineering 363L(149L)

ME 490(165). Special Topics in Mechanical Engineering. Study arranged on a special engineering topic in which the faculty has particular interest and competence as a result of research and professional activities. Consent of instructor and director of undergraduate studies required. Half or one course. Instructor: Staff. Variable credit.

ME 491(197). Special Projects in Mechanical Engineering. Individual projects arranged in consultation with a faculty member. Open only to seniors enrolled in the graduation with distinction program or showing special aptitude for research. Half course to two courses. To be taught in the Fall. Prerequisites: B average and consent of the director of undergraduate studies. Instructor: Staff. Variable credit.

ME 492(198). Special Projects in Mechanical Engineering. Individual projects arranged in consultation with a faculty member. Open only to seniors enrolled in the graduation with distinction program or showing special aptitude for research. Half course to two courses. To be taught in the Spring. Prerequisites: B average and consent of the director of undergraduate studies. Instructor: Staff. Variable credit.

ME 493(173). Engineering Undergraduate Fellows Projects. Continuation course for Engineering Undergraduate Fellows, contingent upon satisfactory completion of ME 394(172). Consent required. Instructor: Staff. One course.

ME 494(174). Engineering Undergraduate Fellows Projects. Final continuation course for Engineering Undergraduate Fellows, contingent upon satisfactory completion of ME 394(172) and 493(173). Consent required. Instructor: Staff. One course.

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