

Suggested Courses for ME Students Interested in Mechanics

Technical Electives:

A limit of 6 credits of List #2 technical electives can be used to satisfy the 15 credits of technical electives required to earn a BSME degree. There is no limit in List #1 technical electives. Be sure to consult the current list of approved technical electives for the year in which you plan to graduate to make sure the courses listed below are valid technical electives.

List #1 Technical Electives:

ME 3604 – Kinematics and Dynamics of Machinery (3 credits) Spring only.

Kinematic analysis and design of cams, gears, and linkages, velocity, acceleration and force analysis, kinematic synthesis, balancing, kinematic and force analysis by complex numbers, computer-aided analysis, and synthesis of linkages. Pre: ESM 2304.

ME 4614: Mechanical Design II (3 credit) Spring only.

Design of mechanical elements such as welded joints hydrodynamic bearings, spur gears, shafts, brakes. Alternative fatigue design methods, cumulative fatigue, mechanical design computer software. Pre: ME 3614.

ME 4624 – Finite Element Practice in Machine Design (3 credits) Fall only.

Application of the finite element method to stress analysis problems in mechanical design. Modeling techniques, proper use of existing computer programs, interpreting of results, application to design modification. Pre: ME3614. Seniors only.

ESM/MSE 3054 Mechanical Behavior of Materials (2 credits)

Mechanical properties and behavior of engineering materials subjected to static, dynamic, creep, and fatigue loads under environments and stress states typical of service conditions; biaxial theories of failure; behavior of cracked bodies; microstructure-property relationships and design methodologies for homogeneous and composite materials. Pre: ESM 2204, MSE 2034 or MSE 2044 or MSE 3094, or CEE 3684.

ESM/MSE 3064 Mechanical Behavior of Materials Lab (1 credit)

Laboratory experiments on mechanical properties and behavior of homogenous and composite engineering materials subjected to static, dynamic, creep, and fatigue loads; behavior of cracked bodies; microstructure-property relationships, and determination of materials properties for use in engineering design. Co: MSE 3054.

ESM 3124 – Intermediate Dynamics (3 credits) Fall only.

Review of Newton's Laws, introduction to Lagrange's equations, rotating coordinate systems, particle dynamics, systems of particles, rigid-body dynamics, small amplitude oscillations, holonomic and nonholonomic constraints, phase space and energy methods. Pre: ESM 2304, MATH 2214, and MATH 2204.

ESM 3154 – Solid Mechanics (3 credits) Spring only.

Introduction to tensors, mathematical description of deformations and internal forces in solids, equations of equilibrium, principle of virtual work, linear elastic material behavior, solution for

linear elastic problems including axially and spherically symmetric solutions, stress function solutions to plane stress and strain problems, solutions to 3-D problems, energy methods. Pre: ESM 2204, MATH 2214. Co req: MATH 4574.

ESM 4044 – Mechanics of Composite Materials (3 credits) Fall only.

Introduction to the deformation, stress, and strength analysis of continuous-fiber-polymer-matrix laminated composites. Fabrication, micromechanics of stiffness and expansional coefficients, classical lamination theory (CLT). Environmentally induced stresses. Computerized implementation and design. Pre: ESM 2204.

ESM 4024 – Advanced Mechanical Behavior of Materials (3 credits) Spring only.

Mechanical behavior of materials, emphasizing solid mechanics aspects and methods for predicting strength and life of engineering components. Plasticity, failure criteria, fracture mechanics, crack growth, strain-based fatigue, and creep. Microstructure-property relationships, and laboratory demonstrations. Pre: ESM 3054 or MSE 3054.

ESM 4204 – Musculoskeletal Biomechanics (3 credits) Fall only.

Skeletal anatomy and mechanics. Muscle anatomy and mechanics. Theory and application of electromyography. Motion and force measuring equipment and techniques. Inverse dynamics modeling of the human body. Current topics in musculoskeletal biomechanics research. Pre: ESM 2304.

ESM 4324 – Mechanics of Biological Materials and Structures (3 credits)

Anatomy and physiology of connective tissue. Techniques for determining the mechanical response of biological soft and hard tissues. Includes static, viscoelastic, creep, fatigue, and fracture. Simplified models of biological structures. Creation of geometric models from medical imaging and computational modeling. Specific topics may include bone, cartilage, ligaments, tendon, teeth, and skin. Pre: ESM/MSE 3054, (ESM/AOE 2074 or ME 2004).

**courses in grey have not been taught in at least one academic year and may not be available*