Mechanical Engineering

**MECH 1208** Introduction to Mechanical Engineering (2 semester hours) The purpose of this course is to give students a general understanding of the broad range of technical areas and applications specific to the mechanical engineering profession. Course activities include team-oriented competitions, and lectures by mechanical engineering experts. Prerequisite: **ECS 1200**. Prerequisites or corequisites: (**PHYS 2325** and **PHYS 2125**) and (**MATH 2419** or **MATH 2414**). (1-1) Y

**MECH 1v95** Topics in Mechanical Engineering (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated as topics vary (9 hours maximum). ([1-9]-0) R

**MECH 2120** Mechanical Measurements Laboratory (1 semester hour) Laboratory course. The laboratory introduces mechanical measurement techniques and processes. Introduction to basic instrumentation used in mechanical engineering, including calibration, use, precision, and accuracy. Consideration of errors, precision, and accuracy in experimental measurements. Corequisite: **MECH 2320**. (0-1) Y

**MECH 2310** Statics (3 semester hours) Lecture course. Course material includes vector representations of forces and moments, free body diagrams, equilibrium of particles, center of mass, centroids, distributed load systems, equivalent force systems, equilibrium of rigid bodies, trusses, frames and machines, internal forces in structural members, shear forces and bending moments in beams, friction, area and mass moments of inertia, the principle of virtual work. Prerequisites: **MECH 1208** and (**PHYS 2325** and **PHYS 2125**). Prerequisite or corequisite: **MATH 2415** or **MATH 2419**. (3-0) Y

**MECH 2320** Strength of Materials (3 semester hours) Lecture course. Introduction to stress and deformation analysis of basic structural elements subjected to axial, torsional, bending, and pressure loads. Prerequisites: (**MATH 2415** or **MATH 2419**) and **MECH 2310**. Corequisite: **MECH 2120**. (3-0) Y

**MECH 2330** Dynamics (3 semester hours) Lecture course. Kinematics and kinetics of particles, planar rigid bodies, three-dimensional rigid bodies and equations of motion. Methods utilizing force and acceleration, work and energy and impulse and momentum. Single degree of freedom vibration systems are and simulation tools are introduced. Prerequisites: **MECH 2310**. Prerequisite or corequisite: **ENGR 2300** and **MATH 2420**. (3-0) Y

**MECH 2v95** Topics in Mechanical Engineering (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated as topics vary (9 hours maximum). ([1-9]-0) R

**MECH 3105** Computer Aided Design Laboratory (1 semester hour) Project-based course associated with **MECH 3305**. Design projects involving CAD tools constitute a major portion of the course. Corequisite: **MECH 3305**. (0-1) Y

**MECH 3115** Fluid Mechanics Laboratory (1 semester hour) Laboratory course associated with **MECH 3315**. Wind tunnel calibration and survey, wind tunnel turbulence tests, boundary layer on a flat plate, static stability, design and conduct experiments. Prerequisite: **MECH 3315**; it is recommended that the laboratory is taken the next long semester after completion of **MECH 3315**. (0-1) Y

**MECH 3120** Heat Transfer Laboratory (1 semester hour) Laboratory course associated with **MECH 3320**. Course emphasis is on experiments related to thermodynamics, heat transfer, and fluid mechanics. Proper
experimental methods, data and uncertainty analysis related to thermal and fluids measurements are discussed. Prerequisite: MECH 3320; it is recommended that the laboratory is taken the next long semester after completion of MECH 3320. (0-1) Y

**MECH 3150** Kinematics and Dynamics Laboratory (1 semester hour) Project-based course associated with MECH 3350. Laboratory course focused on performing a team design project of a mechanical system. Prerequisite: MECH 3350; it is recommended that the laboratory is taken the next long semester after completion of MECH 3350. (0-1) Y

**MECH 3301** Mechanics of Materials (3 semester hours) Lecture course. Course material includes determination of stresses, deflections, and stability of deformable bodies, including theory of advanced beams, elasticity and matrix structural analysis. Prerequisites: MECH 2320 and ENGR 3300. (3-0) Y

**MECH 3305** Computer Aided Design (3 semester hours) Lecture course. Course material includes an introduction to Computer-Aided Mechanical Design (CAMD) tools and their applications to mechanical systems design. Prerequisites: MECH 1208 and ENGR 2300 and PHYS 2325. Prerequisite or corequisite: CS 1325 or (CE 1337 or CS 1337 or TE 1337). Corequisite: MECH 3105. (3-0) Y

**MECH 3310** Thermodynamics (3 semester hours) Lecture course. This course focuses on introductory concepts and definitions of thermodynamics, energy and the availability and reversible work, machine, and cycle processes; real gas behavior; first law of thermodynamics, phase-change, internal energy, energy balance, entropy, ideal gas, control volume analysis, second law of thermodynamics, vapor, gas and refrigeration power systems. Prerequisites: MECH 1208 and ENGR 3300 and PHYS 2325. Prerequisite or corequisite: CHEM 1311. (3-0) Y

**MECH 3315** Fluid Mechanics (3 semester hours) Lecture course. Course material includes the concepts and applications of fluid mechanics and dimensional analysis with an emphasis on fluid behavior, internal and external flows, analysis of engineering applications of incompressible pipe systems, and external aerodynamics, ideal fluid flow including potential flow theory, and computer solutions in ideal fluid flow. Prerequisites: MECH 2330 and ENGR 3300. Prerequisite or corequisite: MECH 3310. (3-0) Y

**MECH 3320** Heat Transfer (3 semester hours) Lecture course. This course focuses on the steady and unsteady conduction in one- and two-dimensions; forced convection, internal and external flows; heat exchangers; introduction to radiation; elements of thermal system design. Prerequisites: MECH 3310 and MECH 3315. (3-0) Y

**MECH 3350** Kinematics and Dynamics of Mechanical Systems (3 semester hours) Lecture course. Motion and interaction of machine elements and mechanisms. Kinematics, statics, and dynamics are applied for analysis and design of the parts of machines such as planar mechanisms, cams and gears. Prerequisites: ENGR 2300 and MATH 2420 and MECH 2330 and ENGR 3300. (3-0) Y

**MECH 3351** Design of Mechanical Systems (3 semester hours) Lecture course. Design and analysis tools for mechanical systems. Design criteria based on reliability and functionality are introduced. Basic principles of stress and deflection analysis, application to mechanical components and systems. Failure design theory based on static and dynamic loads, stochastic considerations, and design of mechanical components such as shafts, bearing and shaft-bearing systems, gear and gear systems and mechanical joints. Prerequisites: MECH 2320 and ENGR 3300. Prerequisite or corequisite: MECH 3350. (3-0) Y

**MECH 3v95** Topics in Mechanical Engineering (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated as topics vary (9 hours maximum). (1-9) R
**MECH 4110** Systems and Controls Laboratory (1 semester hour) Laboratory course associated with **MECH 4310**. Course focused on the modeling and parameter estimation of dynamical systems, and the design of control systems. Prerequisite: **MECH 4310**; it is recommended that the laboratory is taken the next long semester after completion of **MECH 4310**. (0-1) Y

**MECH 4310** Systems and Controls (3 semester hours) Lecture course. Introduction to linear control theory. General structure of control systems. Mathematical models including differential equations, transfer functions, and state space. Transient response and steady-state error. Performance, stability, root-locus method, Bode diagram, and Nyquist plot. Compensation design using PID, phase-lead, and phase-lag controllers. Prerequisites: **ENGR 2300** and **MATH 2420** and **MECH 2330**. Prerequisite or corequisite: **MECH 3315**. (3-0) Y

**MECH 4330** Intermediate Fluid Mechanics (3 semester hours) Lecture course. This course covers ideal fluid flow, including potential flow theory, computer solutions in ideal fluid flow, viscous flow and boundary layer theory and introduction to turbulence. Prerequisite: **MECH 3315**. (3-0) Y

**MECH 4340** Mechanical Vibrations (3 semester hours) Lecture course. This course covers harmonic and periodic motion including both damped and undamped free and forced vibration, single- and multi-degree-of-freedom systems and matrix techniques suitable for computer simulations. Prerequisites: **ENGR 2300** and **MATH 2420** and **ENGR 3341** and **MECH 2330**. (3-0) Y

**MECH 4350** Applied Heat Transfer (3 semester hours) Lecture course. This course extends topics beyond those found in the first course in heat transfer (**MECH 3320**), as well as introducing multi-mode heat transfer analyses. More complex heat transfer problems, both transient and steady state, are introduced. Examples of current heat transfer applications are incorporated into the course material. Prerequisite: **MECH 3320**. (3-0) Y

**MECH 4360** Introduction to Nanostructured Materials (3 semester hours) Lecture course. The emphasis in this course is to introduce the science of the building blocks of nanostructured materials, their chemical and structural characterization, material behavior, and the technological implications of these materials. Special attention is devoted to presenting new developments in this field and future perspectives. Prerequisites: **CHEM 1311** and **MECH 3301**. (3-0) Y

**MECH 4370** Introduction to MEMS (3 semester hours) Lecture course. This course will target an audience of motivated senior-level undergraduates, with the goal of providing an introduction to M/NEMS fabrication techniques, selected device applications, and the design tradeoffs in developing systems. Prerequisites: **CHEM 1311** and **MECH 3310** and **MECH 3350**. (3-0) Y

**MECH 4381** Senior Design Project I (3 semester hours) Project-based capstone course. Student groups design, build, and test a device that solves an open-ended mechanical engineering design problem. **MECH 4381** focuses on background research and engineering analysis, **MECH 4382** on prototype construction and testing. As a designated MECH Writing-Intensive Course, **MECH 4381** and **MECH 4382** also focus on the refinement of students' engineering communications skills and their use of writing as a critical-thinking and learning tool. Prerequisites: **MECH 3305** and **MECH 3320** and **MECH 3351** and **MECH 4310** and **ECS 3390**. (3-0) Y

**MECH 4382** Senior Design Project II (3 semester hours) Project-based capstone course. Student groups design, build, and test a device that solves an open-ended mechanical engineering design problem. **MECH 4381** focuses on background research and engineering analysis, **MECH 4382** on prototype construction
and testing. As a designated MECH Writing-Intensive Course, MECH 4381 and MECH 4382 also focus on the refinement of students' engineering communications skills and their use of writing as a critical-thinking and learning tool. Prerequisite: MECH 4381. (3-0) Y

**MECH 4399** Senior Honors in Mechanical Engineering (3 semester hours) For students conducting independent research for honors theses or projects. (3-0) R

**MECH 4v95** Topics in Mechanical Engineering (1-9 semester hours) Subject matter will vary from semester to semester. May be repeated as topics vary (9 hours maximum). ([1-9]-0) R

**MECH 4v98** Undergraduate Research in Mechanical Engineering (1-9 semester hours) Topics will vary from semester to semester. May be repeated for credit (9 hours maximum). Instructor consent required. ([1-9]-0) R