

MECHANICAL ENGINEERING TECHNOLOGY

Courses

MCT 110L. Mechanical Design & CAD I. 2 Hours

An introduction to Mechanical Design using commercial computer-aided design (CAD) software. Using appropriate CAD modeling techniques to create 3-dimensional component and assembly models. Creating technical drawings that show a basic knowledge of industry standards and practices. The course includes an introduction to Geometric Dimensioning & Tolerancing principals and 2-dimensional CAD layouts.

MCT 111L. Mechanical Design & CAD II. 2 Hours

Intermediate and advanced design techniques and application of standards to develop mechanical devices are explored through the application of 3D parametric solid-modeling computer-aided design (CAD) software. The student will gain experience through the completion of individual and team design projects. Students will analyze customer requirements using Quality Function Deployment, Design for Manufacturability and Design Failure Mode & Effects analysis as they develop more advanced models and assemblies to meet these requirements. Prerequisites: MCT 110L or MEE 104L.

MCT 112L. Introduction to Mechanical Design. 3 Hours

Modern design techniques to develop a mechanical device are explored. This is achieved through the application of commercial parametric solid modeling software. Experience with such a system is gained through the completion of individual and team design projects. The application of Geometric Dimensioning & Tolerancing standards per ASME Y14.5 2009 is integrated into the design process. Prerequisite(s): MCT 110L.

MCT 215. Statics. 3 Hours

Study of forces on bodies at rest. Vectors, force systems, components, reactions, resultants, free body diagrams, equilibrium, centroids, and moments of inertia. Prerequisites: SET 150 or MTH 168. Corequisites: MTH 168.

MCT 220. Statics & Dynamics. 3 Hours

Study of forces on bodies at rest and in motion using Newton's three laws of motion. Vectors, force systems, components, reactions, resultants, free body diagrams, equilibrium, centroids, moment of inertia, kinetics, and kinematics. Corequisite(s): MTH 137 or MTH 168.

MCT 221. Strength of Materials. 3 Hours

Analysis and design of load-carrying members, considering stress, strain, and deflection. Study of direct tension, compression, and shear; torsion; shear and moment diagrams; bending; combined stress; analysis of columns; pressure vessels. Prerequisites: MCT 215; MTH 168.

MCT 231. Fluid Mechanics. 3 Hours

Fluid properties, fluid statics including manometry, submerged surfaces, buoyancy and stability of floating bodies. The principles of fluid flow including Bernoulli's and energy equations, energy losses, and pump power. Analysis and design of pipe line systems and open channels; pump selection. Prerequisite(s): MTH 168.

MCT 313. Industrial Mechanisms. 3 Hours

Design and analysis of linkages and cams. Graphical solutions to kinematics problems including the concepts of instantaneous motion and relative motion. Development and analysis of motion diagrams. Study of geometric features of gears and gear transmission systems. Prerequisite(s): MCT 110L, MCT 220; MTH 137 or MTH168.

MCT 315. Dynamics. 3 Hours

Study of bodies in motion with a focus on machinery applications. Kinematics of particles and rigid bodies including translation, rotation, plane motion, and relative motion. Kinetics by the methods of force-mass-acceleration, work-energy, and impulse-momentum. Introduction to mechanical vibrations. Prerequisite(s): MCT 215; MTH 169; PHY 201.

MCT 317. Machine Dynamics. 3 Hours

Principles of applied engineering mechanics as they relate to machines; static force analysis in both 2 and 3 dimensional systems, kinetics of machine components by the methods of force-mass-acceleration, work-energy, and impulse-momentum; machine balancing; introduction to mechanical vibrations. Prerequisite(s): MCT 111L, MCT 313; MTH 138 or MTH 168; SET 153L.

MCT 320. Design of Machine Elements I. 3 Hours

Analytical design techniques used to evaluate machine elements & structures; stress analysis, working stress, failure theories, fatigue failure, buckling failure. Design methods for gears. Original design project using commercial 3D solid modeling software. Introduction to Finite Element Analysis using commercial software. Prerequisites: MCT 112L, MCT 221.

MCT 330. Design of Machine Elements. 3 Hours

Analytical design techniques used to evaluate machine elements; stress analysis, working stress, failure theories, fatigue failure; design methods for spur gears, shafts, keys and couplings, roller and journal bearings, and springs. Original design project. Prerequisite(s): MCT 111L, MCT 221, MFG 208L.

MCT 336. Fluid Power. 3 Hours

Study of hydraulic and pneumatic fluid power components and systems used in industrial, mobile, and aerospace applications; standard symbols in circuit design; circuit analysis; specification for pumps, valves, cylinders, and circuits; hydraulic fluids; filtration; electric motors; system efficiencies; proportional control and electrohydraulic servo control systems; seals; fluid conductors; pneumatic components and systems. Library research project. Corequisite(s): MCT 336L.

MCT 336L. Fluid Power Laboratory. 1 Hour

To accompany MCT 336. Evaluation of fluid power components: pressure, flow, RPM, sound level, current, voltage, power, torque, and time. Graphical design, computational analysis, assembly, and testing of typical circuits and systems. Testing of hydraulic fluids for viscosity, pour point, flash and fire point, specific gravity. Three hours of laboratory a week. Corequisite(s): MCT 336.

MCT 337. Fluid Power w/ Lab. 3 Hours

Study of hydraulic and pneumatic fluid power components and systems used in industrial, mobile, and aerospace applications; standard symbols in circuit design; circuit analysis; specification for pumps, valves, cylinders, and circuits; hydraulic fluids; filtration; electric motors; system efficiencies; proportional control and electro-hydraulic servo control systems; seals; fluid conductors; pneumatic components and systems. Evaluation of fluid power components; pressure, flow, RPM, sound level, current, voltage, power, torque, and time. Graphical design, computational analysis, assembly, and testing of typical circuits and systems. Testing of hydraulic fluids for viscosity, pour point, flash and fire point, specific gravity. This course is a lecture with an integrated lab; 2 hours of lecture with 3 hours of lab.

MCT 342. Thermodynamics. 3 Hours

Energy analysis of engineering systems using the concepts and laws of thermodynamics. The principle of the mechanical equivalent of heat, behavior of pure substances, use of thermodynamic property tables, and study of gas mixtures. Application of the Carnot cycle to both heat engines and reversed heat engines. Prerequisites: MCT 231.

MCT 400. Selected Mechanical Topics. 1-4 Hours

Investigations and discussion of current technical topics in mechanical engineering technology. Research report. May be taken more than once. Prerequisite(s): Permission of department chairperson.

MCT 420. Design of Machine Elements II. 3 Hours

Design, analysis, and selection of basic machine components including: belt & chain drives, gears, rolling contact & plain surface bearings, linear motion elements, electric motors, and clutches/brakes. Design project(s) using commercial 3D solid modeling software. Prerequisite(s): MCT 320; MCT 315.

MCT 423. Product Development. 3 Hours

Synthesis of mechanical devices and systems. Emphasis on the integration of various machine elements into a single unit. Activities include design, scheduling, budgeting, purchasing, fabrication, assembly and performance testing of an original team project. Prerequisite(s): MCT 330.

MCT 430. Design of Fluid Power Systems. 3 Hours

Energy efficiency; pressure drop determinations, variable volume pressure-compensated pumps, accumulators, proportional and electrohydraulic valves, cylinder design, hydraulic motor selection; circuit design, open and closed loop systems, power unit design; sizing of electric motors; use of industrial data and National Fluid Power Assn.-JIC design standards. Individual design project. Prerequisite(s): MCT 336.

MCT 438. Heat Transfer. 3 Hours

The principles of conduction, convection, and thermal radiation energy transfer. Conduction through series and parallel walls, pipes, and containers. Forced and free convection through films, thermal radiation of energy between surfaces, and the overall transfer of heat. Prerequisites: MCT 231; SET 250.

MCT 440. Applied Vibrations. 3 Hours

Free and forced vibration of single degree of freedom systems with and without damping. Industrial applications including reciprocating and rotating machinery, balancing, isolation, and noise reduction. Demonstrations of vibration sensors and instrumentation. Prerequisite(s): MCT 317; SET 153L.

MCT 445. Experimental Mechanics. 3 Hours

The selection, application, and use of strain gages and strain gage rosettes. Transformation of stress and strain. Advanced mechanics of materials topics with empirical verification of theoretical predictions. Prerequisite(s): MCT 221. Corequisite(s): MCT 445L.

MCT 445L. Experimental Mechanics Laboratory. 1 Hour

Installation of strain gauge rosettes. Experiments to determine the state of strain and stress in structures using strain gauges, photoelasticity, and brittle coatings. Vibration measurement using strain gauges, accelerometers, and motion transducers. Written and oral reports. Corequisite(s): MCT 445.

MCT 446. Applied Finite Element Modeling. 3 Hours

Introduction to the fundamentals of structural finite element modeling. Geometry creation, element types, material specification, problem solution and results postprocessing. A focus is placed on modeling techniques using commercially available software. Prerequisites: MCT 221; SET 250.

MCT 456. Automotive Powertrain & Chassis Systems. 3 Hours

Theory and design of engines, transmissions, suspension, and chassis systems. Overview of manufacturing and commercial aspects of the automotive industry. Prerequisites: EGR 201 or MCT 215.

MCT 490. Senior Project. 3 Hours

Advanced study and research of the product realization process focusing on conceptual design, embodiment design, final design, and prototyping or other design verification. Students work on externally sponsored engineering projects in multidisciplinary teams that perform engineering analysis that includes safety, ergonomics, environmental, cost and sociological impact of their designs. Prerequisite(s): IET 323 and MCT 320. Corequisite(s): MCT 420.

MCT 493. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program.

MCT 494. Honors Thesis. 3 Hours

Selection, design, investigation, and completion of an independent, original research study resulting in a document prepared for submission as a potential publication and a completed undergraduate thesis. Restricted to students in University Honors Program. Prerequisites: MCT 493.