MECHANICAL ENGINEERING TECHNOLOGY

Courses

MCT 110L. Technical Drawing & CAD Laboratory. 2 Hours
Technical sketching and shape description, orthographic projection theory, multi-view drawings, necessary views, sectional views, working and shop drawings, dimensioning practices, tolerancing, thread and fastener representation and nomenclature, assembly and detail drawings. Six hours of laboratory a week using instruments and commercial computer-aided design (CAD) software.

MCT 111L. Introduction to Design Laboratory. 2 Hours
Advanced topics of Computer Aided Design using three-dimensional, parametric, solid modeling software. Laboratory assignments involving the CAD software are completed through a series of individual and team design projects. Introduction to design requirements, conceptualization, and design decisions. Computer drafting topics such as ANSI Y14.5M-1994 geometric dimensioning and tolerancing standards, weld symbols, machining and surface finish symbols. Blueprint reading. Prerequisite(s): MCT 110L or MEE 104L and MEE 227L.

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): MCT 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. Prerequisite(s): MCT 220; MFG 204, MFG 204L; MTH 137 or 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): MCT 137 or 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 MTH 168.

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; SE 153L.

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 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. Prerequisite(s): MCT 231; MTH 138 or MTH 168; SET 153L.

MCT 400. Selected Mechanical Topics. 1-4 Hours
Investigations and discussion of cur-rent technical topics in mechanical engineering technology. Research report. May be taken more than once. Prerequisite(s): Permission of department chairperson.

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 432. Heat Power. 3 Hours
Applications of the principles of thermodynamic cycles. Analysis of energy transfer systems such as internal combustion and gas turbine engines. Power generation through steam cycles including reheat and regenerative cycles. Reversed heat engine cycles and vapor compression cycles used in heating and cooling. Prerequisite(s): MCT 342; SET 153L.

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. Prerequisite(s): MCT 231; SET 153L.

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. Prerequisite(s): MCT 221; SET 153L.

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. Prerequisite(s): EGR 201 or MCT 220.

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): CMM 100; IET 323; MCT 317, MCT 330.

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. Prerequisite(s): MCT 493.