

# MECHANICAL ENGINEERING (MCT)

## MCT 100 Manufacturing Design Systems

30 Class Hours, 60 Lab Hours, 60 Quarter Credit Hours

## MCT 113 Design Principles

2 Class Hours, 2 Lab Hours, 3 Quarter Credit Hours

Students are introduced to methods and procedures for design and product development. Basic principles and approaches to design are covered with emphasis on methods of concept generation, prototyping and testing, reverse engineering, and other different approaches used in product development. A design project is introduced that is carried through the curriculum and will be completed in a Term VI design project.

## MCT 115 Computer-Aided Design I

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

An introduction to computer design that utilizes a three-dimensional solid modeling software package that allows students to immediately create "solid" objects in virtual reality. Emphasis will be placed on design intent. Topics include 3D features, revolve, sweep, and lofted features, shell and coil features, orthographic drawing production, and assembly drawing.

## MCT 124 Computer-Aided Design II

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 115

This course is a continuation of MCT 115 Computer-Aided Design I with an emphasis on the basic principles of mechanical drawing. Drafting topics include orthographic projection, basic dimensioning and tolerancing, sections, threads, 2D design layout, single auxiliary views, and assemblies. The essentials of 2D CAD will be covered along with additional 3D modeling topics.

## MCT 125 Manufacturing Processes

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 212

This course introduces the fundamentals of machine technology, with step-by-step analysis of how to turn materials into products. Topics include the traditional methods of material removal (machining operations and machine tools), material deformation (cutting, bending, forming, and rolling), sheet metalworking (stamping), joining (welding and fastening), casting, molding, forging, and conditioning.

## MCT 130 Engineering Materials

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: or MA 125

Material properties will be discussed as they apply to product design, manufacturing process design and control. Theories will be discussed in class and reinforced through lab problems.

## MCT 134 Computer-Aided Design III

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 124

This course is a continuation of MCT 115 Computer-Aided Design I and MCT 124 Computer-Aided Design II with emphasis on design layout and intent utilizing a three-dimensional solid modeling software package. Projects will include advanced assemblies. Students will be provided a deeper understanding about presenting a design with presentation mode and animation.

## MCT 212 Metrology

2 Class Hours, 2 Lab Hours, 3 Quarter Credit Hours

The science of measurement in the manufacturing environment will be studied with emphasis on measurement methods, precision, and accuracy, tolerance control, standards, and inspection techniques. Economics and its relationship to measurement are covered. Both manual measurement techniques and automated techniques will be taught.

## MCT 215 Statics

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 125

The principles of statics as applied to design. The purpose of the course is to provide a clear and thorough presentation of the theory and application of mechanics. Topics include vector algebra, Newton's Laws of Motion, equilibrium of forces and moments, friction, centroids and moments of inertia. Laboratory assignments will support all the key topics.

## MCT 221 AutoCAD Essentials

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 125

This course provides a comprehensive introduction to mechanical drafting and two-dimensional drawing tools using AutoCAD software. The basic AutoCAD drawing and editing commands are covered including orthographic projection, view creation, dimensioning, hatching techniques, blocks, layouts and plotting, tolerances, and annotations.

## MCT 224 Mechanics of Materials

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 125 and MCT 215

This course provides coverage of important topics in strength of material with an emphasis on application, problem-solving, and design of structural members, mechanical devices, and systems. Study of the principles of the strength of materials is based on an understanding of the relationship between stress and strain associated with the application of compression, tension, torsional, shear, and bending forces. Laboratory exercises will support these concepts.

## MCT 235 Industrial Robotic Automation

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 210

This course covers the utilization of robotics and automated controls and assembly processes in the manufacturing environment. Levels of automation, flexible and hard automation, open and closed loop control, adaptive control, and material handling will also be discussed. The students will complete the course by taking the FANUC Robotics Certification Exam.

## MCT 237 Capstone Project

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 113 and MCT 125 and MCT 130 and MCT 134 and MCT 212 and MCT 224 and ENG 118

Students produce a design utilizing the knowledge gained from the principles covered in the design-related courses. Preparation for this course starts with MCT 113 Design Principles and is reinforced in subsequent courses. Students are required to submit electronic and paper documentation of their design and give a presentation explaining their approach to the design process.

**MCT 239 Quality**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 125 (may be taken concurrently)

This course includes the organization, methodology and responsibility of quality assurance programs in manufacturing industries. Topics included are statistical analysis, control charts, process capability, cost of quality and other quality related topics.

**MCT 240 Manufacturing Planning**

4 Class Hours, 4 Quarter Credit Hours

Prerequisites: MA 210

This course studies the concepts and techniques used to improve manufacturing performance in order to gain a competitive advantage. Topics include production planning, capacity planning, production control, master production scheduling, and forecasting.

**MCT 300 Applications of Kinematics**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 237 or WEL 259

Application of kinematics introduces mechanisms and machines with both analytical and graphical techniques. Topics include displacement analysis of linkages, cam design, gear and gear trains, belts and chain drives.

**MCT 310 Programmable Automation Controller Essentials**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

This course is an introduction to the programmable automation controller (PAC) and automation systems. The history of the PLC and PAC will be discussed as well as how and where the PAC is used in the manufacturing industry and elsewhere today. Using the Allen-Bradley CompactLogix PAC and RS Logix 5000 software, students learn the tag-based structure common in today's PACs, ladder logic fundamentals and programming techniques using series and parallel elements. Relay instructions, timers, counters, comparisons, and subroutines are introduced. Creating and writing programs for the Allen-Bradley CompactLogix programmable logic controller constitutes the major portion of the lab. Students then download their programs into the CompactLogix training unit, debug the programs, and verify the correct operation. Students will also be shown the practical wiring and installation of PACs.

**MCT 314 Mechatronics**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Mechatronics integrates mechanical, electrical/electronic, and computer/programming systems in the design of products. This course will allow students to apply mechatronics principles to the design, build, and testing of electromechanical systems, and demonstrate new products and devices.

**MCT 317 CAD/CAM Design & Manufacturing**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 134

Utilization of computer-aided manufacturing software with 3D solids modeling design capabilities to produce parts on computerized numerical control machines is presented. Topics include computerized generation of rapid prototypes and principles of reverse engineering.

**MCT 322 Fluid Power**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

This course covers the theory and practical use of fluid power and pneumatics. Topics include circuit diagrams, valves, cylinders, actuators, pumps, system losses, fluid logic and standards.

**MCT 324 Design for Manufacture and Assembly**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

The principles of effective design for manufacture and assembly is applied to product design leading to simplified designs, reduced part counts, reduced assembly operations, and overall cost reductions without sacrificing quality. Topics include design for manual and automated assembly and design for assembly and handling by industrial robots.

**MCT 336 Dynamics**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 310

Dynamic forces, balancing, and the synthesis of mechanisms and motion will be discussed. This course provides an understanding of the theory and application of engineering mechanics. Topics will include kinematics of a particle, force and acceleration, work and energy, impulse and momentum, and rigid bodies. Theories will be discussed in class and reinforced through lab sessions.

**MCT 416 Operations Management**

4 Class Hours, 4 Quarter Credit Hours

A management course specifically tailored for mechanical engineers that includes the principles of project management (CPM PERT, Gantt Charts), traditional management principles, total quality management (TQM), and materials management (Independent Demand vs. Dependent Demand).

**MCT 418 Advance Computer Applications**

2 Class Hours, 2 Lab Hours, 3 Quarter Credit Hours

An overview of computer applications and management information systems that are used in mechanical engineering is presented. Laboratory assignments emphasize mechanical engineering design applications.

**MCT 420 Thermodynamics**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: CHM 300

MCT 420 Thermodynamics 3 Class Hours 2 Lab Hours 4 Quarter Credit Hours Prerequisite: MA 210, CHM 300 This course is a study of energy systems and the relationships between heat and work. Topics include the perfect gas laws, thermodynamic principles of boilers, turbines, internal combustion engines, and heating and refrigeration.

**MCT 422 Manufacturing Processes II**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Advanced manufacturing process technology, management technology, and material technology will be discussed. Topics covered will be metal casting, powder metallurgy, bulk deformation processes, advance chip removal processes, nontraditional machining and thermal cutting processes, and processing of integrated circuits.

**MCT 424 Design with Plastics**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 422

This course studies the design of plastic components. Properties of different resins are covered along with the unique characteristics of plastic as a design material. Design considerations relative to the different types of plastic processes are also covered along with tooling considerations and cost analysis. Design of products made of composite material is included.

**MCT 431 Machine Design**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Emphasis in this course is placed on machine design utilizing stress analysis, failure modes, and the integration of machine components to develop manufacturing processes appropriate to the raw material and the final product.

**MCT 433 Thermal Energy Analysis**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MA 310 and CHM 300

This course presents applications of conservation of energy to thermodynamics and heat transfer. Topics include properties of materials and fluid properties, analysis of internal combustion engines, power generation and refrigeration systems, and heat exchangers.

**MCT 434 Heat Transfer**

3 Class Hours, 2 Lab Hours, 4 Quarter Credit Hours

Prerequisites: MCT 420

MCT 434 Heat Transfer 3 Class Hours 2 Lab Hours 4 Quarter Credit Hours Prerequisite: MCT 420 This course studies basic principles of heat transfer. Topics include steady and transient heat conduction, forced external and internal convection, natural convection, heat exchangers, radiation heat transfer, and mass heat transfer.