

TME - MECHANICAL TECHNOLOGY

TME 110 Materials Science

This course introduces students to the structure, properties, use and design considerations of a variety of materials including ferrous metal, non-ferrous metals, ceramics and polymers.

Upon successful completion of this course, students should be able to:

Determine the structure of materials.

Select the proper material (s) according to their properties and use.

Determine the properties and use of polymetric materials, plastics, polymeric coatings and adhesives.

Determine the various applications of ceramics.

Determine the heat-treatment sequence of steel.

Determine the properties and use of stainless steel, copper, aluminum, nickel, zinc, titanium, magnesium and refractory metals.

Select welding processes according to joint configuration and weldability.

Identify the structure of a composite.

Determine the purposes and applications of composites.

Prerequisite: NONE New students should complete Placement Testing prior to registration. Visiting students may submit college transcript.

3 Credits3 Weekly Lecture Hours

TME 111 Machining Technology

This course provides an introduction to the knowledge and skills associated with various conventional chip making machine tools their design, application, set-up and operation. Theory and mathematical concepts and calculations associated with inspection techniques, tapers, digital readout quantifications, speeds, feeds, torque, horsepower, threading, indexing and unit cycle time determination will be covered. Emphasis will be placed on tooling and work holding requirements, and set-up and cutting tool materials (H.S.S., carbide, ceramic and diamond) selection. Additional topics include: an introduction to process planning, quality control charting - Statistical Process Control (SPC) techniques, and Geometric Dimensioning and Tolerancing (GD&T). NOTE: Prerequisites: TME 111 or demonstratable precision measuring instrument familiarization (contact program coordinator).

Upon successful completion of this course, students should be able to:

Describe and perform practices and procedures required to safely complete operations involving cutoff and contour saws, drill presses, vertical and horizontal milling machines, engine lathes, pedestal and surface grinders.

Identify the basic principles and terms associated with the interpretation of drawings for the manufacture and inspection of parts, with an emphasis on Geometric Dimensioning and Tolerancing.

Implement various aspects of design, planning and organization for the production of manufactured parts.

Discuss, in general terms, the nature, properties and types of materials used to produce manufactured parts.

Refer to manufacturers' catalogs and the theory of cutting tools to determine the application and the identification of appropriate cutting tool holders, adapters, cutters and inserts, and to develop a machining operation plan, including set-up and job sheets.

Perform algebraic and trigonometric computations associated with the manufacture of piece-parts to include speeds and feeds, tapers, threads and indexing; and other mathematical calculations related to various machining parameters, machine selection, set-up and inspection of piece-parts.

Utilize engineering drawings and precision instruments to produce parts on machine tools, to include cut-off and contour saws, drill press, vertical and horizontal milling machines, engine lathe, pedestal and surface grinders.

Describe, in basic terms, the various considerations associated with special purpose machines, processes, mass production, hard and soft automation, and assembly techniques.

Prerequisite: TCC 111 and TCC 112* and MAT 128*. (*Courses may be taken concurrently.)

3 Credits2 Weekly Lecture Hours

2 Weekly Lab Hours

TME 115 Basic Technical Skills

This course introduces students to the basic hands-on technical skills required for skilled trades, manufacturing and other advanced technology trades. Students receive instruction in use of hand and power tools, operation of equipment, use of English and Metric measurement instruments, use of precision measuring instruments, as well as, basic heating, bending and cutting.

Upon successful completion of this course, students should be able to:
Apply basic accident prevention practices and procedures relative to personal protection.

Interpret sketches, drawings and schematics, and perform basic layout practices.

Use English and Metric rules, weights and other instruments to make accurate measurements and layouts.

Perform basic electrical measurements.

Demonstrate the skills and knowledge required to utilize common hand and power tools.

Conduct basic heating, bending and cutting.

Demonstrate basic rigging and equipment moving procedures.

Prerequisite: NONE New students should complete Placement Testing prior to registration. Visiting students may submit college transcript.

3 Credits2 Weekly Lecture Hours**2 Weekly Lab Hours****TME 190 Advanced Technologies Internship (1 credit)**

College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 60 hour internship will earn 1 college credit for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.

Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.

Describe the ways that technology is utilized in the work experience.

Analyze the culture of the host organization.

Analyze an operational process within the work experience.

Demonstrate how assigned tasks depend on successful communication.

Describe how time and activity are managed to meet work-imposed deadlines.

Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.

Demonstrate specifically how job-related competence has improved.

Formulate a self-assessment for career growth and personal satisfaction.

Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).

Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.

1 Credit**TME 194 Advanced Technologies Internship (2 credits)**

College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 120 hour internship will earn 2 college credit for this experience. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years Have begun course work in their major (at least 9 credits) Have an overall grade point average (GPA) of 2.5 Obtain a written recommendation by a DCCC faculty within the discipline of the internship Submit a current resume to the Office of Student Employment Services

Upon successful completion of this course, students should be able to:

Explain three program-related concepts that have been applied during the work experience.

Describe the ways that technology is utilized in the work experience.

Analyze the culture of the host organization.

Analyze an operational process within the work experience.

Demonstrate how assigned tasks depend on successful communication.

Describe how time and activity are managed to meet work-imposed deadlines.

Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.

Demonstrate specifically how job-related competence has improved.

Formulate a self-assessment for career growth and personal satisfaction.

Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).

Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.

2 Credits

TME 199 Advanced Technologies Internship (3 credits)

College-Sponsored Experiential Learning (CSEL) is designed to integrate on-the-job learning experiences with classroom studies. These experiences are structured either to explore career options or to prepare for a specific occupation. Students participating in the Cooperative Education and Internship Program gain college credit and are graded for their learning/work experience by the appropriate faculty. Students participating in this 180 hour internship will earn 3 college credits for this experience. Upon successful completion of this hands-on work experience, the student should be able to satisfy instructionally selected competencies from those below according to the number of credits to be awarded. NOTE To be eligible for an internship, students must: Have completed a minimum of 18 or more credits within the last 5 years. Have begun course work in their major (at least 9 credits). Have an overall grade point average (GPA) of 2.5. Obtain a written recommendation by a DCCC faculty within the discipline of the internship. Submit a current resume to the Office of Student Employment Services.

Upon successful completion of this course, students should be able to:
Explain three program-related concepts that have been applied during the work experience.

Describe the ways that technology is utilized in the work experience.

Analyze the culture of the host organization.

Analyze an operational process within the work experience.

Demonstrate how assigned tasks depend on successful communication.

Describe how time and activity are managed to meet work-imposed deadlines.

Describe an instance where problem-solving skills were needed to analyze a situation in the work experience.

Demonstrate specifically how job-related competence has improved.

Formulate a self-assessment for career growth and personal satisfaction.

Satisfy the competencies of the chosen CSEL placement (to be developed in consultation with the CSEL instructor).

Work closely with a faculty mentor in the student's program/major to complete a project which articulates how the experience helps the student achieve program outcomes.

3 Credits3 Weekly Lecture Hours

TME 212 Computer Aided Machining

This course provides students with an introduction to off-line programming of Computerized Numerically Controlled (CNC) machine tools via the use of Computer Aided Machining (CAM) software. Emphasis is placed on becoming comfortable and productive with a CAM system operated as an automated process modeling tool. Fundamental concepts terminology and applications are stressed, as is the use of interactive software modules for modeling CNC operations. Topics include an introduction to the computer/plotter/printer as a work station, an overview of graphics modeling concepts, the application's Graphical User Interface (GUI) and a thorough familiarization of selected icons and definitions. Generalized and specific activities associated with introductory computer-aided drafting (CAD)/CAM operations, job planning, piece-part geometry/tool path definition and part modeling will be covered. An introduction to workplanes and MACROS, as well as CNC code generation and machine communications, will be addressed. Milling and turning (with a minor emphasis on fabrication) operations will be stressed. Process modeling software packages for production milling and turning will be used as vehicles of instruction for this course.

Upon successful completion of this course, students should be able to:
Develop the concepts necessary for interpretation and conversion of part drawings into proceduralized manufacturing process/operation, tooling sheets and job plans.

Use computer software and hardware (including peripherals) to interactively create, edit and communicate job plans (to include tooling/operational information), CAM generated drawings and machine code files.

Demonstrate a basic ability to transfer (and manipulate) 2D CAD/CAM design data for use in piece-part process modeling and experimentation.

Formulate necessary logic (object/action techniques) and demonstrate knowledge of the software module's capabilities to define, create and edit drawings, and tool path elements using freeform and continuous part profile and surface creation techniques.

Complete activities associated with the verification of tool path motion, and for the creation of machine ready code, for piece-part production.

Utilize advanced software features to describe, manipulate and perform repetitive tasks associated with the creation of a manufacturing process model.

Conduct part program origin and workplane/transformations.

Prerequisite: TME 111.

3 Credits2 Weekly Lecture Hours

2 Weekly Lab Hours

TME 216 Statics and Strength of Material

This course provides students with a foundation in the general procedures and principles of the mechanical design process. Students solve force systems select components and determine resultants in equilibrium. Strength failures of various materials will also be studied in detail.

Upon successful completion of this course, students should be able to:
Analyze and solve problems involving force systems, components, resultants and equilibrium.

Determine center of gravity and centroids of members and objects.

Identify moment of inertia of objects.

Analyze simple structures under linear stress and strain.

Investigate the effects of torsion on shafts and springs.

Find the load, stress and deflection on beams.

Analyze structures subjected to combined loading.

Prerequisite: MAT 128 and PHY 107.

4 Credits3 Weekly Lecture Hours

2 Weekly Lab Hours

TME 221 Manufacturing Processes II

A continuation of Manufacturing Processes I. This course includes practical experience in machine operations. Hot-working manufacturing processes including laboratory production of simple molds, cores, castings and weldments are introduced.

Upon successful completion of this course, students should be able to:

Describe principles of the major manufacturing processes and operations.

Determine a plan for the layout, operation and quality check of chip-cutting (cold), forging and melting (hot) manufacturing processes.

Produce a plan, layout and quality check of products by manufacturing processes.

Form a product by casting.

Form a product by forging.

Perform basic heat-treating operations.

Fabricate a product by welding.

Prerequisite: TME 121.

3 Credits2 Weekly Lecture Hours

2 Weekly Lab Hours

TME 222 Advanced Computer Aided Machining

This course provides introductory instruction on advanced piece-part modeling techniques of Computer-Aided Drafting/Design-Computer Aided Machining (CADD-CAM). A broad based instructional approach provides concepts necessary to applying process modeling techniques for both advanced milling and turning. Three-dimensional (combined surface types) geometry and associated tool path coding on multiple work and tool planes will be covered. Advanced solutions for completing four-axis simultaneous turning and integrated mill/turn (C-Axis) and 'live' tooling operations for modern lathes will be included also. Process modeling software packages for advanced three-dimensional machining and advanced turning will be used in instruction for this course.

Upon successful completion of this course, students should be able to:

Describe the basic concepts and performance requirements for effecting translation and manipulation of Computer-Aided Drafting/Design to Computer-Aided Machining (CADD-CAM) data for Computer Numerically Controlled (CNC) program creation.

Complete advanced work and tool plane definition, and manipulate software functions to perform operational activities involving same.

Conduct four- and five-axis position and rotary axis modeling as well as CNC code generation.

Identify, create and perform operations on surface primitives and developed (3D composite) wireframe and surface geometry models.

Create job plans and 3D surface geometry tool path and associated CNC machine tool code for piece-part production.

Plan, create and program synchronized four-axis turning operations.

Apply appropriate techniques for modeling mill/turn operations and for creating machine tool code.

Plan, develop, edit and execute macros for family- of-parts operations.

Prerequisite: TME 212.

3 Credits2 Weekly Lecture Hours

2 Weekly Lab Hours

TME 223 Industrial Robotics

(Formerly TME 220) This course provides an in-depth look into the field of robotics. The specific types of robots, their function and their impact on the way the world does business will be discussed. A brief history of the robot, and automation will be discussed starting with a simple wind-up toy robot up to and including developments in Artificial Intelligence (AI). The course will address the impact that programmable automation and the application of robotics is having on the worker, the workplace and society in general. Changes in manufacturing, production and the planning processes will also be examined. Fundamental robot design, classification, configuration and programming will be examined in order to implement the proper robotic systems needed for specific manufacturing tasks. The course includes hands-on experience in the construction, programming and operation of multiple types of robots and automated equipment.

Upon successful completion of this course, students should be able to:

Discuss the evolution of and latest advancements that automation and robotics has made on industry, the worker, and society in general.

Describe the basic structure and mechanical configuration as well as the functional characteristics of various types of robots.

Compare and contrast robotic/automated control systems, programming methods, and the need for repeatable processes.

Describe common robotic work envelope configuration and match these envelopes with specific robot applications.

Discuss general workshop safety precautions as well as safety considerations for robotic systems in the working environment.

Explain the aspects of flexible applications inherent to robots; and, automated work cells.

Identify the advancements that robots have made to die casting, spray painting, welding and assembly finishing inspection, loading and unloading services within the manufacturing sector.

Demonstrate the use of PLC's in the programming of industrial and consumer types of robots and the need for standardization of automatic and repeatable control processes.

Prerequisite: TEL 200 and ELT 204.

4 Credits3 Weekly Lecture Hours

2 Weekly Lab Hours

TME 229 Fluid Power and Controls

This course provides a study of the basic principles of industrial fluid mechanics hydraulics and pneumatics. Types of fluid, their condition and use in transmitting power throughout various circuits are addressed. Pumps and compressors, conductors, circuit components, application and control are also topics of coverage. Characteristics such as flow, pressure/vacuum, force, temperature, torque, speed, horsepower, efficiency, fluid and system conditioning, as well as component and circuit performance will be addressed. System design, component specifications and selection, will be examined also. Pilot and electromechanical control system features will be discussed and investigated. Instructional emphasis is placed on the relevant theoretical and practical aspects of the subject. NOTE: Recommended concurrent: TME 220.

Upon successful completion of this course, students should be able to:
Cite basic maintenance and accident prevention practices and procedures for fluid power and control system service and operation.

Identify criteria and methods used to specify components, as well as commonly used fluids for pneumatic and hydraulic systems.

Identify, classify and specify hydraulic and pneumatic prime movers, compressor/pumps, valves, conductors, filters and strainers.

Determine cylinder load, speed, volume, pressure/ vacuum, flow rate, and horsepower requirements.

Size fluid conductors, receivers, reservoirs and accumulators based on fluid pressure, flow rates and volumetric requirements.

Recognize standard graphic symbols for common pneumatic and hydraulic components.

Lay out and sketch simple circuits using standard graphic symbols.

Construct, demonstrate and investigate the use of various control devices, circuits and systems including pilot and electro/mechanical controls.

Prerequisite: PHY 107 and (MAT 120* or MAT 135* or MAT 151*)

(*Courses may be taken concurrently.)

4 Credits3 Weekly Lecture Hours

2 Weekly Lab Hours

TME 231 Technical Mechanics

This course provides students with the concepts and skills required to apply the principles of mechanics for the solution of problems commonly encountered in the fields of drafting and design mechanical and automated manufacturing and robotics technologies.

Upon successful completion of this course, students should be able to:

Review force systems using free bodies in equilibrium.

Solve friction problems for wedge, belt, rolling and bearing systems.

Review the center of gravity and moment of inertia for distributed area and mass systems.

Describe motion of a particle or ridged body.

Determine the effect of forces on moving bodies.

Analyze simple systems subjected to impulse and momentum.

Calculate work, energy and power during mechanical operations

Prerequisite: MAT 128 and PHY 107.

4 Credits3 Weekly Lecture Hours

2 Weekly Lab Hours

TME 232 Robotic Systems

Offered as a continuation of Robotics and Programmable Logic Controllers (TME 220) this course provides instruction in robotic work-cell development and applications. This course focuses on the application of robots and manufacturing automation systems. Cell layout, documentation, programming and the integration of sensory feedback systems to monitor a control process within a manipulative and transporting system are stressed.

Upon successful completion of this course, students should be able to:
Analyze the processes and operations involved and prepare a plan for the layout and integration of various components within a robotic work cell.

Read and create drawings, circuits and logic diagrams applicable to installing, interfacing, programming and repairing automated systems.

Describe the basic function of a sensory monitoring/ feedback system and discuss the concepts involved for accomplishing system interfacing, and system control.

Perform off-line programming functions for Robotic and Programmable Logic Controllers (PLC) devices.

Monitor the performance of a PLC microprocessor/computer automated system.

Interact with supervisory personnel and assist with the installation of a programmable automated system.

Prerequisite: TME 220.

3 Credits2 Weekly Lecture Hours

2 Weekly Lab Hours

TME 290 Fluid Mechanics

This course provides a study of the basic principles of industrial fluid mechanics and pneumatics. Included are topics related to types of fluid and their use to transmit power throughout various circuits, together with pumps and compressors, circuit components, their application and control will be investigated. Characteristics such as flow, pressure/ vacuum, force, temperature, torque, speed, horsepower, efficiency, fluid and system conditioning, as well as component and circuit performance will be addressed. System design, component specifications and selection, will be examined. Pilot and electromechanical control system features will be discussed and investigated. Instructional emphasis is placed on the relevant theoretical and practical aspects of the subject matter.

Upon successful completion of this course, students should be able to:
Cite basic maintenance and accident prevention practices and procedures for fluid power and control systems operation.

Identify methods and criteria used to specify pneumatic prime movers, motors, pumps, valves, filters and strainers.

Identify, classify and specify hydraulic and pneumatic prime movers, motors, pumps, valves, filters and strainers.

Determine cylinder load and speed and calculate fluid volume, pressure/ vacuum, flow rate and horsepower requirements.

Size fluid conductors, receivers, reservoirs, and accumulators based on fluid pressure, flow rates, and volumetric requirements.

Recognize standard graphic symbols for the more common pneumatic and hydraulic components.

Sketch simple circuits using standard graphic symbols.

Describe the function of basic fluidic devices, circuits and control systems. Construct, demonstrate and investigate the use of various control devices, circuits and systems; to include pilot and electro/mechanical controls.

Prerequisite: NONE New students should complete Placement Testing prior to registration. Visiting students may submit college transcript.

3 Credits3 Weekly Lecture Hours