MECHANICAL TECHNOLOGY (TME)

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 ceramicsDetermine 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.
3 Credits 3 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.
Prerequisites: TCC 111.
Corequisites: TCC 112 and (MAT 110 or MAT 128).
3 Credits 2 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.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

TME 190 Advanced Technologies Internship
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
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
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 Credits 3 Weekly Lecture Hours

TME 210 CNC Operation and Manual Programming
This course provides an introduction to the operation and manual programming of Computerized Numerically Controlled (CNC) machine tools including fundamental concepts, terminology and applications. The capabilities, advantages and disadvantages of numerically controlled equipment will be covered. Mathematical applications for definition of location, set-up, positioning and movement within specific coordinate systems will be presented. Various aspects of manual programming (G and M codes) and computerized conversational graphics modeling will be included. Criteria and practices basic to effective preventative maintenance, accident prevention practices and procedures, process planning, tooling, machine set-up and operation (dry-run, first and production runs) will also be addressed. NOTE: Prerequisites: TME 111 or documentable and demonstratable proficiency, and competencies from appropriate work-life experiences (contact program coordinator).
Upon successful completion of this course, students should be able to:
Develop an appreciation for the aspects of Numerical Control (NC) and for production enhancement capabilities of Computerized Numerically Controlled (CNC) machine tools.
Via manual methods, interpret and convert basic part drawings to procedural manufacturing process/operation, tooling and job plans for a CNC mill or a CNC lathe.
Apply principles of mathematics, engineering piece-part print interpretation and geometric analysis techniques to describe a manufactured part's datum points and planes, surfaces and feature locations in terms of two dimensional, interpolated machine axes and tooling positions.
Utilize the concepts and techniques of manual programming to prepare and proof a written manuscript for the production of a manufactured part on a CNC mill and a CNC lathe.
Demonstrate the ability to use concepts, techniques, hardware, software menus and computer system practices associated with a Computer Aided Machining/Distributed Numerical Control (DNC) system to write, save, retrieve and transfer CNC machine tool programs.
Conduct CNC mill and lathe set-up, dry run, first run, inspection and adjustment techniques, and production run procedures and practices.
Prerequisites: TME 111.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

TME 212 Computer Aided Machining
This course provides students with and 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 familizarion 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.
Prerequisites: TME 111.
Corequisites: TCC 112.
3 Credits 2 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.
Prerequisites: (MAT 110 or MAT 128) and (PHY 100 or PHY 107).
4 Credits 3 Weekly Lecture Hours
2 Weekly Lab Hours

TME 220 Robotics and Programmable Controls
This course provides an introduction to the field of robotics. The specific types of industrial robots their function and mode of operation will be addressed. The impact that programmable automation and the application of robotics is having on the worker, the workplace and on production planning will be discussed. Actuation and operational characteristics of robots will also be covered. A study of sensor and automation applications will be included. NOTE: Recommended co-requisite: TME 229.
Upon successful completion of this course, students should be able to:
Discuss the effects that automation technology and industrial robots have on employers, employees 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.
List the end-of-arm-tooling characteristics available to the production planner.
Develop a list of accident prevention practices and procedures, and maintenance requirements for robotic work-cell operations.
Explain the aspects of flexible applications inherent to a robot.
Define the areas in manufacturing conducive to the utilization of robots.
Describe the operation of a PLC and prepare programs to effect automatic control of processes.
3 Credits 2 Weekly Lecture Hours
2 Weekly Lab Hours

TME 221 Manufacturing Proccesses 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.
Prerequisites: TME 121.
2,3 Credits 2 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.
Prerequisites: TME 212.
3 Credits 2 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.
Prerequisites: PHY 100 or PHY 107.
Corequisites: MAT 111 or MAT 120 or MAT 135 or MAT 151.
4 Credits 3 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
Prerequisites: (MAT 110 or MAT 128) and (PHY 100 or PHY 107).
4 Credits 3 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.
Prerequisites: TME 220.
3 Credits 2 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 penuematics. 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 practicial 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.
3 Credits 3 Weekly Lecture Hours