MTT - MACHINE TOOL TECHNOLOGY

MTT 108 Mathematics for Occupational Technologies
This course is designed to provide the student with relevant theory and skills in solving practical, industrially based mathematical problems. Topics of instruction will include, but will not be limited to, calculating arithmetic expressions involving whole numbers, fractions, decimals, ratio, proportion, and percentages. The appropriate use of English/metric conversions, exponents, square roots, basic graph interpretation, and basic algebraic expression (formulas) manipulation will be presented. In addition, the solution of geometric figures will be addressed. An introduction to the use of trigonometry for the solution of right and oblique triangles will also be included.
Upon successful completion of this course, students should be able to:
Conduct arithmetic operations using whole numbers, fractions, and decimals for the solutions of typical technologically based concepts, processes and operations.
Perform English and Metric computations involving numeric and literal problems.
Demonstrate the use of a Cartesian and a polar coordinate system to interpret and construct basic graphs, such as; bar, pie, broken line, etc.
Analyze data and select an appropriate method to construct a chart, or graph, as well as decipher relationships among topical data.
Solve fundamental expressions and common formulas using algebraic rules for addition, subtraction, multiplication, division, ratio, proportion, percentages, powers and roots, and transposition of terms, to include mixed operators.
Apply appropriate terminology and rules for solving problems involving basic geometric entities and figures.
Communicate the rules of similarity and congruency and solve basic triangles.
Identify and construct right triangles and utilize the Pythagorean theorem, sine, cosine, and tangent functions and The Law of Sines/Cosines for the trigonometric solution of unknowns.
Prerequisite: NONE New students should complete Placement Testing prior to registration. Visiting students may submit college transcript.
3 Credits3 Weekly Lecture Hours
1 Weekly Lab Hour

MTT 110 Print Layout and Measurement for Machining
This introductory course is designed to provide instruction in the theory and skills necessary to read conventional drawings commonly used in the machining industry. Instruction will be centered around object visualization and feature definition/recognition. Basic through intermediate difficulty multiview third angle (with lesser emphasis on first angle) projection, to include orthographic, isometric, sectional and auxiliary view drawings will be addressed. Piece-part feature terminology, tolerances, limits, fits, conventional dimensioning practices, surface finish and inspection issues will be stressed. Sketching, precision layout tools, measurement tools, and techniques of usage will be covered and utilized to demonstrate comprehension in print/part interpretation.
Upon successful completion of this course, students should be able to:
Discuss the purpose, the importance, the types, and various uses of engineering drawings, as they relate to the design and manufacture of parts.
Communicate the purpose of a title sheet, and relate the value of each of its components to the process of completing a finished product.
Analyze the features of an object and develop representative sketch using the principles of orthographic projection.
Interpret line work, dimensions, orthographic views, various section types, auxiliary views, and annotations associated with mechanical drawings.
Visualize objects, describe geometric relationships, determine feature size and placement, and apply terminology in the interpretation of graphical representations of a tab, bevel, chamfer, neck, fillet, round, slot, keyway, flat, boss, pad, hole/pattern, countersink, counterbore, tapered surface, as well as English and metric thread forms.
Describe, discuss and apply the techniques used in standard coordinate dimensioning methods to complete sketches, to layout parts, and perform inspection operations.
Identify, and discuss the purpose, and the limitations, of various layout tools; and, of common precision measuring instruments.
Demonstrate the use of various layout and precision measurement tools.
Prerequisites: MTT 108* or MAT 128* or MAT 140* or MAT 150* or MAT 151* or MAT 160*. *May be taken concurrently.
4 Credits3 Weekly Lecture Hours
1 Weekly Lab Hour

MTT 111 Introduction to Manufacturing
This course provides an introduction to the field of manufacturing/machining. The course is designed to provide instruction in the commonalties of theory and skills associated with various branches of the manufacturing industry. An overview of departments, engineering design, job planning, process documents, manufacturing support team responsibilities, as well as production workforce member's duties and responsibilities will be discussed. Shop floor etiquette, workplace cleanliness, safety and health, common powered and non-powered hand tools will be covered. Machine tool operations involving cut-off and contour metal cutting saws, drilling machines, offhand grinding of High-Speed Steel (HSS) twist drills and lathe tools as well as surface grinding operations will be addressed. The application of measuring and layout tools will be combined with piece-part layout and inspection practices for part production. Materials, including cutting tools, and their properties will be introduced. Non-traditional machining processes, special purpose production machines, as well as hard and soft automation are among additional topics to be discussed. A rudimental introduction/familiarization with conventional lathes and milling machines will also be included.
Upon successful completion of this course, students should be able to:
Describe the purpose, importance, and responsibilities of various personnel and departments within a manufacturing organization.
Determine the general salary ranges and job description for a position of employment.
Outline a plan for personal career path growth in manufacturing.
Interpret work-related documents such as work orders, process, and various operation sheets.
Apply appropriate terminology in order to, select, handle, care for, and store tools used to perform bench work, inspection and assembly operations.
Discuss and apply basic accident prevention practices and procedures, commonly required in manufacturing, as well as personal safety equipment; in order to assure personal health and safety.
Compare and contrast hardness and machinability ratings.
Demonstrate procedures for set-up and operation of various sawing, drilling, offhand, and surface grinding machines.
Perform commonly assigned operator clean up and maintenance tasks associated with grinding, sawing and drilling machines.
Demonstrate appropriate shop floor etiquette among co-workers and discuss the basic concepts of customer relationships in the context of work teams facilitation.
Describe various characteristics associated with special purpose machines, mass production, hard and soft automation and assembly techniques.
Define various common acronyms associated with processes, equipment, and operations common to the manufacturing industry.
Describe the geometric features and part shapes created by broaching, shaping, planing, lathe and milling machine operations.
Explain the various abrasive machining processes; and, the high production thread and gear cutting processes.
Discuss the nature, properties, and selection criteria for various types of materials used to manufacture parts.
Prerequisites: MTT 108 or MAT 128 or MAT 140 or MAT 150 or MAT 151 or MAT 160.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 112 Lathe Operations I
This course provides instruction in the terminology, design, setup, operation, and daily care of conventional metal working engine and related lathes. Theory and practical skill development exercises will focus on cutting tool preparations for completing external surface machining such as; straight turning, threading, chucking and tailstock operations. Accident prevention practices and procedures will be stressed throughout the course.
Upon successful completion of this course, students should be able to:
Lubricate, clean, and perform commonly assigned operator maintenance duties for a lathe.
Interpret work-related documents for piece-part machining on a lathe.
Utilize appropriate terminology and accident prevention practices and procedures while referring to, and using lathes, and related accessories.
Research design criteria and sharpen lathe tools and twist drills via off-hand grinding.
Utilize detail drawings, calculations, layout tools, precision measuring instruments and appropriate techniques to prepare parts for manufacture on a lathe and verify part dimensions during inspection procedures.
Identify, select, mount, set-up and adjust appropriate machine tool accessories, attachments, work holding and tool holding devices, cutting tools, and work-pieces in preparation for performing lathe operations.
Calculate and set speeds/feeds in order to perform lathe operations such as facing, chamfering, center drilling, drilling, reaming, turning, necking, grooving, parting, knurling, external threading as well as hand tapping, filing, polishing, and de-burring.
Prerequisites: MTT 108* and MTT 110* and MTT 111*. *May be taken concurrently.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 122 Lathe Operations II
This course is designed to provide supplemental theory and skills instruction in conventional lathe machining operations. Skill embellishment and expanded external, as well as internal surface piece-part machining operations and associated accident prevention practices and procedures will be stressed in this course. Concepts and mathematical calculations for part geometry determination, specific lathe (machining) requirements, and the use of digital readout units will be covered. Carbide/ceramic/diamond cutting tool material, insert, and tool holder identification and selection requirements for lathe work will be explained in detail. Process planning and Geometric Dimensioning and Tolerancing (GD&T) characteristics appropriate for lathe machining will also be addressed.
Upon successful completion of this course, students should be able to:
Set-up and operate a conventional engine lathe to complete intermediate to advanced operations involving trepanning, tool post grinding, radius-turning devices, threading (tap/die) heads, steady, and follower rests.
Select accessories and attachments, set-up and use face plates, independent, universal, and combination chucks, collect attachments, and a steady rest to facilitate internal surface feature creation such as radii, bores (straight, and tapered), grooves, and chased threads on a lathe.
Interpret print requirements (including GD&T) and part geometry for machining and inspection of advanced lathe parts.
Identify coolant requirements; and, using machinability and other factors, select inserts and toolholders for job completion.
Perform geometric/algebraic/trigonometric calculations for set-up, machining and inspection of parts, to include chamfers, tapers, threads, etc.
Review reference materials in order to develop a process plan (to include job/operations tooling, and inspection procedures) for machining of a basic lathe piece-part.
Conduct mathematical calculations associated with tapers, threads, torque, horsepower, unit cycle time/cycle time reduction, and basic estimating.
Prerequisite: MTT 112.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 124 Milling Operations I
This course provides introductory instruction in the terminology, design, application, set-up, operation and daily care of conventional milling machines. Accident prevention practices will be stressed.
Upon successful completion of this course, students should be able to:
Lubricate, clean and perform commonly assigned cleanup and operator maintenance duties for a milling machine.
Interpret work-related documents for piece-part machining on a milling machine.
Utilize appropriate terminology when referring to milling machines, attachments and associated equipment.
Utilize detail drawings, calculations, layout tools, precision-measuring instruments and appropriate techniques to prepare parts, and to verify part dimensions during inspection procedures.
Identify required work and tool holding devices, select, mount, set-up and adjust appropriate accessories, attachments, and workpieces in preparation for performing milling machine operations such as facing, step, and slot milling, chamfering, spot drilling, drilling, reaming, spot finishing as well as hand tapping.
Perform machine head/table and workholding device alignments.
Calculate and set speeds and feeds, and perform milling machine operations.
Prerequisites: MTT 108* and MTT 110* and MTT 111*. *May be taken concurrently.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 129 Solids (CAM) Modeling
This course is designed to provide introductory instruction in the theory and skills associated with Computer Aided Manufacturing (CAM) solids modeling industry. 3D design / modeling characteristics as well as criteria for constraint and feature-based design modeling will be stressed. Specific elements of designing for Computer Aided Machining (CAM) facilitation will be addressed.
Upon successful completion of this course, students should be able to:
Determine occupational positions and define basic terms relevant to functioning within the engineering design/manufacturing CAM industries.
Analyze piece-parts for parametric feature/profile/surface and pattern definition.
Describe work and tool planes, axes, coordinate systems, and develops feature definitions for manufactured parts.
Interact with hardware/software in order to create and manipulate various views as a means for appropriately displaying a model.
Plan and demonstrate steps for creating and modifying (manufactured) part models using a CAM package.
Develop intermediate to advanced geometric part features and surface models using extrude, revolve, swept, and lofted function solid modeling techniques.
Manipulate part definition history, and edit shapes via cut and paste functions, as well as Object Linking and Embedding (OLE) functions of the solid modeling software.
Create/customize and present working (or shopfloor) documents.
Analyze factors, design and create/customize, and communicate information regarding templates for manufactured part production.
Perform extraction, as well as import and export operations involving graphical data.
Prerequisite: MTT 110 and TCC 111.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 190 Machine Tool 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

MTT 194 Machine Tool 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 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.
2 Credits

MTT 199 Machine Tool 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 Credits

MTT 210 CNC Machine Tool Operations
This course is designed to provide appropriately prepared conventional machine tool operators with an introduction to Computerized Numerical Control (CNC) machine tool set-up and operation. Theory will be practical in nature and relate directly to shop based applications. Lathe, and mill, operations will be stressed; however, the theory and concepts will be applicable to various CNC machine tools.
Upon successful completion of this course, students should be able to:
Conduct commonly assigned CNC machine tool operator cleanup and maintenance activities.
Describe the various axes and coordinate systems associated with differing CNC machine tool types.
Apply accident prevention practices and procedures while interacting with the Machine Control Unit (MCU), as well as during program proof-out; and, while performing maintenance.
Discuss the types and principles of MCU offset registers, and their usage.
Analyze rudimental program problems and perform basic editing operations to modify G-code programs via Manual Data Input (MDI) operations.
Edit canned cycle functions utilizing calculations/data prepared by others to create simple G-code programs via conversational graphics as well as by typing on a personal computer.
Demonstrate upload/downloading and other Distributed Networked Computer (DNC) functions on a shop floor computer network.
Set-up, align, and zero-out workholding devices, tooling adapters, and toolholders.
Perform dry/first/production runs and inspections, adjusting various register values to assure tool qualification, and part dimensionality.
Communicate and apply piece-part set-up and inspection procedures commonly associated with, advanced Lathe and Milling Operations.
Prerequisite: MTT 122.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 213 Manufacturing Processes
This course is designed to provide broad spectrum, first exposure, technical instruction in the fundamental processes (other than material removal) used to produce manufactured goods. Various aspects of manufactures' responsibilities in providing producer and consumer goods, as well as services, will be covered. Generalized methods of conversion of materials into various forms and shapes via processes such as casting, extrusion, injection molding, welding, etc., will be the primary focus of this course. Principles, terminology, as well as practical applications will be stressed. In addition to rounding-out educational experiences for manufacturing/mechanical/drafting and design students, this course is also suited for providing novice engineers, supervisors, and managers with practical experiences in varied manufacturing processes.
Upon successful completion of this course, students should be able to:
Describe the design process and various considerations engineers typically ponder/explore before deciding on a process for manufacturing an article.
Discuss the production of parts with respect to the fundamentals of the casting and molding processes.
Demonstrate a basic understanding of the principles involved in the forming, rolling, drawing, extrusion and molding processes.
Differentiate, document, and demonstrate flame/arc cutting and welding process variables.
Compare and contrast various bonding, joining (to include welding and related processes), and mechanical fastening methods.
Research, and describe in an oral presentation, a non-traditional material removal process, or prototyping process available to manufacturers, relating same to aspects of future human development.
Distinguish between the common surface treatments and finishing processes.
Relate the classifications of production systems and the impact automation has for each.
Elaborate on the principles of Lean Production and the "Factory within a Department" concepts, suggesting their possible impact on the social fabric of the workplace.
Summarize the concepts and criteria for reducing costs and increasing productivity on the shop floor.
Utilize welding, melting, casting, and molding equipment to conduct laboratory exercises.
Present examples of how artists can use manufacturing processes to create works of art.
Prerequisite: MTT 108 and MTT 110.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 214 Milling Operations II
This course is designed to provide theory and skill instruction supplemental to that introduced in Milling Operations I (MTT 124). Skill embellishment and expanded surface feature creation in the use of conventional metal working milling machines and attachments, along with associated accident prevention practices and procedures will be stressed. Concepts and mathematical calculations for machining of prismatic (cube-like) features and part geometry will be emphasized. Process planning, documentation and Geometric Dimensioning, and Tolerancing (GD&T) characteristics for milling work will be addressed. Cutters and insert (geometry and grade) selection, as well as cutting parameters, will be stressed.
Upon successful completion of this course, students should be able to:
Utilize detail drawings, layout, and inspection tools to produce parts via horizontal and vertical milling operations.
Plan sequential operations and develop a process, a tooling, and an operation sheet, for advanced piece-part manufacturing on milling machines.
Develop set-up and inspection procedures for milled parts.
Compare milling machine cutting tool material types, and their selection criteria.
Research machinability factors and ratings for various types and classifications of materials.
Refer to manufacturer's catalogs and apply theory of cutting tools to determine the application, and the identification of cutting tool adapters, cutters, and inserts.
Determine coolant selection, speed, and feed settings in regard to tool material and insert geometry requirements in order to obtain specific surface finish requirements on milled parts.
Interpret print requirements (including GD&T) and part geometry for machining and inspection of advanced milling parts.
Create internal features to include chamfers, bores, recesses, counterbores, countersinks, grooves and pockets using a milling machine.
Set-up and use various style cutters to create form (profile) geometry such as angle, convex, concave, radius, T-slot, and key-way features.
Mount and use milling machine accessories and attachments such as a right angle plate, rotary table, dividing head, boring head, angular vise, angle plate, V-blocks, sine bar/plate/vise.
Position fixtures and perform fly cutting, slitting, straddle, and gang milling operations.
Prerequisite: MTT 124.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 219 CAM Solids I
As a continuation of the principles of Computer Aided Manufacturing (CAM) design database development and usage, this course is designed to build on the course entitled Solids (CAM) Modeling (MTT 129). As such, instruction in this course will be centered around the theory and skills associated with the generation of 2 through 2 1/2 axis Computerized Numerically Controlled (CNC) machine tool code generation. Specific tool assignment and tool path generation for CNC milling and profiling [router, water-jet, laser and like machines] as well as conventional, two axis, CNC lathes will be addressed.
Upon successful completion of this course, students should be able to:
Conduct import and export, as well as other data file management and Distributed Networked Computer (DNC) operations.
Analyze geometry in order to develop tool path routines utilizing appropriate lead in/out and roughing moves to create desired features and surface quality.
Design and create libraries of commonly used machining operations, as well as modify operations to optimize tool paths for the improvement of part production efficiency.
Prepare piece-part modeling documentation, to include dimensioning; and, hard copy output.
Create tool paths for drilling, boring, and reaming on CNC mills and 2-axis lathes.
Develop, verify, and edit tool path, and CNC code, for single surface profile creation; as well as pocketing, island, and thin-wall surface and feature creation.
Generate roughing and finishing tool path for drilling, turning, grooving, facing, and threading (to include multiple lead) operations (inside and outside) on cylindrical parts.
Prerequisites: MTT 129 and MTT 210.* *May be taken concurrently.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 220 CNC Programming
This course is designed to provide the experienced Computerized Numerically Controlled (CNC) machine tool operator with instruction in manual part programming and advanced operations. Mathematical applications for definition of location, set-up, positioning and tool movement (absolute/incremental) within specific coordinate systems will be presented. Various aspects of intermediate to Advanced G and M code programming to include fixture offsets, thread milling, looping, macro, and sub program development/utilization/execution will be included. Criteria relevant to accident prevention practices and procedures, process planning, work-holding, tooling, machine set-up and operation, program proof-out, and quality control will also be addressed.
Upon successful completion of this course, students should be able to:
Via manual methods, interpret and convert basic piece-part drawings in order to produce proceduralized manufacturing process/operation, workholding, tooling documentation sheets, and job plans for a CNC mill (router on similar machine tool) and a CNC lathe.
Apply principles of mathematics, engineering print interpretation and geometric analysis to describe part datum's, surfaces, and feature locations in terms of 2 and 2 1/2, axis machine/tool positioning.
Prepare and proof a written manuscript for the production of parts on a CNC mill, (or similar machine), and a CNC lathe.
Utilize mathematical calculations, and concepts of geometric relationships combined with techniques, hardware, software menus and computer system practices associated with a Computer Aided Machining/Distributed Numerical Control (CAM/DNC) system to manually write, save, retrieve and transfer CNC machine tool programs.
Apply programming techniques (to include advanced canned cycle, loops, and macros).
Develop programs involving advanced operations such as helical interpolation and thread milling operations.
Program multiple and varied parts involving multiple operations per set-up to include the use of indexing devices.
Describe the purpose and use of charting as it applies to Statistical Process Quality Control (SPQC) in the CNC machining environment.
Discuss the principles and applications of parametric programming as they apply group technology part programming.
Prerequisites: (MTT 108 or MAT 128) and MTT 110 and MTT 112 and MTT 122 and MTT210 and TCC 111
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 229 CAM Solids II
This course in advanced principles of Computer Aided Manufacturing/ Machining builds on the skills and knowledge gained in CAM Solids I. Topics of instruction will include advanced (multisurface) part modeling and tool path generation for 3-axis milling (similar profiling) machines with additional positioning axis: and multi axis (mill-turn) lathes.
Upon successful completion of this course, students should be able to:
Analyze 3D-parts geometry in order to conceptualize and create tool paths for prismatic (cube-like) part contours and blended multi-surface generation via 3-axis milling.
Select an appropriate Computerized Numerically Controlled (CNC) machine tool for required piece-part production.
Structure a plan for approaching multi-part, same set-up, tool path generation for difficult to machine piece-parts.
Formulate a strategy, and generate axis positioning, as well as tool path code for 4th and 5th axis programming.
Generate tool paths for creating cross drilling, face contouring, and c-axis contours on mill-turn machine tool.
Customize a generic CNC machine tool post processor to produce desired machine/tool/program operation.
Robots software programming capabilities to consumer products and life style improvements.
Prerequisites: MTT 219 and MTT 220.* *May be taken concurrently.
3 Credits2 Weekly Lecture Hours
2 Weekly Lab Hours

MTT 230 Electrical Discharge Machining
This course is designed to provide the student with the information and basic skills required to program and operate both ram (sinker), and 4-axis wire (EDM) Electrical Discharge Machining/machines. Instruction will address the fundamental principles of the EDM process, terms, capabilities, and machine tool system components. Aspects of programming and machining methodology, to include; work holding, tooling, electrode selection and operational characteristics, process variables, set-up and operation of ram and wire machines will be addressed.
Upon successful completion of this course, students should be able to:
Cite in writing, the principles of operation for the EDM process.
Identify the function and the components, and operational characteristics, as well as the operation parameters, of typical ram and wire EDM machine tools.
Compare and contrast requirements for ram and wire EDM machine maintenance, set-up and operation.
Summarize the various types of electrode materials and designs, as well as their application.
Explain the design and operational characteristics a ram type electrode must exhibit in order to perform appropriately.
Interpret work order requirements and set-up a typical ram, and a wire EDM machine tool for production.
Set-up and operate a ram and a wire EDM machine tool in order to achieve desired inspection/quality characteristics on a finished part.
Analyze part geometry requirements and create Computer Numerically Controlled (CNC) piece-part programs, incorporating control of various processes and machining parameters for machining on a ram; and, a 4-axis wire EDM machine.
Utilize CAM software programming options to modify cutting parameters and settings, part geometry at various points on a contour.
Conduct service and maintenance functions typically assigned to an EDM machine tool operator.
Prerequisites: MTT 220 and MTT 229.* *May be taken concurrently.
4 Credits3 Weekly Lecture Hours
2 Weekly Lab Hours