

# MFG - MANUFACTURING TECHNOLOGY

## **MFG 102** 3 credit hours (lecture: 2 | lab: 2)

### **Industrial Drafting and Design**

The course provides a thorough understanding of industrial drafting and design. It starts with outline of main differences between 2D and 3D design techniques. Main content covers examining the three major components of manufacturing drawings: geometry, dimensions, and drawing annotations required to machine a part or build an assembly according to the specifications. Additional topics include differences between metric (first angle) and standard (third angle) projections and dimensioning; interpreting advanced drawing views, and analyzing detail and assembly drawings. The course concludes with introduction to Geometric Dimensioning and Tolerancing (GD&T). Introduction to three-dimensional Computer Aided Design (CAD) software is integrated throughout the course.

*Delivery mode: Face-to-Face | Hybrid | Online*

## **MFG 110** 3 credit hours (lecture: 2 | lab: 2)

### **Introduction to Machining**

Designed for students with little or no experience in precision metal-working machine tools, the course starts with detail coverage of industrial safety and OSHA policies. Main content examines basic principles and operations of a drill press, lathe, and vertical milling machine. It provides students with understanding of common machining operations together with related tooling and fixtures. Additional topics include ferrous and nonferrous metals, introduction to precision measurements, and basic technical math including speeds and feeds calculations. The course provides an introduction to Computer Numerical Control (CNC) machining.

*Delivery mode: Face-to-Face | Hybrid | Online*

## **MFG 111** 3 credit hours (lecture: 2 | lab: 2)

### **Introduction to Computer Integrated Manufacturing (CIM)**

Course introduces students to the concepts of Computer Integrated Manufacturing (CIM) systems used to automate manufacturing processes. The course starts with outline of main differences between hard and flexible automation. Main content provides introduction to basic electricity, electric motor types, hydraulics and pneumatics used for motion control, sensors and vision systems, industrial robotics, and programmable controllers. The course concludes with students composing an advanced manufacturing CIM cell.

*Delivery mode: Face-to-Face | Online*

## **MFG 112** 3 credit hours (lecture: 2 | lab: 2)

### **Automated Storage and Distribution**

Course provides a general background of fundamental manufacturing concepts, practices and current technical procedures. Content includes specific studies for those interested in manufacturing and related business practices and industries, who wish to expand their knowledge of manufacturing techniques, operations, production of parts, various elements of automation of factories, various and supply chain technology. The course covers fundamentals of related to materials handling mechanics and career awareness as it relates to the various manufacturing and supply chain functions.

*Delivery mode: Face-to-Face*

Fee: \$50

## **MFG 120** 4 credit hours (lecture: 3 | lab: 2)

### **Introduction to Welding**

Course covers basic electric arc, oxy-fuel, gas metal arc, and gas tungsten arc welding processes, along with safety procedures required to set up and shut down welding equipment for the various processes. Hands-on experience includes practice with the four welding systems using various thickness materials. Industrial standards and American Welding Society (AWS) standards for quality are discussed.

*Delivery mode: Face-to-Face | Hybrid*

Fee: \$50

## **MFG 125** 4 credit hours (lecture: 3 | lab: 2)

### **Advanced Welding**

Course teaches advanced electric arc, tungsten inert gas, gas metal arc welding processes. Safety procedures required to set up and shut down welding equipment for the various processes are enforced. Hands-on experience includes practice with the three welding systems using various thickness materials. Industrial standards and American Welding Society (AWS) standards for quality are discussed. Previous welding experience is recommended.

**Recommended:** MFG 120

*Delivery mode: Face-to-Face | Hybrid*

Fee: \$50

## **MFG 130** 3 credit hours (lecture: 2 | lab: 2)

### **TagNet Middleware**

Course covers TagNet RFID middleware; specifically on how to install, configure, and implement various use cases found in the supply chain. Topics include an understanding of the capabilities of TagNet and how various use case factors influence read rates and reliability.

**Prerequisite:** ELT 120 or concurrent enrollment in ELT 120.

*Delivery mode: Face-to-Face | Online*

Fee: \$40

## **MFG 135** 3 credit hours (lecture: 2 | lab: 2)

### **Hydraulics, Pneumatics and Controls**

Course includes instruction in hydraulic, pneumatic, and control areas, for those who maintain and design fluid power systems. Hands-on operation and troubleshooting of training equipment used to illustrate fluid properties, pressure, and pipe friction. Actual components used include: pumps, reservoirs and accumulators, actuators, control valves, packing and seals, compressors, and electrical controls (including PLCs).

*Delivery mode: Face-to-Face | Hybrid | Online*

Fee: \$50

## **MFG 140** 4 credit hours (lecture: 3 | lab: 2)

### **Introduction to Robotics and Vision Systems**

Course presents overview of operation and usage of robots in manufacturing applications. Content includes manipulators, drive systems, controllers, motion, payload, programming, and vision systems. Course work involves hands-on projects.

*Delivery mode: Face-to-Face | Hybrid | Online*

Fee: \$50

## **MFG 141** 4 credit hours (lecture: 2 | lab: 4)

### **CNC Machine Operation - NIMS Test Preparation**

Course provides instructional and hands on training to prepare students to take the NIMS (National Institute for Metalworking Skills) "CNC Operator" certification test. This is a web-based training class which contains 24 self-paced learning units as well as a lab component for hands on experience. Topics covered are: computer numerical control (CNC) mill, lathe and grinder set-up and operation, tool identification, set-up and maintenance, fixture set-up and operation, CNC troubleshooting and maintenance, precision measurement and gauging, print reading, geometric dimensioning and tolerancing, machining processes, statistical process control, quality and cycle time optimization, and CNC program operation.

**Recommended:** Computer competency and familiarity with web-based instruction.

*Delivery mode: Face-to-Face | Hybrid | Online*

Fee: \$50

<p><b>MFG 142</b> <b>2 credit hours (lecture: 1   lab: 2)</b>  <b>CNC Setup and Operations</b>            Course provides hands-on training in setup and operation of computer numerical control (CNC) machines, including CNC mill (vertical milling center) and CNC lathe (turning center) for purposes of setting up machines with required tooling and fixturing, operating CNC machines, reading and interpreting CNC programs, using inspection equipment, and troubleshooting various production problems.  <i>Delivery mode: Face-to-Face</i> Fee: \$50</p>	<p><b>MFG 220</b> <b>3 credit hours (lecture: 2   lab: 2)</b>  <b>Automation Vision Systems</b>            Designed for students with little or no experience with sensing and machine vision systems. The course outlines various types of sensors and machine vision technology commonly used in industry for automating machinery and performing quality inspection. Using sensors and machine vision, students will design and set up systems used for a variety of applications: including measurement and gauging, presence/absence sensing, identification, and machine vision guided robotics. Students will see how sensors and vision systems work and how they are applied, including CMOS sensors, limit switches, proximity sensors, photoelectric, ultrasonic, vacuum, pressure, and temperature. In addition, students will learn to integrate these sensors into external programmable controllers. Hands on projects are part of this course.  <b>Recommended:</b> MFG 111  <i>Delivery mode: Face-to-Face   Hybrid   Online</i> Fee: \$50</p>
<p><b>MFG 144</b> <b>4 credit hours (lecture: 2   lab: 4)</b>  <b>Introduction to CNC Programming</b>            Course provides hands-on training in G-code programming of computer numerical control (CNC) machines, including CNC mill (vertical machining center) and the CNC lathe (turning center), for purposes of program loading and operating CNC machines, using inspection equipment, and troubleshooting various production problems. Programs are written, developed, simulated, run, and debugged on actual machine tools. Content includes reading, interpreting, and manually creating CNC programs.  <i>Delivery mode: Face-to-Face   Hybrid</i> Fee: \$50</p>	<p><b>MFG 225</b> <b>3 credit hours (lecture: 2   lab: 2)</b>  <b>Motors and Controls</b>            Course offers theoretical and practical applications of electrical motors along with control circuits. The course starts with electrical safety overview as applied to industrial motors. Main content provides overview of various Direct Current (DC) and single/three phase Alternating Current (AC) motors. During the course students will learn about different type of motors and controls including: step motors, servo motors, and variable frequency drives (VFD). Hands-on assignments associated with diverse motor control applications in the industry are integrated throughout the course.  <b>Recommended:</b> MFG 111  <i>Delivery mode: Face-to-Face   Hybrid</i> Fee: \$50</p>
<p><b>MFG 145</b> <b>4 credit hours (lecture: 4   lab: 0)</b>  <b>Advanced CNC Programming</b>            Course is hands-on follow-up to MFG 144 and allows greater depth in design and production of CNC programs. Advanced programs simulated off-line and run on CNC machine tools. Content includes canned cycles, cutter compensation, macro programming, and subroutines. CAM software used for planning and simulation.  <b>Prerequisite:</b> MFG 144.  <i>Delivery mode: Face-to-Face   Online</i> Fee: \$50</p>	<p><b>MFG 240</b> <b>4 credit hours (lecture: 3   lab: 3)</b>  <b>Programmable Logic Controllers (PLC)</b>            Course teaches the fundamentals of a Programmable Logic Controllers (PLC) utilizing Allen-Bradley SLC-500 based trainers. The course starts with overview of basic terminology, binary and hex number systems, Boolean mathematics, common discrete input and output devices, and various types of PLC controllers. Main content is based on programming sequences of events utilizing RSLogix 500 software to control electrical motors, pneumatic actuators, and lights. During the course students will learn how to address PLC Inputs and Outputs (I/O) and utilize common software instructions including latching, timers, counters, and data shifting. Hands-on Ladder Logic programming and testing utilizing SLC-500 based PLC trainers with multiple digital I/O is integrated throughout the course.  <b>Recommended:</b> MFG 111  <i>Delivery mode: Face-to-Face   Hybrid</i> Fee: \$50</p>
<p><b>MFG 165</b> <b>4 credit hours (lecture: 4   lab: 2)</b>  <b>Mastercam Computer Aided Manufacturing</b>            CAD/CAM course for quality control personnel, auditors, and inspectors uses MASTERCAM software to create part geometry and assign tool path to geometry. Topics covered include automatic generation and communication of CNC programs to machine tools in Oakton's Manufacturing Lab, using post-processor translator. Both 2-D and 3-D tool paths used to make parts using machines with various controllers. Graphic simulation used to prove-out results.  <b>Recommended:</b> MFG 144 or equivalent experience.  <i>Delivery mode: Face-to-Face   Hybrid   Online</i> Fee: \$50</p>	<p><b>MFG 245</b> <b>4 credit hours (lecture: 3   lab: 3)</b>  <b>Programmable Automation Controllers (PAC)</b>            Course offers practical study and applications of Programmable Automation Controllers (PAC) utilizing Allen-Bradley CompactLogix based trainers. The course starts with overview of main differences between traditional Programmable Logic Controllers (PLC) and modern Programmable Automation Controllers (PAC). Main content provides programming skills to control operation of complex industrial automated systems utilizing RSLogix/Studio 5000 software. During the course students will learn how to assign system tags and tag arrays to address external I/O and internal memory and how to develop and maintain automation projects including tasks, programs, and routines. Practical applications of Function Block Diagram (FBD) and Sequential Function Chart (SFC) programming and testing utilizing CompactLogix based trainers with digital and analog I/O is integrated throughout the course.  <b>Recommended:</b> MFG 240 or previous PLC experience  <i>Delivery mode: Face-to-Face   Hybrid   Online</i> Fee: \$50</p>
<p><b>MFG 166</b> <b>4 credit hours (lecture: 2   lab: 4)</b>  <b>MASTERCAM Computer Aided Manufacturing II</b>            Course continues to build on the foundation completed in MFG 165. Focus is on creating 3D wire frame models, surface modeling, and 2D/3D solids using advanced commands, including special automatic tool path cycles, routines using post-processor translator, and graphic simulation for complex CNC machining that requires creating a simultaneous, five-axis tool path.  <b>Prerequisite:</b> MFG 165 or consent of instructor.  <i>Delivery mode: Face-to-Face   Hybrid   Online</i> Fee: \$50</p>	

**MFG 250** **4 credit hours (lecture: 2 | lab: 4)**

**Advanced Automation Applications (PLC/PAC/HMI)**

Course covers advanced concepts and skills needed to program and use programmable controllers in automated systems in industry. This course stresses a system approach to integrate controllers to manage several electromechanical and pneumatic components based on input status of multiple types of sensors to function together as one mechanism. During the course students will use RSLogix 5000 software to program, edit, download, and run a sequence of motions utilizing Allen-Bradley CompactLogix based trainers. Students will also learn how utilize FactoryTalk View Studio software to develop screen layouts for PanelView Plus HMI (Human Machine Interface) devices. Extensive analysis of controllers wiring and troubleshooting of automation systems are integrated activities of this course.

**Prerequisite:** MFG 240 or MFG 245 or consent of the instructor.

*Delivery mode:* Face-to-Face

Fee: \$50

**MFG 290** **1-4 credit hours (lecture: 1-4 | lab: 1-4)**

**Topics In Computer Numerical Control**

Course covers variety of different topics during different semesters. Topics selected from current advances in CNC (computer numerical control)- related hardware and software. Typical courses might include: advanced programming techniques; probe techniques; management/purchasing issues or DNC (direct numerical control). Course may be repeated twice. Refer to instructor for details of latest course listings. Fee Varies. Prerequisite may vary by topic.

*Delivery mode:* Face-to-Face

**MFG 292** **1-4 credit hours (lecture: 1-4 | lab: 1-4)**

**Topics In Manufacturing**

Course explores major issues in the field of manufacturing. Topics selected from subspecialties relating to manufacturing may include: automation; CNC machining; quality; simulation; and data acquisition. Course has different focus and/or scope from other current department courses offered, and can be repeated on different topics up to three times for up to nine semester hours of credit. Fee Varies. Prerequisite may vary by topic.

*Delivery mode:* Face-to-Face | Hybrid | Online