

MANUFACTURING TECHNOLOGY (MFG)

For additional information, contact the Industrial Technology Department at 503-594-3318.

MFG-102 Makerspace: An Introduction to Digital Manufacturing
1 credits, Not Offered Every Term

This course introduces students to aspects of digital design and manufacturing through the use of sophisticated modeling software; 3-D printing, laser cutting and scanning; and CNC machining. Students will complete a series of hands-on projects that require imagination and determination while learning solid workmanship principles.

MFG-103 Machining for Fabrication & Maintenance
3 credits, Fall/Spring

This course is an introduction to metal working for welders, fabricators, maintenance personnel and others who need to understand simple machining principles. Students will be introduced to precision measurement with calipers and micrometers. Combination squares, protractor dividers and scribes will be used for semi-precision layout of workpieces in preparation for machining. The elementary use of the drill press, band saw, milling machine and lathe, as well as hand tools, will be practiced during hands-on labs. A discussion of thread systems will include nomenclature, measurement, tapping, chasing and repair.
Prerequisites: MTH-050

MFG-104 Print Reading
3 credits, Fall/Winter/Spring

Introduction to basic print reading. Students will use the principles of orthographic projection and current industry standards as they apply this knowledge to interpreting manufacturing prints.

MFG-105 Dimensional Inspection
2 credits, Winter

Covers precision measuring tools such as micrometers, dial indicators, gauge blocks, sine bars and other instruments used in quality control of manufactured products.
Prerequisites: MFG-104

MFG-106 Advanced Applied Geometric Dimensioning and Tolerancing for Manufacturing
1-3 credits, Fall

Introduces participants to the application of gauging and inspection using Geometric Dimensioning and Tolerancing (GDT). Students will identify inspection equipment and inspect GDT characteristics while experiencing their manufacturing implications. Variable Credit: 1-3 credits.

Prerequisites: MFG-104

MFG-107 Industrial Safety & First Aid
3 credits, Fall/Winter/Spring/Summer

This course is designed to provide the student with a basic understanding of safety hazards and first aid in the workplace. Includes eye safety, grinding wheel hazards, electrical/chemical hazards, slips, falls and back injuries. Instruction in first aid, AED and CPR and OSHA 10.

MFG-109 Computer Literacy for Technicians
3 credits, Fall/Winter/Spring

Presents the uses of computers in business and industry. Subjects covered include computer platforms, basic hardware, data communication and operating systems. Reviews & uses word processing, spreadsheet and database software for the PC.

MFG-110 Manufacturing Special Projects

1-9 credits, Fall/Winter/Spring

Allows students a great deal of latitude in project selection, design & production utilizing manual machine tools, CNC machine tools, CAD/CAM and electrical discharge machines. A solid understanding of all basic machine tools is expected. Variable Credit: 1-9 credits. May be repeated for up to 9 credits. Required: Student Petition.

MFG-111 Machine Tool Fundamentals I

3-9 credits, Fall/Winter/Spring/Summer

This course is an introduction to machine tool operation, precision measurement and engineering drawings. It also covers machine tool operations including drill presses, lathes and milling machines. The course includes internal and external threading. Variable Credit: 3-9 credits. May be repeated for up to 9 credits.

Recommended: MFG-104, MFG-107, and MTH-050

MFG-112 Machine Tool Fundamentals II

3-9 credits, Fall/Winter/Spring

This course is a continuation of machine tool operations. Covers set-up and operation of the vertical milling machine and boring techniques on the lathe. Includes surface grinding and selection of abrasive grinding wheels. Variable Credit: 3-9 credits. May be repeated for up to 9 credits.
Prerequisites: 6 credits of MFG-111

MFG-113 Machine Tool Fundamentals III

3-9 credits, Fall/Winter/Spring

Topics include offset boring heads, rotary tables, indexing devices, and taper attachments. Also covers applied technical math, inspection techniques, optical comparators, coordinate measuring machines, and cylindrical grinding. Variable Credit: 3-9 credits. May be repeated for up to 9 credits.

Prerequisites: 6 credits of MFG-112

Recommended: MFG-111 and MFG-112

MFG-130 Basic Electricity I

3 credits, Fall

Explores fundamentals of AC and DC electricity. Includes: atomic structure, direct current, alternating current, Ohm's law, series, parallel, and combination circuits, DC circuit theorems, production of DC voltages, magnetic principles, transformers, motors and generators.

MFG-131 Basic Electricity II

3 credits, Winter

Covers application of several theories learned in previous term. Additional topics will include: motors, controls, alignment, pulleys and gears, troubleshooting theory, power distribution and lighting, electrical wiring and schematics.

Recommended: MFG-130 and MTH-050

MFG-132 Basic Electricity III

3 credits, Spring

This course offers continued study in the control of industrial electric motors. Concepts in the application of relays, motor starters, switches and overload protection are explored from both a practical and theoretical viewpoint. Wiring techniques and electrical devices for residential, commercial and industrial facilities are presented along with hands-on activities. Additional topics include: electrical conductors, installation materials, and the scope of work performed by licensed electricians.

Recommended: MFG-130 and MFG-131

MFG-140 Principles of Fluid Power

3 credits, Winter

Course provides students with instruction in the use of hydraulics and pneumatics in industry, covering the fundamentals of hydraulics, basic components (valves, cylinders, pumps, motors, piping, fluid, fluid conditions, and accessories).

Recommended: MTH-050

MFG-200 Introduction to CNC

1 credits, Not Offered Every Term

Short course to prepare students to be entry-level CNC machine operators. Covers fundamentals of operation, setup principles and G & M code programming. Students will use hands-on activities on industrial milling & turning centers. Recommended for individuals with limited knowledge of CNC machining.

Recommended: MFG-111

MFG-201 CNC I: Set-Up and Operation

4 credits, Fall

A hands-on class will teach students how to set-up and operate Computer Numerical Control (CNC) milling and turning centers. Includes an introduction to G&M-code programming. Designed for persons with little or no previous experience.

Prerequisites: 6 credits of MFG-111

Recommended: MFG-109 and MTH-080

MFG-202 CNC II: Programming & Operation

4 credits, Summer/Winter

This course emphasizes the writing of G&M machine codes. Students will learn advanced programming and operations of CNC milling centers and basic programming, set-up, and operation of CNC turning centers.

Prerequisites: MFG-201

MFG-203 CNC III: Applied Programming & Operation

3 credits, Fall/Spring

Students work individually or in small groups to design, program, manufacture, and test advanced projects using: CNC mills, CNC lathes, Electrical Discharge Machines (EDM) and various software applications.

Prerequisites: MFG-202

Recommended: MFG-201 or MFG-204

MFG-204 Computer-Aided Manufacturing I

4 credits, Fall

This course is an introduction to computer-aided part creation and programming. Students will use CAD/CAM software to generate Numerical Control (NC) code to produce machined products. Model creation, process verification, code generation and CAD/CAM integration will be covered.

Prerequisites: 6 credits of MFG-111

MFG-205 Computer-Aided Manufacturing II

4 credits, Winter

This course focuses on hands-on CNC and manufacturing activities, including Mastercam solids, lathe, and multi-axis. Additional topics will include reverse engineering and post-processing. Class time will be devoted to demonstrations, and in-class projects.

Prerequisites: MFG-204

MFG-206 Computer-Aided Manufacturing III

3 credits, Spring

This course exposes students to advanced CAD/CAM processes, including mill/turn, four and five axis machining, tombstone and work holding concepts.

Prerequisites: MFG-205

MFG-209 Programming & Automation for Manufacturing

3 credits, Winter

A high-level computer literacy course for technologists. The focus of this course is on structured computer programming in the Visual Basic language and the application of programming industrial automation. Basic knowledge of the PC required.

Recommended: MFG-109

MFG-210 CAM Special Projects

1-4 credits, Not Offered Every Term

Allows students to integrate and improve CNC and CAD/CAM manufacturing skills. Students will be assigned a variety of hands-on projects based on their skill level and interest. Variable Credit: 1-4 credits. May be repeated for up to 4 credits. Required: Student Petition.

Recommended: MFG-201 and MFG-204 (May be taken concurrently with MFG-204)

MFG-211 Machine Tool Fundamentals IV

3-6 credits, Fall/Winter/Spring

Concentrates on CNC setup and operation and on surface grinding. Students will develop and apply their machining skills while creating products in a team environment. Additional topics may include fixture design and cutting mechanics. Variable Credit: 3-6 credits. May be repeated for up to 6 credits.

Prerequisites: 6 credits of MFG-113

Recommended: MFG-104, MFG-105 and MFG-113

MFG-218 Lean Manufacturing and Quality Systems

3 credits, Fall

This survey course provides students with literacy in the elements of quality systems including Lean Manufacturing/Six Sigma and related statistical methods. Participants will learn about the philosophy and tools that make up a lean manufacturing system. Students will become familiar with the concepts and tools of quality management which include kaizen, visual management, 5S, value stream mapping, A3 problem solving, SPC, Six Sigma, and the Toyota Production System.

MFG-219 Robotics

3 credits, Not Offered Every Term

An introduction to robotics and industrial motion control. Students will be exposed to the operation, programming and applications of a typical FANUC, six-axis industrial robot. Hands-on activities will include manual tech programming, testing with simulation software and programming of advanced movements.

Recommended: MFG-209 and MTH-050

MFG-221 Materials Science

3 credits, Spring

Introduces metallurgy and material science. Extractive and physical metallurgy will be covered. Specific topics include heat treatment, materials analysis, the iron carbon phase diagram, composites, ceramics and industrial plastics.

Recommended: MTH-050

MFG-264 CMM Set-Up and Operation

2 credits, Winter

In this last course of the precision measurement sequence, students will learn to properly set-up and operate a Coordinate Measuring Machine (CMM) and design measurement plans for optimal metrology output.

Prerequisites: MFG-104

MFG-271 Mastercam Mill I

4 credits, Not Offered Every Term

Covers the creation and manipulation of two and three dimensional wire frame models as well as the creating, editing, and verification of 2-1/2 axis toolpaths. A fundamental understanding of the CAD/CAM process will be gained.

MFG-272 Mastercam Mill II

4 credits, Not Offered Every Term

Students construct three-dimensional geometric models using solids and surface modeling techniques. Students program models using advanced multi-axis programming techniques utilizing all aspects of roughing and finishing. Projects verified with solids toolpath verification.

Recommended: MFG-271 or prior experience

MFG-273 Mastercam, Lathe, Mill, Multi-Axis

4 credits, Spring

This course covers the fundamentals of Mastercam lathe and mill/turn tool paths. It also provides demonstrations and exercises on new and current programming techniques for advanced mill/turn machining centers. Additional topics will include multi-axis documentation and set-up sheets.

Recommended: MFG-272 or prior experience

MFG-280 Manufacturing Technology/CWE

1-6 credits, Fall/Winter/Spring/Summer

Cooperative work experience. Practical experience in the manufacturing trades. Coordination of instruction will occur with industry and the manufacturing and cooperative work departments. Variable Credit: 1-6 credits. May be repeated for up to 6 credits. Required: Student Petition.

Corequisites: CWE-281