MANUFACTURING TECHNOLOGY

Advanced manufacturing is a diverse sector closely connected with engineering and industrial design. The College's manufacturing programs train students for immediate employment in Central Oregon, provide continuing skills training for local industry employees in a format designed for working adults, and provide customized skills training at local employers' request.

See the Manufacturing Technology page for program and contact information.

Degrees and Certificates

Career and Technical Education

Associate of Applied Science

- Manufacturing Machining Technician - Associate of Applied Science (AAS)
- Welding - Associate of Applied Science (AAS)

One-Year Certificate of Completion

- Manufacturing CNC Machine Operator - One-Year Certificate (CC1)
- Welding - One-Year Certificate of Completion (CC1)

Career Pathway Certificate of Completion

- Manufacturing Technician - Career Pathway Certificate of Completion (CPCC)
- Welding Technician- Career Pathway Certificate of Completion (CPCC)

Courses

MFG 100 Manufacturing Technology Orientation (1 Credit)
Provides new Manufacturing Technology students with required information before participating in open lab learning. Includes understanding Manufacturing and Applied Technology Center (MATC) procedures, safety, manufacturing careers, and proper equipment set up. P/NP grading.

MFG 101 Blueprint Reading (3 Credits)
Prerequisites with concurrency: MFG 100.
Covers reading and interpreting industrial blueprints used in manufacturing/fabrication. Includes interpretation of line types, geometric tolerancing and dimensioning, surface finish callouts, auxiliary views, and orthographic projection.

MFG 102 Blueprint Reading Sheet Metal (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Provides student with training to read and interpret various types of sheet metal blueprints. Covers line and print development, sheet metal layout, pattern drafting and bend allowances, maximum utilization of material, identification of sheet metal types and grades, correct use of sheet metal for the application and sheet metal bend and shear strengths.

MFG 103 Welding Technology I (4 Credits)
Prerequisites with concurrency: MFG 100.
First course in a three-course sequence focused on introductory level skills used in structural plate welding in accordance to AWS D1.1 Structural Steel Welding code. Introduces basic welding processes, safety, nomenclature, and equipment operation for introduction to perform 1F and 2F weldments using shielded metal arc welding (SMAW) welding and gas metal arc welding (GMAW) on mild steel.

MFG 104 Blueprint Reading for Welders (4 Credits)
Introduces students to the fundamental interpretation of technical drawings commonly utilized in industrial fabrication facilities. Explores basic lines and views, dimensioning, cut lists/bills of material, alternative views, assembly prints, and American Welding Society welding symbols.

MFG 105 Welding Technology II (4 Credits)
Prerequisites: MFG 103.
Prerequisites with concurrency: MFG 100.
Second course in a three-course sequence focused on introductory level skills used in structural plate welding in accordance to AWS D1.1 Structural Steel Welding code. Introduces intermediate welding processes, safety, nomenclature, and equipment operation for the advancement of more difficult weldments in the 3F and 4F position using shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) on mild steel.

MFG 107 Welding Technology III (4 Credits)
Prerequisites: Instructor approval.
Prerequisites with concurrency: MFG 105.
Final course in a three-course sequence focused on introductory level skills used in structural plate welding in accordance to AWS D1.1 Structural Steel Welding code. Advancing to more difficult weld joints such as 1G and 2G V-groove butt joint on plate using the SMAW and GMAW process and destructive bend test. Perform outside corner joints in all positions. Introduces the GTAW process in 1F and 2F positions on mild steel and aluminum.

MFG 109 Lean Practices (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Lean practices are methods used to eliminate waste in any process to which they are applied. This course provides students with an understanding of lean practices commonly used in industry including: value stream mapping, standardized work, 5S, structured problem solving, visual factory, Kanban/pull systems other lean tools.

MFG 110 Manufacturing Processes I (4 Credits)
Introduces students to the fundamentals of manual machining, emphasizing safe operational practices and precision in manufacturing to blueprint specifications. Covers basic part layout, use of hand tools, drill press, bandsaw, manual milling, and lathe processes. Includes reading and interpreting blueprints and the application of precision and semi-precision measuring instruments.

MFG 112 Manufacturing Processes II (4 Credits)
Prerequisites: MFG 110.
Builds on Manufacturing Processes I concepts, focusing on advanced machining operations. Emphasizes speed and feed calculations, milling machine and lathe practices, as well as producing process plans, advanced tooling and tooling geometry, and hands-on projects like pocket milling, taper turning, and threading. Covers how to operate manual mills and lathes to close tolerances.

MFG 114 Manufacturing Processes III (4 Credits)
Prerequisites: MFG 112.
Culminates the Manufacturing Processes series (MFG 110, MFG 112, MFG 114) focused on advanced manual machining skills. Emphasizes precision in complex operations involving manual lathes and milling machines. Includes systems of fits, tolerances, assemblies, and quality assurance. Features hands-on projects that support development of critical thinking, problem-solving, and project management skills. Integrates basic material science with machining processes, and introduces principles of environmental and sustainable practices in manufacturing.

MFG 115 Design Processes I (4 Credits)
Recommended preparation: CIS 120.
Introduces solid modeling software (CAD) used in design and manufacturing. Includes practical applications using the software to capture design intent through part development and to create assemblies using these parts. Adheres to engineering and manufacturing standards and formats.

MFG 116 Manufacturing Electrical Systems (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Studies electrical circuitry and components used in manufacturing applications. Includes introductory AC/DC electrical circuit construction and Ohm's Law.

MFG 118 Fluid Power Systems I (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Introductory fluid power class. Includes single/double-acting cylinder operations, directional control valve operations, fluid power symbols and the creating of operational hydraulic and pneumatic circuits.

MFG 119 Manufacturing Design and Drafting Techniques (4 Credits)
Introduces solid modeling software (computer aided drafting) used in design and manufacturing. Includes using the software to capture design intent through part development and creating assemblies with these parts. Adheres to engineering and manufacturing standards and formats.

MFG 119M Mechanical Drawing Techniques (4 Credits)
Introduces Mechanical Drawing Techniques used in design and manufacturing. Includes practical applications using drafting techniques to capture design intent through part development and to create assemblies using these parts. Adheres to engineering and manufacturing standards and formats.

MFG 133 Quality Assurance (3 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Presents key quality control concepts, including precision and semi-precision measuring, digital measuring tool operations, measuring practice using digital gauges, micrometers, depth gauge and height gauge measuring tools. Introduces statistical process control and pneumatic gauging topics.

MFG 160 Materials Engineering (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
A continuation of Quality Assurance topics focused on materials. Includes shear, hardness, tensile and compression testing and other material analyzing techniques.

MFG 161 Capstone Project I (3 Credits)
Provides opportunity for students to showcase skills and knowledge achieved in the first year of the Manufacturing Technology Machining Pathway, by creating an assembly of toleranced parts complete with process plans, drawings, and a bill of materials.

MFG 199 Selected Topics: Manufacturing (1-4 Credits)
Prerequisites: instructor approval.
Provides a learning experience in manufacturing not currently available; this course is in development to be proposed as a permanent course.

MFG 201 Bench Work (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Covers use of hand tools, files, hacksaw, chisels and coated abrasives. Includes shop safety, hand tapping, thread measurement, arbor press operations, micrometer, and vernier caliper reading.

MFG 202 Metals Preparation (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Details safe use and operation of horizontal bandsaw, cold saws, and hot saws as well as ironworker facets to include hole punching shearing, profile cutting, and notching. Practices base metal identification and abrasive power tool operations.

MFG 203 Layout (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Semi-precision and precision layout practices. Includes height gauge operations, surface plate set-ups, bolt circle layout, and the use of hand and power tools to produce accurate workpiece profiles.

MFG 205 Drill Press (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Drill press operations training. Includes safety, machine nomenclature, measuring and sharpening drills, machine set-up, cutting tool selection, magnetic based drill, electric drill motor and radial arm drill operations.

MFG 210 Vertical Milling (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Vertical milling machine operations. Includes safety, work holding, table set-ups, power feeds, digital read-out operation, cutter selections, climb and conventional cutting and spindle speed changes.

MFG 214 Lathe Operator I (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Introductory manual lathe operations training. Includes safety, machine maintenance, quick-change tooling, chuck set-ups, compound taper cutting, general turning and drilling operations.

MFG 216 Lathe Operator II (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Advanced lathe operations training. Four-jaw chucking, taper turning, carbide cutting tool selections, boring, single point threading, thread measurement and other precision turning operations.

MFG 219 MFG Design/Drafting II (4 Credits)
Prerequisites: MFG 119 or MFG 119M.
Builds on concepts and principles of MFG Design/Drafting I. Focuses on higher-level operations of Computer-Aided Design (CAD) software to create custom assemblies, produce working drawings, and simulate motion of parts.

MFG 246 Mechanical Troubleshooting (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
This course is an overview of mechanical drive systems and safety, key fasteners, power transmission systems, lubrication concepts, plain bearings, ball bearings, roller bearings, and gaskets and seals.

MFG 250 Additive Manufacturing I (3 Credits)
Prerequisites: MFG 100.
Introduces additive manufacturing concepts, including various processes used in rapid prototyping. Builds design and fabrication skills by using a three-dimensional printing process to create sample parts.

MFG 254 Manufacturing Jigs and Fixtures (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Jig and fixture design practices. Includes clamps, locators, degrees of freedom, radial and conical locators, templates, automated clamping and modular fixturing.

MFG 256 CNC Mill Programming (4 Credits)
Prerequisites: MFG 100 and MFG 110.
Recommended to be taken with: MFG 257.
Introduces basic programming skills used on the CNC Mill.

MFG 257 CNC Mill I (4 Credits)
Prerequisites: MFG 100 and MFG 110.
Introduces concepts used in the basic operation and setup of CNC Mill machining centers.

MFG 258 CAM Mill I (4 Credits)
Prerequisites: MFG 100; MFG 110; and MFG 119.
Introduces Computer Aided Machining/Manufacturing for Computer Numerically Controlled (CNC) milling machines. Includes the use of software to generate toolpaths, catalog and manage tool libraries, simulate cutting processes, and revise workholding setups.

MFG 259 CNC Lathe Programming (4 Credits)
Prerequisites: MFG 100 and MFG 110.
Recommended to be taken with: MFG 260.
Introduces basic programming skills used on the CNC lathe.

MFG 260 CNC Lathe I (4 Credits)
Prerequisites: MFG 100 and MFG 110.
Introduces concepts used in the basic operation and setup of Computer Numerically Controlled (CNC) Lathes.

MFG 261 CAM Lathe I (4 Credits)
Prerequisites: MFG 100; MFG 110; and MFG 119.
Introduces Computer Aided Machining/Manufacturing (CAM) for Computer Numerically Controlled (CNC) lathes. Includes the use of software to generate toolpaths, catalog and manage tool libraries, simulate cutting processes, and revise workholding setups.

MFG 262 Welding Inspection/Quality Control (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Studies quality control issues related to weld joint inspection. Includes student exposure to visual and nondestructive inspection techniques that are utilized by welders and inspectors to interpret and monitor AWS quality standards.

MFG 264 Automated Cutting (3 Credits)
Prerequisites: MFG 119 or MFG 119M.
Utilize CAD tools to lay out and generate code for efficiently cutting material using a CNC plasma table or other 2D CNC tool. Includes design, tool set-up, tool maintenance, code editing, and safe operation of tools to create a final product.

MFG 266 Manufacturing Cost Estimation (2 Credits)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Cost estimation techniques used in the analysis and planning of manufacturing projects. Includes software estimates, manufacturing costs, standard vs. actual costs, fixturing and welding-related topics.

MFG 267 Oxygen-Fuel and Plasma Cutting (3 Credits)
Prerequisites: MFG 100.
Covers gas torch, air carbon arc, and plasma gas cutting. Includes torch setup and maintenance, flame setting, diagnostics, track torch operations, circle cutting, and carbon arc scarfing practice.

MFG 268 CNC Mill II (4 Credits)
Prerequisites: MFG 257.
Builds on concepts presented in CNC Mill I with a focus on advanced features, such as touch probe operations, custom fixtures for workholding, and 3-axis CNC machining.

MFG 270 CNC Fixture Design Mill (3 Credits)
Prerequisites: MFG 119 and MFG 257.
Provides methods beyond the basic use of a vice in order to hold and machine irregularly shaped parts using a mill.

MFG 271 SMAW (4 Credits)
Prerequisites with concurrency: MFG 107.
Introduces specialized work in shielded metal arc welding of various joint configurations and structural shapes. Covers advanced concepts and utilization of the shielded metal arc welding process and practical applications for the shielded metal arc welding process.

MFG 272 GMAW (4 Credits)
Prerequisites with concurrency: MFG 107.
Introduces advanced principles in the Gas Metal Arc Welding of various joint configurations,specialized uses of the Gas Metal Arc Welding process, applications for the Gas Metal Arc Welding Process, and welding variables in the Gas Metal Arc Welding Process.

MFG 277 CNC Lathe II (4 Credits)
Prerequisites: MFG 260.
Builds on concepts presented in CNC Lathe I with a focus on advanced features, such as touch probe operations, live tooling utilization, and custom fixtures for workholding.

MFG 278 CNC Fixture Design Lathe (3 Credits)
Prerequisites: MFG 119, MFG 250, MFG 257.
Covers methods beyond the basic use of a chuck in order to hold and machine irregularly shaped parts using a lathe.

MFG 279 Capstone Project II (3 Credits)
Provides opportunity for students to showcase skills and knowledge achieved through the second year of the Manufacturing Technology Machining pathway by creating an assembly of toleranced parts complete with process plans, drawings, and a bill of materials.

MFG 280 Co-op Work Experience Manufacturing (1-4 Credits)
Prerequisites: Instructor approval.
Recommended preparation: MFG 100.
Provides experience in which students apply previous classroom learning in an occupational setting. Credits depend on the number of hours worked. P/NP grading.

MFG 281 GTAW (4 Credits)
Prerequisites with concurrency: MFG 107.
Introduces advanced principles in the Gas Tungsten Arc Welding of various joint configurations, specialized uses of the Gas Tungsten Arc Welding process, applications for the Gas Tungsten Arc Welding Process, and welding variables in the Gas Tungsten Arc Welding Process.

MFG 282 FCAW (4 Credits)
Prerequisites with concurrency: MFG 107.
Introduces advanced principles in the Flux Cored Arc Welding of various joint configurations, specialized uses of the Flux Cored Arc Welding process, applications for the Flux Cored Arc Welding Process, and welding variables in the Flux Cored Equinox Arc Welding Process.

MFG 283 GTAW II (3 Credits)
Prerequisites: MFG 281.
GTAW welding complete joint penetration welds on 2″ and 6″ pipe in 2G and 5G positions.

MFG 284 FCAW II (3 Credits)
Prerequisites: MFG 282.
Includes FCAW welding complete joint penetration welds on 2″ and 6″ pipe in 2G and 5G positions.

MFG 288 Industrial Fabrication (4 Credits)
Prerequisites: MFG 107.
Includes metal fabrication focusing on blueprint interpretation, proper fit techniques, length and width allowances, welding processes, utilization of jigs and fixtures, and performance evaluation.

MFG 289 Material Handling-Fork Lift Safety (1 Credit)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Focuses on identifying and ordering sheet metal materials plus the safe storage and handling of those materials. Includes OSHA safety regulations and fork lift operation and safety.

MFG 290 Certification Test Preparation AWS I (1 Credit)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Testing materials preparation for Level One Weld Certification Testing. Includes materials test sample preparation, set-up, testing, grinding samples and evaluation. P/NP grading.

MFG 291 Certification Test Preparation NIMS I (1 Credit)
Prerequisites: instructor approval.
Recommended preparation: MFG 100.
Testing materials preparation for Level One NIMS Certification Testing. Includes materials test workpiece preparation, set-up, testing and evaluation activities. P/NP grading.

MFG 298 Independent Study: Manufacturing (1-6 Credits)
Prerequisites: Instructor approval.
Recommended Preparation: Prior coursework in the discipline.
Individualized, advanced study to focus on outcomes not addressed in existing courses or of special interest to a student. P/NP grading.

MFG 299 Selected Topics: Manufacturing (1-6 Credits)
Prerequisites: instructor approval.
Provides a learning experience in manufacturing not currently available; this course is in development to be proposed as a permanent course.