

# MANUFACTURING TECHNOLOGY (MANUF)

## MANUF 0480

### ***Blueprint Reading for Machinists***

1 Credit Hour

Lines, dimensions, tolerances, notes, symbols, specifications, materials, manufacturing processes and standards. Orthographic and pictorial projections. Machine shop terminology. (1 lecture hour)

## MANUF 1101

### ***Industrial Design/CAD***

3 Credit Hours

An introduction to the use of microcomputers for design of industrial blueprints of intermediate complexity. Sketching, lettering, orthographic projections, descriptive geometry, point, line and basic geometric shapes. The use of menus, layers, fonts and weights. Basic dimensioning, tolerancing and pictorial drawings. The student is expected to draw a blueprint with simple dimensions label and notes using different layers. (2 lecture hours, 2 lab hours)

## MANUF 1102

### ***Basic Robotics Fabrication***

2 Credit Hours

Students will design a robot using a 3D modeling program and construct their design into a functional robot. (4 lab hours)

**Prerequisite:** Consent of Instructor.

## MANUF 1104

### ***Technical Mechanics***

2 Credit Hours

Analysis and solution of practical problems in technical mechanics. Application of basic calculations and standards for design and maintenance of mechanical systems. (2 lecture hours)

## MANUF 1110

### ***Metrology***

3 Credit Hours

Initial course in the science of precision measurement techniques. Basic and advanced methodology behind measurement principles and tools used in the measurement process. Emphasis on laboratory skills in dimensional measurement using micrometers, calipers and gage blocks. Basics of geometric tolerancing and data analysis. Various applications of measurement including the Coordinate Measuring Machine (CMM), roundness measurement, and surface finish measurement. Additional topics include optical systems and quality control methods, as well as calibration standards. (2 lecture hours, 2 lab hours)

## MANUF 1121

### ***Physical Metallurgy***

3 Credit Hours

Functions of the metallurgical laboratory and equipment including mechanical testing, metallography, heat treatment and extractive metallurgy. Basic principles concerning materials science including atomic and crystal arrangements and their effect on mechanical properties. Simple phase equilibrium. Ferrous and nonferrous metals and alloys classification systems. (2 lecture hours, 2 lab hours)

## MANUF 1126

### ***Introduction to Plastics***

3 Credit Hours

The theory and use of plastics in industry. Physical, chemical and electrical properties of plastics and testing criteria are discussed. Processes such as injection molding, extrusion, blow molding, rotational molding, and thermoforming are covered. Control factors affecting the quality of parts, applications, benefits and limitations of plastics are explained. Related topics include process relationships, parameter setting techniques, rapid changeover techniques, process control and troubleshooting. (3 lecture hours)

## MANUF 1127

### ***Engineering Materials of Industry***

3 Credit Hours

Basic principles of materials technology including the internal structures of materials, physical and mechanical properties, fusion and bonding, annealing and plastic deformation. (3 lecture hours)

## MANUF 1151

### ***Machine Shop I***

3 Credit Hours

Designed for students with little background in the use of metal-working machine tools. Basic principles and operations on the engine lathe, vertical milling machine and surface grinder. Precision measurement. (2 lecture hours, 2 lab hours)

## MANUF 1153

### ***Advanced Machine Processes***

3 Credit Hours

The application of skills that are commonly known in the industry as machine shop. The development of operation skills of traditional engine lathes, vertical/horizontal mills and grinding as well as operations on similar machines. Emphasis is on those skills needed by trade's persons who have achieved proficiency in the operation of machines and related tooling and equipment. Quality skills related to machining and some planning and job control skills related to machine work. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 1151 or equivalent or consent of instructor.

## MANUF 1160

### ***Technical Static & Strength of Material***

4 Credit Hours

Basic analysis of external force systems acting upon bodies in equilibrium with subsequent treatment of the stresses and strains induced. Laboratory projects involve the use of nondestructive and destructive testing equipment to determine the various mechanical properties of materials and their behavior under load. Not intended for engineering students. (3 lecture hours, 2 lab hours)

**Prerequisite:** PHYSI 1201 or equivalent and MATH 1432 (or college equivalent) or qualifying score on the Mathematics placement test or qualifying A.C.T. math score or consent of instructor.

**MANUF 1180*****Quality Control***

3 Credit Hours

An introduction to quality control and the development of the concept of total quality control engineering, process improvement, and quality information systems. A broad overview of total quality control and its scope throughout the business organization enables the student to analyze the various costs of quality and improve productivity. Topics will include 100 percent inspection versus statistical inspection and process control charts, as well as some of the tools of Organizational Development (OD) useful in promoting a Total Quality Control (TQC) and Total Quality Management (TQM) environment. (3 lecture hours)

**Course types:** Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)

**MANUF 1700*****Fundamentals of Plastics and Plastic Products***

3 Credit Hours

Fundamentals of plastics materials as they pertain to plastic products. Topics include comparing and contrasting elastomers and plastics, and testing methods. Data sheet analysis used to predict product characteristics. (3 lecture hours)

**Prerequisite:** MANUF 1126 with a grade of D or better or equivalent.

**MANUF 1820*****Selected Topics I***

1-10 Credit Hours

Introductory exploration and analysis of selected topics with a specific theme indicated by course title listed in college class schedule. This course may be taken four times for credit as long as different topics are selected. (1 to 6 lecture hours, 2 to 8 lab hours)

**MANUF 1840*****Independent Study***

1-4 Credit Hours

Exploration and analysis of topics within the discipline to meet individual student-defined course description, goals, objectives, topical outline and methods of evaluation in coordination with and approved by the instructor. This course may be taken four times for credit as long as different topics are selected. (1 to 4 lecture hours)

**Prerequisite:** Consent of instructor is required.

**MANUF 2200*****Production Technology***

4 Credit Hours

The theory of process planning and process control in manufacturing. Emphasis is on the study of these concepts as they apply the manufacturing production process, safety, quality and continuous improvement, and maintenance awareness. (4 lecture hours)

**Prerequisite:** Consent of instructor is required.

**MANUF 2201*****Geometric Dimensioning and Tolerancing***

3 Credit Hours

Introduces the principles of industrial drafting as specified by the American National Standards Institute (ANSI). Topics include part dimensional control techniques, interchangeability of parts and the differences between traditional dimensioning and geometric dimensioning. Symbols and terms for dimensioning, datum and materials condition symbols are introduced. Various tolerances of form, profile orientation, run-out and location are demonstrated. Feature control frames are discussed. (3 lecture hours)

**Prerequisite:** MANUF 1101 or consent of instructor.

**MANUF 2202*****Solid Modeling and Design***

3 Credit Hours

The theory and application of solid modeling techniques for product design and manufacturing. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 1101 or consent of instructor.

**MANUF 2203*****Manufacturing Processes and Design***

3 Credit Hours

A survey of manufacturing methods and materials employed in cold working processes. The student will understand the various methods of product fabrication and the manufacturing processes for sound economic decision making in manufacturing and product design. Other topics include the interrelationship among materials, their selection for use in product design and processes, and conversion of these materials into finished components. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 2202 or consent of instructor.

**MANUF 2206*****Mechanical Computr-Aided Drafting/Design***

3 Credit Hours

Computer-aided drafting/design (CADD) as drafting tool for the creation of mechanical production drawings. Solids modeling concepts and application of geometric dimensioning techniques are explained. The student is expected to finish detail and assembly drawings from a layout and demonstrate an understanding of the principles of engineering and design. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 2201 or equivalent and MANUF 2202 or equivalent and consent of instructor.

**MANUF 2207*****Tool Design***

3 Credit Hours

An advanced course on the designing of manufacturing production tools, molds, dies, jigs and fixtures. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 2202 or equivalent or consent of instructor.

**MANUF 2208*****Mechanical Design Portfolio***

3 Credit Hours

Practical overview of the design process with case materials and real-life design problems. Provides the student with an opportunity to create a design portfolio. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 2207 or equivalent, or consent of instructor.

**MANUF 2240*****Basic Parametric Design-Pro/E***

3 Credit Hours

A basic course in creating 3-dimensional. (3-D) parametric parts, 2-dimensional (2-D) drawings and 3-D assemblies. Includes multi-part models. Emphasis is on the philosophy of parametric design and constraints. (2 lecture hours, 2 lab hours)

**Prerequisite:** Experience in design and drafting.

**MANUF 2242*****Advanced Parametric Design-Pro/E***

3 Credit Hours

Advanced course in creating multi-part parametric assemblies, exploded assemblies, parts having complex surface features, and design of sheet metal parts in both a flattened and bent state using parametric modeling software. Includes associated drawing files. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 2240 with a grade of D or better, or equivalent, or consent of instructor.

**MANUF 2251*****Computer Numerical Control (CNC)***

3 Credit Hours

An introduction to CNC machinery as it applies to the operator and programmer. Introduction to CNC programming coding, set-up, tooling, operation and troubleshooting. Basic principles and applications of numerically controlled equipment and the set-up and operation of CNC machines. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 1151 or equivalent, or consent of instructor.

**MANUF 2252*****CNC Operations***

3 Credit Hours

Theory and practice in the preparation and machining of selected parts. Skill is developed in fixturing, tool offsets, finding and setting program zeros. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 1151 and MANUF 2251, both with a grade of B or better, or equivalent or consent of instructor.

**MANUF 2253*****Computer-Aided Manufacturing (CAM)***

3 Credit Hours

Introduction to computer assisted part of programming (CAM) as it applies to computer numerical control (CNC). Various types of programming systems. Piece part geometry definition, computer input of this geometry, and post processing this information into CNC code. This code is then used to machine parts. Familiarity with CAM software and mathematical skills required. The student is expected to demonstrate a measurable level of skill in geometry definition of the CAM system, post processor knowledge to modify CNC code, and application of computer aided design (CAD) to generate CNC code. (2 lecture hours, 2 lab hours)

**Prerequisite:** MANUF 2251 or equivalent.

**MANUF 2261*****Basic Die Making I***

4 Credit Hours

Fundamental theory and study of tool and die making, including punch press sizes and feeds for dies, and their uses and relationships to each other. (4 lecture hours)

**Prerequisite:** Consent of instructor is required.

**MANUF 2262*****Basic Die Making II***

4 Credit Hours

Continuation of Basic Die Making I. Principles and processes used in sheet metal work, using stock-strip layouts, cutting and stripping pressures, and flat blank layouts. (4 lecture hours)

**Prerequisite:** MANUF 2261 or equivalent or consent of instructor.

**MANUF 2265*****Mold Making I***

4 Credit Hours

Mold construction, elastics, die casting, proper selection and heat treatment. (4 lecture hours)

**Prerequisite:** Consent of instructor is required.

**MANUF 2267*****Mold Making II***

4 Credit Hours

An advanced class in mold making. Emphasis is on the use of side cores, various methods of mold construction, fitting clearances, locking devices, and finishes required in mold cavities. (4 lecture hours)

**Prerequisite:** MANUF 2265 or equivalent, or consent of instructor.

**MANUF 2271*****Robotic Application***

3 Credit Hours

Industrial applications of robots with emphasis on set-up, programming and operations. End effect or design and production line interfacing are studied. (2 lecture hours, 2 lab hours)

**Prerequisite:** ELMEC 1171 or equivalent.

**MANUF 2272*****Advanced Die Making and Engineering I***

4 Credit Hours

An introduction to draw dies: the theory of the drawing of metal, metal reaction, problems and solutions used, lubricants and draw die reductions along with advanced work in gages, fixtures and intricate progressive dies. (4 lecture hours)

**Prerequisite:** MANUF 2262 or equivalent, or consent of instructor.

**MANUF 2274*****Advanced Die Making and Engineering II***

4 Credit Hours

An advanced study of draw dies including types, materials used, lubricants, and the theory of draw die reductions with a continuation of advanced work in gages, fixtures and intricate progressive dies. (4 lecture hours)

**Prerequisite:** MANUF 2272 or equivalent, and consent of instructor.

**MANUF 2276*****Advanced Mold Making and Engineering I***

4 Credit Hours

Theory and process of mold cavities using electrical impulse methods, thread molding and automatic unscrewing methods. (4 lecture hours)

**Prerequisite:** MANUF 2267 or equivalent, or consent of instructor.

**MANUF 2277*****Advanced Mold Making and Engineering II***

4 Credit Hours

A continuation of Advanced Mold Making and Engineering I. Product standards for die casting and analysis of mold cavities by electrical impulse methods. Thread molding and automatic unscrewing methods, current advances in molds, molding machines, and mold-making methods. (4 lecture hours)

**Prerequisite:** MANUF 2276 or equivalent, and consent of instructor.

**MANUF 2280*****Industrial Safety***

2 Credit Hours

Survey and analysis of current problems and trends in the design and supervision of industrial accident prevention programs. (2 lecture hours)

**Course types:** Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)

**MANUF 2281*****Cost Analysis***

2 Credit Hours

Study of the economic interdependency of the design, tooling, manufacturing, inspection and testing decisions and the means of quantifying such decisions. Sources and controls of direct, indirect and fixed costs. Influences of cost-accounting practices on engineering decisions. Generating alternatives based on the principles of time and motion economics and work simplification. Cost estimation procedures and controls. (2 lecture hours)

**MANUF 2860**

***Internship (Career & Technical Ed)***

1-4 Credit Hours

Course requires participation in Career and Technical Education work experience with onsite supervision. Internship learning objectives are developed by student and faculty member, with approval of employer, to provide appropriate work-based learning experiences. Credit is earned by working a minimum of 75 clock hours per semester credit hour, up to a maximum of four credits.

**Prerequisite:** Consent of instructor and 2.0 cumulative grade point average; 12 semester credits earned in a related field of study; students work with Career Services staff to obtain approval of the internship by the dean from the academic discipline where the student is planning to earn credit.

**Course types:** Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)

**MANUF 2865**

***Internship Advanced (Career & Tech Ed)***

1-4 Credit Hours

Continuation of Internship (Career and Technical Education). Course requires participation in Career & Technical Education work experience with onsite supervision. Internship learning objectives are developed by student and faculty member, with approval of employer, to provide appropriate work-based learning experiences. Credit is earned by working a minimum of 75 clock hours per semester credit hour, up to a maximum of four credits.

**Prerequisite:** Consent of instructor and 2.0 cumulative grade point average; 12 semester credits earned in a related field of study; students work with Career Services staff to obtain approval of the internship by the dean from the academic discipline where the student is planning to earn credit.

**Course types:** Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)