

MEC-111 Machine Processes I

COURSE DESCRIPTION:

Prerequisites: None

Corequisites: None

This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, drilling machines, saws, milling machines, bench grinders, and layout instruments. Upon completion, students should be able to safely perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. Course Hours Per Week: Class, 1 Lab, 4; Semester Hours Credit, 3.

LEARNING OUTCOMES:

Upon completing requirements for this course, the student will be able to:

1. Follow safety rules and regulations in the shop
2. Select and use semi-precision tools
3. Select and use precision tools
4. Layout a work piece
5. Use files properly
6. Use horizontal band saw making a straight cut
7. Use vertical band saw and saw a layout
8. Identification of parts and operation of a milling machine
9. Identification of parts and operation of an engine lathe
10. Manufacture simple parts using a milling machine and an engine lathe

OUTLINE OF INSTRUCTION:

- I. Orientation and Safety
 - A. Safety rules and regulations
 - B. Safety glasses and goggles
 1. Type
 2. Cleaning methods
 3. Adjustments
 4. Storage
 - C. Fire extinguisher
 1. Location
 2. Uses
 - D. All exits
 1. Route to exits
 2. Aisle markings
- II. Basic Hand Tools
 - A. Types
 - B. Use
 - C. Safe practices
 - D. Storage

- III. Measuring Tools
 - A. Semi-precision measuring tools
 - 1. Types
 - 2. Care
 - 3. Use
 - 4. Storage
 - B. Precision measuring tools
 - 1. Types
 - 2. Care
 - 3. Use
 - 4. Storage
- IV. Layout Tools and Equipment
 - A. Types
 - B. Care
 - C. Use
 - D. Drawing interpretation
- V. Hand Cutting Tools
 - A. Files
 - 1. How to use
 - 2. Proper holding method
 - 3. Use of file card
- VI. Measuring Methods
 - A. Semi-precision measuring tools
 - 1. Measure with a machinist scale to accuracy of .015"
 - 2. Use dividers to transfer measurements, lay out radii and arcs
 - 3. Use combination square set to layout straight or angle lines and to find the center of round stock
 - 4. Scribe parallel lines, transfer measurements, and find the center of round stock using the hermaphrodite caliper
 - 5. Use surface gage on surface plate to scribe and measure lines on a vertical surface
 - B. Precision measuring tools
 - 1. Read a micrometer to an accuracy of .0001" (Vernier micrometer)
 - 2. Measure inside and outside diameters using spring calipers and transfer these measurements using micrometers
 - 3. Measure inside diameter of hole using telescoping gages and transfer these measurements using micrometers
 - 4. Measure the depths of holes, slots, and grooves using a depth micrometer
 - 5. Use a Vernier caliper and read dimensions to an accuracy of .001"
- VII. Bench Work
 - A. Layout lines for drilling, milling and turning
 - B. Filing
 - 1. Remove burrs on parts using a file or deburring tool
 - C. Threading
 - 1. Thread holes using taps and tap wrench
 - 2. Thread round stock using dies and diestock

- VIII. Power Saw Operation
 - A. Horizontal band saw
 - 1. Use Horizontal band saw to cut rough stock of various shapes, to length using proper coolant
 - 2. Install blade with proper tension and set feed
 - B. Vertical band saw
 - 1. Cut layout contours, circles and straight lines on band saw
 - 2. Select proper blade and speed for material to be sawed
- IX. Drill Press Operations
 - A. Drill grinding
 - 1. Sharpen drill bits to correct angles and relief for various metals using drill grinder.
 - 2. Sharpen drill bits to correct angles and relief for various metals by freehand method using pedestal grinder
 - B. Sensitive drill press
 - 1. Make setups for drilling round stock, flat stock, sheet metal and irregular shapes, using proper work-holding devices
 - 2. Drill holes in different types of metals
- X. Engine Lathe
 - A. Setup
 - 1. Clean and mount chucks using wooden board or cradle to protect lathe ways
 - 2. Determine proper speeds and feeds for particular materials and lathe operations
 - 3. Select and mount correct tools and accessories
 - B. Operations
 - 1. Perform the operations of facing, parting (cutting-off) chamfering, making square and filleted shoulders using proper cutting tool bits
 - 2. Use three jaw (universal) chuck in performing lathe operations
 - 3. Use collet chuck to perform lathe operations
 - 4. Use combination drill and countersink (center drill) to prepare work piece for drilling or turning between centers
 - 5. Deburr stock properly using files and form tools
 - 6. Properly remove and/or install indexable carbide inserts in lathe tool holders.
- XI. Vertical Milling Machine
 - A. Setup
 - 1. Select and mount proper cutters for the type of material and for the operations to be performed
 - 2. Use proper work-holding devices
 - 3. Use edge finder to locate the edge of a work piece with respect to the centerline of the spindle
 - 4. Adjust speeds and feeds for type of cutter and material
 - B. Operations
 - 1. Center drill, drill, counterbore, countersink, tap and bore using proper attachments and cutting tools
 - 2. Square stock using proper methods and end mills
 - 3. Mill angles using swivel vises, fixtures, or by turning or tilting the work piece or machine head

REQUIRED TEXTBOOK AND MATERIAL:

The textbook and other instructional material will be determined by the instructor.