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## Course Outline - Machine Tool I & II

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**Course Topic:** Machine Tool I & II

**Recommended Contact Hours:** 120 hours

### Course Description:

This course is designed to provide the student with hands on knowledge and the practical learning experience in the accident prevention awareness required to perform various tasks utilizing basic power tools such as; power sander, hand drill, and a variety of hand and power tools per outlined in course topics.

Then the students will develop hands-on knowledge and the practical learning experience in utilizing the Engine Lathe and component parts per outlined in course topics. The students will also develop knowledge and skill in operating power saws for sawing material to length and drill presses for a variety of drilling operations per outlined in course topics. All students will be required to become proficient in basic measuring tools such as; height measuring systems, calipers, micrometers, surface plates and a variety of measuring tools per outlined in course topics. This course introduces the safe operation of milling machines in the area of vertical milling machines and addresses the various types of milling machines used in industry, their component parts, and associated safety precautions. It also emphasizes the most common milling operations required by multi-skilled industrial maintenance technicians.

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### *Course Outcomes and Objectives*

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#### **MT- 1 Demonstrate safety practices when working with hand tools, operating machine tools**

1. Safety is discussed at the beginning of each lesson

#### **MT- 2 Demonstrate use of manufacturing hand tools**

1. Demonstrate knowledge of standard machine tool movements.
2. Describe metal cutting processes and the production of shapes.
3. Explain the function and operation of a bench vise
4. Review four safety rules to follow when operating the bench vise
5. Describe the function and operation of a hacksaw
6. Describe the function and operation of a file
7. Recognize how to clean and store a file
8. Recognize how layout lines are created on round stock
9. Review how round stock is held securely





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### MT-3 Demonstrate the use of the drill press

1. Describe the operation of metal cutting saws
2. Describe the purpose of performing Layout work
3. Describe the operation of a floor drill press
4. Explain five safety rules that should be followed before starting a drill press
5. Explain the eight safety rules that should be followed during the operation Of the drill press
6. Describe the operation of a twist drill
7. Describe the function and operation of cutting fluid
8. Describe the function and operation of reaming
9. Describe the function and operation of countersinking
10. Describe the function and operation of counter boring
11. Describe the function of tapping
12. Describe the function and operation of chamfering
13. Set up and operate drill press safely and proficiently, layout, drill, ream, chamfer, and assemble completed details per blue print specifications
14. Explain the operation of a manual lathe

### MT-4 Demonstrate us of the operation of band saw

1. Define a manufacturing process
2. Describe the functions of five types of machine tools.
3. Describe the shape of four metal stock shapes
4. Describe the function of two types of saws and give an application of each
5. Describe the operation of a horizontal band saw
6. Describe the operation of a vertical band saw
7. Explain five rules to follow to dress safety around machinery
8. Identify the nine safety rules that should be followed before starting a band saw
9. Explain the nine safety rules that should be followed during the operation of a band saw





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### MT- 5 Demonstrate the use of a manual lathe

1. Explain the operation of a manual lathe
2. Recognize six safety rules to follow before starting a lathe
3. Recognize ten safety rules to follow during operation of the lathe
4. Describe the function and operation of two types of lathe chucks
5. Identify two common methods for mounting a tool in a lathe
6. Identify two functions of the facing operation
7. Tell three methods used to set the spindle speed on a lathe
8. Describe the function of three hand wheels used to feed the cutting tool
9. Recognize the operation of two types of micrometer collars
10. Recognize the function of two types of cuts performed on the lathe
11. Describe two methods of controlling the length of a horizontal cut
12. Explain the operation of automatic feed and give an advantage
13. Review two types of chamfer that can be created on the lathe
14. Describe the function of three types of groove tools
15. Review the function of two types of threading tools
16. Tell how to drill a hole on a lathe
17. Review the function and operation of a combined drill/countersink
18. Review two factors that control the selection of a combination drill/countersink
19. Describe groove tools, threading tools, combination drill and countersink bit
20. Set up and operate the lathe safely and proficiently, layout, face ends of journals to size, turn journals and chamfers to blue print specifications, drill, tap, and ream using the tailstock
21. Set up and operate the lathe safely and proficiently, layout, face ends of journals to size, turn journals and chamfers to blue print specifications, drill, tap, and ream using the tailstock

### MT-6 Demonstrate use of the manual milling machine

1. Describe the operation of a mill
2. Discuss six safety rules that should be followed before starting a milling operation
3. Describe the function and operation of the micrometer collar
4. Explain how backlash affects the accuracy of a mill
5. Set up and operate milling machine safely and proficiently, layout using variety of measuring and layout tools, mill all sides parallel and perpendicular, mill keyways, slots, and pockets, drill, ream, tap, and counter sink per blueprint specifications

### MT- 7 Demonstrate use of machining/milling processes

1. Recognize a step and give four applications





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2. Review two methods used to locate the tool position when milling a step
3. Describe a slot and give two applications
4. Define a pocket and give three applications

### MT- 8 Demonstrate machining measurement and gauging measurement tools

1. Define dimensional measurement and explain its importance
2. Describe two systems of dimensional measurements: U.S. Customary S.I. metric
3. Describe the function and construction of a machinist's rule
4. Describe how to use a metric machinist's rule
5. Define measurement accuracy and explain its importance
6. Define resolution and explain its effect on accuracy
7. Describe how to use a decimal-inch machinist's rule
8. Describe how to use a machinist's rule with a common fraction-inch scale
9. Describe the function and construction of a tape measure
10. Describe how to use a tape measure to measure a length
11. Describe four sources of measurement error
12. Describe how to convert measurement made in common fractions to decimal inches
13. Describe how to convert between the U.S. customary system and the S.I. Metric system
14. Explain the function of a surface plate
15. Explain the information on the name plate
17. Understand the significance of surface plate color
19. Define the two calibration test
20. Safety use and care for a surface plate
21. Explain the purpose of gauge blocks
22. Build a gauge block
23. Wring gauge blocks
24. List the common grades
25. List the common gauge block materials
26. Explain the advantage of sets with more blocks
27. Explain how block tolerances affects accuracy
28. Identify bore gauges and explain their purpose
29. Distinguish between the types of bore gauges
30. Identify the components of indicating bore gauges
31. Identify different types of setting masters used with bore gauges
32. Explain how to use a bore gauge
33. Using a fixed size bore gauge
34. Using an adjustable size bore gauge





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35. Measure lengths, widths, diameters, of various gauge block builds, gauge pins, and also convert inch measurement to metric
36. Layout and install per blue print specifications, power drill and hand tap holes then install chamfers using the belt sander and pencil grinder
37. Review two systems of dimensional measurements: Define and explain the difference between U.S. Customary and Scientific International

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### *Course Outline*

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#### **Hand tools**

- I. General Shop Safety and Machine Shop Safety
- II. Introduction to hand tools
- III. Introduction to power tools
- IV. Introduction to supporting documentation material package and charts
- V. How to create a manufacturing plan
  - A. Pre-Assessment Test
  - B. Lesson 1: Safety
  - C. Lesson 2: Hand Tools
  - D. Lesson 3: Power Tools
  - E. Lab Projects 1- 3 with specific blue print specifications
    1. Lab 1 – Layout and install 3/16 X 45 degree chamfer per print specifications using a belt sander
    2. Lab 2 – Layout and install .03 X 45 degree chamfer per print specifications using a pencil grinder
    3. Lab 3 – Layout and install 5/16 – 18 drill and tapped hole using hand drill, T – handle tap tool, and c’ sink bit for chamfer
  - F. Post-Assessment Test

#### **Drill dress and band saw operation**

- I. General Shop Safety and Machine Shop Safety
- II. Saws
  - A. Pre-Assessment Test
  - B. Lesson 1: Introduction to Horizontal Band Saws
  - C. Lesson 2: Saw Safety
  - D. Lesson 3: Band Saw Blades
  - E. Lesson 4: Band Saw Operations
  - F. Introduction to supporting documentation material package and charts.





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G. Saw Lab Projects 1-4 with specific blue print specifications.

1. Labs 1- 4
2. Lab 1 – Saw 5/8 X 3 X 5 1/8" +/- 1/64
3. Lab 2 – Saw 1 1/2 Dia X 2 1/8" +/- 1/64
4. Lab 3 – Saw 1 1/2 Dia X 5 1/8" +/- 1/64
5. Lab 4 – Saw 3 pieces 3/8 X 1 X 3 1/8" +/- 1/64

### III. Drill Presses

- A. Pre-Assessment Test
- B. Lesson 1: Introduction to Drilling Machines
- C. Lesson 2: Drilling Machine Safety
- D. Lesson 3: Drill Press Operations
- E. Labs 1 – 4
  1. Lab 1 – Using 5/8 X 3 X 5" material, layout hole locations within tolerances specified. Drill holes all the way thru the plate within tolerances as specified on drawing.
  2. Lab 2 – Continue with the same material from lab 1 and ream holes per specified on drawing.
  3. Lab 3 –Using 3/8 x 1.0 x 3.00 inch long material, manufacture a bracket detail with mounting hole pattern and slot for proximity switch that will bolt onto Lab 1 with 5/16 – 18 SHCS.
  4. Lab 4 – Assemble lab 1 plate and lab 3 bracket.

### Introduction to the Milling Machine

1. Functions of the milling machine
2. Types of milling machines
3. Component parts of the vertical milling machine
4. Machine axes
5. Cutting tools used on the vertical milling machine
6. Accessories used on the vertical milling machine
7. Cutting speeds and feeds

### Safety

1. Review of general safety precautions
2. Milling machine safety

### Vertical Milling Machine

1. Installing and removing tools in the vertical milling machine
2. Head alignment
3. Mounting and indicating a vise or fixture





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- 4. Locating an edge or center
- 5. Using the digital readout (DRO)

### Lathe

#### I. General Shop Safety and Machine Shop Safety

#### II. Lathe

- A. Pre-Assessment Test
- B. Lesson 1: Introduction to the Lathe
- C. Lesson 2: Lathe Safety
- D. Lesson 3: Lathe Operation
- E. Introduction to supporting documentation material package and charts.
- F. Lathe Lab Projects 1 – 3 to specific blue print specifications.





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