

Western Technical College

31420341 Vertical Milling Operations

Course Outcome Summary

Course Information

Description	This course will provide instruction and practice in the use of the manual vertical milling machine and various operations performed on it.
Career Cluster	Manufacturing
Instructional Level	One-Year Technical Diploma
Total Credits	2
Total Hours	72

Textbooks

No textbook required.

Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** Campus Shop. Required.

Proper footwear - \$35.00-75.00. **Vendor:** To be discussed in class. Required.

Scientific calculator (recommend T1-36x Solar). **Vendor:** Campus Shop. Required.

Three-ring binder. **Vendor:** Campus Shop. Required.

Clipboard. **Vendor:** Campus Shop. Required.

Pens/Pencils/Black Sharpie Marker. **Vendor:** Campus Shop. Required.

Success Abilities

1. Live Responsibly: Develop Resilience
2. Live Responsibly: Foster Accountability
3. Refine Professionalism: Act Ethically
4. Refine Professionalism: Improve Critical Thinking
5. Refine Professionalism: Practice Effective Communication

Program Outcomes

1. MACH 1. Apply basic safety practices in the machine shop

2. MACH 2. Interpret industrial/engineering drawings
3. MACH 3. Apply precision measuring methods to part inspection
4. MACH 4. Perform basic machine tool equipment set-up and operation

Course Competencies

1. Interpret the use of vertical milling machine components and accessories.

Assessment Strategies

- 1.1. Written Product
- 1.2. Skill Demonstration

Criteria

- 1.1. you identify the location of machine controls, guards, and safety devices.
- 1.2. you operate machine controls, guards, and safety devices.
- 1.3. you describe purpose of vertical milling machine components and accessories.

Learning Objectives

- 1.a. Locate all machine components and accessories.
- 1.b. Describe the function of all machine components and accessories..
- 1.c. Recognize and avoid/minimize safety hazards associated with vertical milling machines.
- 1.d. Identify/locate machine guards/safety devices and their purpose.
- 1.e. Identify different types of workholding devices/accessories and their applications.
- 1.f. Recognize which workholding device/accessory will work best for a given milling process/situation.

2. Identify proper tools and tool holding accessories for vertical milling machining operations.

Assessment Strategies

- 2.1. Written Product
- 2.2. Skill Demonstration

Criteria

You will know you are successful when

- 2.1. you identify cutting tools used on a vertical milling machine.
- 2.2. you describe the purpose of the selected tool.
- 2.3. you identify types of toolholding accessories used on vertical milling machines.
- 2.4. you change tool inserts based on tool wear.

Learning Objectives

- 2.a. Identify cutting tools that are commonly used on vertical milling machines and describe their applications.
- 2.b. Identify types of toolholders commonly used on vertical milling machines.
- 2.c. Demonstrate proper mounting techniques for cutting tools used in vertical milling operations.
- 2.d. Recognize indications of tool wear.
- 2.e. Demonstrate proper technique for changing tool inserts.

3. Verify the alignment of vertical milling machine components.

Assessment Strategies

- 3.1. Written Product
- 3.2. Skill Demonstration

Criteria

You will know you are successful when

- 3.1. you demonstrate the tramming process.
- 3.2. you demonstrate the process of indicating a vise.

Learning Objectives

- 3.a. Recognize the results of toolhead misalignment on a work piece.
- 3.b. Demonstrate the process of checking/adjusting toolhead alignment on a vertical mill.
- 3.c. Recognize the results of misalignment of the vise on a work piece.
- 3.d. Demonstrate the process of aligning the vise on a vertical mill.

4. Apply appropriate Machining Theory principles to vertical milling operations.

Assessment Strategies

- 4.1. Written Product
- 4.2. Skill Demonstration

Criteria

- 4.1. you calculate correct spindle speeds for milling operations
- 4.2. you determine correct feed rates for milling operations
- 4.3. you determine correct infeeds for milling operations
- 4.4. you identify correct cutting fluids for milling operations

Learning Objectives

- 4.a. Demonstrate calculation of correct spindle speeds for milling operations
- 4.b. Demonstrate application of correct feed rates for milling operations
- 4.c. Demonstrate application of correct infeeds for milling operations
- 4.d. Identify the correct cutting fluids for milling operations

5. Operate vertical milling machines according to industry standards.

Assessment Strategies

- 5.1. Skill Demonstration

Criteria

You will know you are successful when

- 5.1. you operate the machine without injury to yourself or others.
- 5.2. you operate the equipment without causing damage to the machine or equipment.
- 5.3. you follow industry safety protocols.
- 5.4. you mill a work piece to length
- 5.5. you mill opposing surfaces of a work piece parallel
- 5.6. you mill adjacent surfaces of a work piece perpendicular
- 5.7. you mill a slot to width, depth, and location
- 5.8. you mill a pocket to width, length, depth, and location
- 5.9. you mill an angle to size and location
- 5.10. you use the offset boring head to bore a hole to size
- 5.11. you use form cutters to mill required features on a work piece
- 5.12. you use an edge finder to precisely locate the edges of a work piece
- 5.13. you use an indicator to precisely locate the center of a work piece

Learning Objectives

- 5.a. Demonstrate the ability to mill a work piece to required dimensions.
- 5.b. Demonstrate the ability to mill opposing surfaces parallel.
- 5.c. Demonstrate the ability to mill adjacent surfaces mutually perpendicular.
- 5.d. Demonstrate the ability to mill a slot to width, depth, and location.
- 5.e. Demonstrate the ability to mill a pocket to width, length, depth, and location.
- 5.f. Demonstrate the ability to mill angles to size and location.
- 5.g. Demonstrate the ability to bore holes to size and location.
- 5.h. Demonstrate the ability to use various form cutters on the vertical mill.
- 5.i. Demonstrate the ability to use an edge finder for precision location on a vertical mill.
- 5.j. Demonstrate the ability to use to indicate in the center of a w/p on the vertical mill.
- 5.k. Determine level of accuracy/precision required on workpiece.
- 5.l. Apply work holding devices as required for different milling operations.

6. Use proper workholding devices for vertical milling operations. (EXPIRE)

Assessment Strategies

- 6.1. Written Product: Evaluation of project planning sheets.
- 6.2. Skill Demonstration

Learning Objectives

- 6.a. Determine level of accuracy/precision required on work-piece.
- 6.b. Identify different types of workholding devices/accessories and their applications.
- 6.c. Recognize which workholding device/accessory will work best for a given turning process/situation.

