



Western Technical College

## 10620144 Mechanical Drives

### Course Outcome Summary

#### Course Information

<b>Description</b>	Mechanical drive components and systems are studied with emphasis on selection, application and proper installation techniques. Topics include machine safety, torque, power, efficiency, bearings, couplings, alignment, v-belt drives, chain drives, gear drives and multi-shafting drives. Industrial equipment is used to present these topics.
<b>Career Cluster</b>	Manufacturing
<b>Instructional Level</b>	Associate Degree Courses
<b>Total Credits</b>	2
<b>Total Hours</b>	54

#### Textbooks

Lap 1, 2, 3, 4 *Mechanical Drives 1* 660-381/620-144 (Custom Book). Amatrol. Required.

Lap 5, 6, 7 *Mechanical Drives 1-Lap 1, 2, 3 Mechanical Drives 2* 660-382/620-144 (Custom Book). Amatrol. Required.

#### Learner Supplies

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

Scientific calculator - T1-30XIIS or T1-36x Solar. **Vendor:** Campus Shop. Required.

Amatrol 206-LSUB4 Elearning License. **Vendor:** Campus Shop. Required.

#### Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Cultivate Passion: Increase Self-Awareness
3. Live Responsibly: Develop Resilience

4. Live Responsibly: Embrace Sustainability
5. Refine Professionalism: Participate Collaboratively

## Program Outcomes

1. Perform work safely.
2. Troubleshoot electrical and mechanical systems and devices.
3. Repair electrical and mechanical systems.
4. Communicate technical information.
5. Integrate electrical and mechanical systems and devices.

## Course Competencies

### 1. Practice mechanical power transmission safety.

#### Assessment Strategies

- 1.1. written objective test
- 1.2. skill demonstration

#### Criteria

*You will know you are successful when*

- 1.1. you describe the five rules of safe dress for working with power transmission equipment.
- 1.2. you list eight mechanical transmission safety rules.
- 1.3. you perform a lockout/tagout procedure.
- 1.4. you describe the proper operation of the lockout/tagout system.

#### Learning Objectives

- 1.a. Identify five rules of safe dress for working with power transmission equipment.
- 1.b. Examine eight mechanical transmission safety rules.
- 1.c. Practice a lockout/tagout procedure.
- 1.d. Examine the proper operation of the lockout/tagout system.

### 2. Analyze key fasteners as a means of connecting a load to an electric motor.

#### Assessment Strategies

- 2.1. written objective test
- 2.2. skill demonstration

#### Criteria

*You will know you are successful when*

- 2.1. you describe the function and operation of a key fastener.
- 2.2. you explain applications of six types of key fasteners.
- 2.3. you analyze specifications for keys and keyseats.
- 2.4. you select a key for a given application.
- 2.5. you measure the actual key and keyseat given a sample.
- 2.6. you assemble a hub to a shaft using a key fastener.

#### Learning Objectives

- 2.a. Identify the function and operation of a key fastener.
- 2.b. Investigate the construction of six types of key fasteners and give an application of each.
- 2.c. Analyze specifications for keys and keyseats.
- 2.d. Select a key for a given application.
- 2.e. Measure the actual key and keyseat given a sample.
- 2.f. Practice assembling a hub to a shaft using a key fastener.

### 3. Analyze operational characteristics of a mechanical drive system.

#### Assessment Strategies

- 3.1. written objective test
- 3.2. skill demonstration

**Criteria**

*You will know you are successful when*

- 3.1. you explain two methods of loading a mechanical drive system.
- 3.2. you measure shaft torque using a prony brake.
- 3.3. you calculate rotary mechanical power.
- 3.4. you calculate mechanical efficiency.
- 3.5. you measure electric motor current.

**Learning Objectives**

- 3.a. Identify two methods of loading a mechanical drive system.
- 3.b. Use a prony brake to measure shaft torque.
- 3.c. Calculate rotary mechanical power.
- 3.d. Calculate mechanical efficiency.
- 3.e. Measure electric motor current.

**4. Identify shaft and bearing applications.**

**Assessment Strategies**

- 4.1. written objective test
- 4.2. skill demonstration

**Criteria**

*You will know you are successful when*

- 4.1. you explain the function of a drive shaft.
- 4.2. you identify shaft size given a sample.
- 4.3. you explain the function of a bearing.
- 4.4. you install pillow block anti-friction bearing on a shaft.

**Learning Objectives**

- 4.a. Examine the function of a drive shaft.
- 4.b. Identify shaft size given a sample.
- 4.c. Examine the function of a bearing.
- 4.d. Practice installing a pillow block anti-friction bearing on a shaft.

**5. Investigate coupling and shaft alignment.**

**Assessment Strategies**

- 5.1. written objective test
- 5.2. skill demonstration

**Criteria**

*You will know you are successful when*

- 5.1. you explain the function and application of a coupling.
- 5.2. you describe four categories of mechanical couplings.
- 5.3. you align two shafts for flexible jaw coupling installation.
- 5.4. you list two types of shaft misalignment.
- 5.5. you install a flexible jaw coupling.

**Learning Objectives**

- 5.a. Examine the function and application of a coupling.
- 5.b. Identify four categories of mechanical couplings.
- 5.c. Align two shafts for flexible jaw coupling installation.
- 5.d. Identify two types of shaft misalignment.
- 5.e. Practice installing a flexible jaw coupling.

**6. Analyze belt drive system operation.**

**Assessment Strategies**

- 6.1. written objective test
- 6.2. skill demonstration

## Criteria

*You will know you are successful when*

- 6.1. you explain the function of the three basic components of a belt drive system.
- 6.2. you define pitch and explain its relevance to belt drive systems.
- 6.3. you determine the pitch circle, pitch diameter and pitch length of a belt drive system.
- 6.4. you calculate the pulley ratio of a belt drive system.
- 6.5. you list five types of belt drives and provide an application of each.
- 6.6. you install and align a fractional horsepower V-belt drive system.

## Learning Objectives

- 6.a. Examine the functions of the three basic components of a belt drive system.
- 6.b. Define pitch and relate its relevance to belt drive systems.
- 6.c. Investigate the pitch circle, pitch diameter and pitch length of a belt drive system.
- 6.d. Calculate the pulley ratio of a belt drive system.
- 6.e. List five types of belt drives and provide an application of each.
- 6.f. Practice installing and aligning a fractional horsepower V-belt drive system.

## 7. Analyze the operation of a chain drive system.

### Assessment Strategies

- 7.1. written objective test
- 7.2. skill demonstration

## Criteria

*You will know you are successful when*

- 7.1. you explain the function of the three basic components of a chain drive system.
- 7.2. you calculate sprocket ratio and explain its significance to a chain drive system.
- 7.3. you calculate shaft speed and torque of a chain drive system.
- 7.4. you explain an application of each (4) type of drive chain.
- 7.5. you describe how to install, align and remove a chain drive system with adjustable centers.

## Learning Objectives

- 7.a. Examine the functions of the three basic components of a chain drive system.
- 7.b. Calculate sprocket ratio and explain its significance to a chain drive system.
- 7.c. Calculate shaft speed and torque of a chain drive system.
- 7.d. List four types of chain drives and give an application of each.
- 7.e. Examine how to install, align and remove a chain drive system with adjustable centers.

## 8. Install a roller chain drive power transmission system.

### Assessment Strategies

- 8.1. written objective test
- 8.2. skill demonstration

## Criteria

*You will know you are successful when*

- 8.1. you install and align a roller chain system with adjustable centers.
- 8.2. you determine allowable chain sag for a given application.
- 8.3. you measure chain sag using a ruler and straight edge.
- 8.4. you adjust chain sag to a specified amount using adjustable centers.
- 8.5. you install and remove a chain master link using a chain puller.

## Learning Objectives

- 8.a. Practice installing and aligning a roller chain system with adjustable centers.
- 8.b. Determine allowable chain sag for a given application.
- 8.c. Measure chain sag using a ruler and straight edge.
- 8.d. Adjust chain sag to a specified amount using adjustable centers.
- 8.e. Practice installing and removing a chain master link using a chain puller.

## 9. Examine the operation of a spur gear drive system.

### Assessment Strategies

- 9.1. written objective test
- 9.2. skill demonstration

**Criteria**

*You will know you are successful when*

- 9.1. you describe the function of three components of a gear drive system.
- 9.2. you calculate gear ratio.
- 9.3. you calculate shaft speed and torque of a gear drive system.
- 9.4. you define the gear pitch, pitch circle and pitch diameter of a gear drive system.

**Learning Objectives**

- 9.a. Identify the functions of three components of a gear drive system.
- 9.b. Calculate gear ratio.
- 9.c. Calculate shaft speed and torque of a gear drive system.
- 9.d. Examine the gear pitch, pitch circle and pitch diameter of a gear drive system.

**10. Align a multiple shaft gear drive system.**

**Assessment Strategies**

- 10.1. written objective test
- 10.2. skill demonstration

**Criteria**

*You will know you are successful when*

- 10.1. you explain how to install a spur gear drive system.
- 10.2. you install a spur gear drive system.
- 10.3. you align a spur gear drive system.
- 10.4. you determine the allowable backlash in a gear drive system.
- 10.5. you measure gear backlash.
- 10.6. you adjust gear backlash to a specified amount.

**Learning Objectives**

- 10.a. Explore how to install a spur gear drive system.
- 10.b. Practice installing a spur gear drive system.
- 10.c. Align a spur gear drive system.
- 10.d. Determine the allowable backlash in a gear drive system.
- 10.e. Measure gear backlash.
- 10.f. Adjust gear backlash to a specified amount.