



Western Technical College

10620120 Motors and Drives

Course Outcome Summary

Course Information

Description	This course expands knowledge of motor controls and motor control systems. VFDs will be introduced and applied for control of a three phase motor. Positioning systems using both stepper and servo drives are explored. Application of industrial equipment is emphasized and students are required to use and interpret equipment manuals to control and integrate the equipment. Control of DC and single phase motors are also introduced.
Career Cluster	Manufacturing
Instructional Level	A.A.S. - Associate in Applied Science
Total Credits	2
Total Hours	54

Pre/Corequisites

Prerequisite 10620135 Basic Industrial Controls

Textbooks

Electric Motors and Control Systems. 3rd Edition. Copyright 2020. Petruzella, Frank. Publisher: McGraw-Hill Publishing Company. **ISBN-13:** 978-1-260-25805-9. Required.

Success Abilities

1. Live Responsibly: Embrace Sustainability

Course Competencies

1. Investigate DC machines.

Assessment Strategies

- 1.1. Written objective test
- 1.2. Skill demonstration

Criteria

You will know you are successful when

- 1.1. you assemble a DC motor system.
- 1.2. you assemble a DC generator system.
- 1.3. you analyze the operation of a DC motor system.
- 1.4. you analyze the operation of a DC generator system.
- 1.5. you identify parts of a DC motor and generator system.

Learning Objectives

- 1.a. Identify parts of various DC machines.
- 1.b. Explore operation of DC machines.
- 1.c. Explore power options for DC machines.
- 1.d. Explore voltage to speed ratio in DC machines.
- 1.e. Explore torque generation in DC motors.

2. Investigate single phase AC motors.

Assessment Strategies

- 2.1. Written objective test
- 2.2. Skill demonstration

Criteria

You will know you are successful when

- 2.1. you assemble single phase AC motor systems.
- 2.2. you analyze the operation of single phase AC motor systems.
- 2.3. you identify parts of single phase AC motor systems.

Learning Objectives

- 2.a. Identify parts of various single phase AC motors.
- 2.b. Explore operation of single phase AC motors.
- 2.c. Explore power options for single phase AC motors.
- 2.d. Explore poles to speed ratio in a single phase AC motor.
- 2.e. Explore torque generation in single phase AC motors.
- 2.f. Explore various starting configurations for single phase AC motors.

3. Investigate 3Ø motors and starting systems.

Assessment Strategies

- 3.1. Written objective test
- 3.2. Skill demonstration

Criteria

You will know you are successful when

- 3.1. you assemble basic 3Ø motor systems.
- 3.2. you analyze the operation of basic 3Ø motor systems.
- 3.3. you identify the parts of basic 3Ø motor systems.

Learning Objectives

- 3.a. Identify how a 3Ø motor works.
- 3.b. Identify 3Ø motor electrical protective and starting devices.
- 3.c. Wire 3Ø motor.
- 3.d. Wire 3Ø motor starter.
- 3.e. Wire 3Ø soft starters.
- 3.f. Explore results of overloading a 3Ø motor with various starting methods.

4. Investigate variable frequency drives as applied to 3Ø motors.

Assessment Strategies

- 4.1. Written Objective Test
- 4.2. Skill Demonstration

Criteria

You will know you are successful when

- 4.1. you assemble motor systems controlled by VFDs.
- 4.2. you analyze the operation motor systems controlled by VFDs.
- 4.3. you identify the parts of motor systems controlled by VFDs.

Learning Objectives

- 4.a. Investigate the theory of VFD operation.
- 4.b. Explore electronic operation of a VFD.
- 4.c. Program a VFD.
- 4.d. Explore available analog inputs and outputs for a VFD.
- 4.e. Explore available digital inputs and outputs for a VFD.
- 4.f. Summarize the effects of VFD output on 3Ø motor operation.

5. Investigate stepper motor systems.

Assessment Strategies

- 5.1. Written objective test
- 5.2. Skill demonstration

Criteria

You will know you are successful when

- 5.1. you assemble stepper motor systems.
- 5.2. you analyze the operation of stepper motor systems.
- 5.3. you identify the parts of stepper motor systems.

Learning Objectives

- 5.a. Identify parts of various stepper motor systems.
- 5.b. Explore operation of stepper motor systems.
- 5.c. Explore pulse rate and resolution and their relationship to speed in stepper motors.
- 5.d. Explore torque generation in stepper motors.
- 5.e. Explore holding torque and current for stepper motors.

6. Investigate motor feedback devices.

Assessment Strategies

- 6.1. Written objective test
- 6.2. Skill demonstration

Criteria

You will know you are successful when

- 6.1. you assemble motor system feedback devices.
- 6.2. you analyze the operation of motor system feedback devices.
- 6.3. you identify the parts of motor system feedback devices.

Learning Objectives

- 6.a. Identify different types of encoders and tachometers.
- 6.b. Explore operation and function of encoders and tachometers.
- 6.c. Explore power and communication configurations to encoders and tachometers.
- 6.d. Explore voltage to speed ratio in a tachometer.
- 6.e. Explore pulse counts in an incremental and an absolute encoder.

7. Investigate servomotor systems.

Assessment Strategies

- 7.1. Written objective test
- 7.2. Skill demonstration

Criteria

You will know you are successful when

- 7.1. you assemble servomotor systems.
- 7.2. you analyze the operation of servomotor systems.
- 7.3. you identify the parts of servomotor systems.

Learning Objectives

- 7.a. Identify parts of various servomotor systems.
- 7.b. Explore operation of servomotor systems.
- 7.c. Explore adjustments to speed in a servomotor.
- 7.d. Explore torque generation in servomotors.
- 7.e. Explore motion and positioning methods in servomotors.