



Western Technical College

10664103 Safeguarding and Safety Circuits

Course Outcome Summary

Course Information

Description	In this course, safeguarding principles to keep personnel safe will be examined including the use of guards, barriers, safety devices, and/or safe working conditions. Safety levels of machine safeguarding devices will be explored. Investigation of electromechanical devices designed expressly for the purpose of monitoring the integrity of a machine's safety system will be included. Additionally, safety switches, relays, and circuits are examined.
Career Cluster	Manufacturing
Instructional Level	Associate Degree Courses
Total Credits	2
Total Hours	54

Pre/Corequisites

Prerequisite 10620153 Basic PLC Programming

Textbooks

Euchner Safety Book (Part #103344). 4th Edition. Copyright 2023. Publisher: Powermation. Required.

Success Abilities

1. Refine Professionalism: Participate Collaboratively

Program Outcomes

1. Perform work safely

Course Competencies

1. Examine methods of safeguarding.

Assessment Strategies

- 1.1. Written Objective Test

Criteria

- 1.1. you identify different safeguarding techniques.
- 1.2. you determine what safeguarding techniques are adequate for the application.
- 1.3. you identify the purpose of different safeguarding techniques.

Learning Objectives

- 1.a. Define safeguarding.
- 1.b. Identify purpose and types of guards.
- 1.c. Identify purpose and types of barriers.
- 1.d. Explore how machine location and/or distance impacts safety.

2. Examine the process for performing a risk analysis.

Assessment Strategies

- 2.1. Written Objective Test

Criteria

- 2.1. you determine acceptable risk level for an application.
- 2.2. you differentiate between the 5 categories of circuitry requirements in EN ISO 13849.
- 2.3. you perform a sample risk estimation using EN ISO 13849

Learning Objectives

- 2.a. Determine the limits of the machine.
- 2.b. Identify tasks and the associated hazards in the workplace
- 2.c. Estimate risk.

- 2.d. Identify common ways to reduce risk.
- 2.e. Research different types of risk assessment and its purpose.
- 2.f. Explore documentation requirements.

3. Identify basic layout of safety switches.

Assessment Strategies

- 3.1. Written Objective Test

Criteria

You will know you are successful when

- 3.1. you differentiate between the 4 types of switches according to EN ISO 13849.
- 3.2. you identify the basic elements of a safety switch.
- 3.3. you explain the reasoning for positively driven contacts in safety devices.

Learning Objectives

- 3.a. Identify electromechanical switching elements.
- 3.b. Identify slow-action contact elements.
- 3.c. Identify snap-action contact elements.
- 3.d. Explore switching elements with multiple contacts.
- 3.e. Explore safety contacts in relays.

4. Wire safety sensors and interlocking devices.

Assessment Strategies

- 4.1. Demonstration
- 4.2. Written Objective Test

Criteria

You will know you are successful when

- 4.1. you wire an encoded non contact safety switch.

- 4.2. you wire a safety door switch with key.
- 4.3. you terminate wiring to a safety relay.

Learning Objectives

- 4.a. Wire a non-contact encoded safety switch.
- 4.b. Wire an interlocking safety switch.
- 4.c. Terminate safety sensors and switches to safety relays.
- 4.d. Identify the purposes for using a safety sensor.

- 4.e. Determine correct application for using a safety sensor.

5. Wire single and dual channel safety relays.

Assessment Strategies

- 5.1. Demonstration
- 5.2. Written Objective Test

Criteria

- 5.1. you wire a single channel safety relay.
- 5.2. you explain the difference between a normal relay and a safety relay.
- 5.3. you wire a dual channel safety relay.
- 5.4. you terminate external circuitry to safety relay contacts.

Learning Objectives

- 5.a. Define positively driven contacts.
- 5.b. Examine the difference between safety relays and normal relays.
- 5.c. Wire safety relays to external circuitry.
- 5.d. Wire a monitoring safety relay.

6. Wire and write logic in programmable safety relays.

Assessment Strategies

- 6.1. Demonstration
- 6.2. Written Objective Test

Criteria

- 6.1. you wire inputs and outputs on a programmable safety relay.
- 6.2. you write logic in a program for a programmable safety relay.
- 6.3. you establish communication with a programmable safety relay and download the project.

Learning Objectives

- 6.a. Wire safety switches and sensors to inputs on programmable safety relays.
- 6.b. Wire loads to outputs on programmable safety relays.
- 6.c. Write logic in software to download to programmable safety relays.

7. Examine regulations and standards for safety circuits.

Assessment Strategies

- 7.1. Written Objective Test

Criteria

You will know you are successful when

- 7.1. you explain the purpose of standards ISO 13849-1, 13849-2, ISO 12100, and ANSI B11.19
- 7.2. you locate relevant information about implementation of safety circuits on machinery within the standards.
- 7.3. you identify similarities and differences between the standards.
- 7.4. you interpret diagrams and symbols.
- 7.5. you communicate using industry standard terminology.

Learning Objectives

- 7.a. Explore standards ISO 13849-1, 13849-2, ISO 12100, and ANSI B11.19
- 7.b. Locate relevant information about implementation of safety circuits on machinery within the standards.
- 7.c. Identify similarities and differences between the standards.
- 7.d. Identify common language (in manuals), symbols, and/or diagram parts related to safety circuits.

