

# EPEC - Electrical Products Education Course

## Gold Level – Module 1

### Delivering Quality Power

#### Objectives

Upon completion of this module, you will be able to:

- Explain how equality, loss of power, or power surges impact power distribution at industrial facilities.
- Calculate load values.
- Realize the importance of control concepts, switches, starters, and sensors and what they mean to an industrial application.
- Understand motor control center opportunities.
- Identify energy management options on large projects.

#### Chapter Outline

Chapter One: Quality Power Challenges with Multiple Loads

- A. Load Types and Losses
- B. Harmonics and Total Harmonic Distortion
- C. Solutions to Combat Total Harmonic Distortion and Increase Power Quality

Chapter Two: Controls

- A. Control Concepts: Information, Decision, Action = INPUT, LOGIC, OUTPUT
- B. Electromechanical Limit Switches
- C. Proximity Sensors
- D. Photoelectric Sensors

Chapter Three: Strategies for Startup Problems

- A. Reduced-Voltage Starters
- B. Motor Control Centers

Chapter Four: Energy Management

- A. Controls
- B. Daylighting
- C. Sustainable Building Design
- D. Lighting Management

Chapter Four: Power Distribution Systems: Industrial Products and Considerations

- A. Sources of Power and Distribution Methods
- B. Transformers and Substations in Power Distribution Systems
- C. Low-Voltage Switchboards and Switchgear
- D. Low-Voltage Industrial Circuit Breakers
- E. Low-Voltage Panelboards

Chapter Five: EPEC Assignment

- A. Pricing Switchboards
- B. EPEC Assignment

# EPEC - Electrical Products Education Course

## Gold Level – Module 2

### Controllers, Relays, & Drives

#### Objectives

Upon completion of this module, you will be able to:

- Explain the difference between NPN and PNP materials and how they are used in diodes, transistors, and thyristors.
- Discuss why it is more efficient and economical to generate and transmit AC power rather than DC power.
- Define the meaning of three-phase rectification.
- Locate the different parts and components on a printed circuit board.
- Discuss how semiconductors can act much like a mechanical switch yet offer many other options.
- List the advantages of solid-state relays and the four designs for control applications.
- Confidently select the correct solid-state relays for each application.
- Gain a thorough understanding of the uses of PLCs.
- Identify the differences between discrete versus analog inputs and outputs.

#### Chapter Outline

##### Chapter One: Basics of Solid-State Electronic

##### Control Devices

- A. Semiconductors, Diodes, Rectification, and Amplification
- B. PC Boards
- C. Thermistor
- D. Silicon-Controlled Rectifier
- E. Triac and Diac
- F. Integrated Circuits

##### Chapter Four: Variable Frequency Drive Basics

- A. Benefits of Variable Frequency Drives
- B. Load Types for Variable Frequency Drives

##### Chapter Five: EPEC Assignment

- A. EPEC Electrical System: Controllers, Relays, and Drives
- B. EPEC Assignment

##### Chapter Two: Solid-State Relays

- A. Solid-State Relay Operation
- B. Solid-State Relay Design
- C. Product Selection Considerations

##### Chapter Three: Basics of Programmable

##### Controllers

- A. PLCs: Introduction
- B. Basic Components of a Programmable Controller
- C. Numbers, Bits, and Bytes
- D. Discrete vs Analog—Inputs and Outputs
- E. The CPU
- F. PLC Scan, Software, Hardware, and Memory

## EPEC - Electrical Products Education Course

### Gold Level – Module 3

#### Energy Management

##### Objectives

Upon completion of this module, you will be able to:

- Discuss international efforts and cooperative agreements regarding climate change and their impact upon the electrical industry.
- Plan for total energy management and help your clients choose the best solutions.
- Recognize the need for careful utility planning.
- Realize the benefits of a heat-of-light system.
- See how utility companies face huge capital requirements due to zonal comfort conditioning benefits in demand-side management.
- Identify how fans can conserve energy and save money.
- Choose products to enhance system energy efficiency.
- Comprehend and suggest the different light controls available for customers.
- Appreciate the link between electrical energy savings and HVAC controls
- Discuss how motor controls with variable frequency drives enhance energy savings.
- Become familiar with the more advanced remote, multifunction, and computer-based EMCS devices.

##### Chapter Outline

###### Chapter One: Energy Savings and HVAC Systems

- A. Heat-of-Light System
- B. Zonal Comfort Conditioning Benefits in Demand-Side Management
- C. Conserving Energy and Saving Money Using Low-Powered Fans
- D. Product Considerations in Energy-Efficient Motors

###### Chapter Two: Controls

- A. Lighting Controls
- B. HVAC Controls
- C. Motor Controls: Energy Savings with Variable Frequency Drives
- D. Remote, Multifunction, and Computer-Based EMCS

###### Chapter Three: Sales Strategies for Sustainability

- A. The Energy Management Opportunity
- B. Planning for Total Energy Management
- C. Utility Billing Factors

###### Chapter Four: EPEC Assignment

- A. EPEC Electrical System: Energy Management

### Gold Level – Capstone

#### Department Store and Amusement Park