

Merced College

Industrial Electrical Training

Part 1

Course Description:

This session is designed for entry level maintenance or operator personal. This course is also very effective for updating skills of upper level maintenance technician's .The material is presented using practical methods specifically for the industrial processing technician. The course emphasis is to introduce the learner to electrical safety, electrical theory, test equipment usage, motor control circuits, Variable Frequency Drives and an introduction to Basic PLC's.

Course Outcomes:

The expected outcome is for the learner to obtain practical electrical theory knowledge and the skills to safely utilize electrical test equipment.

SUBJECTS

1. Electrical Safety
 - A. Electrocution
 - B. Personal Protection
 - C. Safe Electrical Servicing Practices including Lockout/Tagout
 - D. Electrical Hazard Assessment

2. Review Electrical Theory
 - A. Safety
 - B. AC and DC
 - C. Magnetism
 - D. Electromagnetic Components
 - F. Resistance, Current and Voltage
 - G. Power and Kilowatt/hours
 - H. Inductance
 - I. Ohms Law
 - J. Resistive Loads
 - K. Inductive Loads-Motors and Transformers

3. Test Equipment-Meters and Software
 - A. Multi Meter
 - B. Current Meter
 - C. Capacitance Meter
 - D. Mega Ohm Meter
 - E. Infrared Thermometer
 - F. Thermal Imaging Camera

Lab

1. Voltage Measurement
 - A. AC Single Phase
 - B. AC Three Phase
 - C. DC
2. Resistance Measurement
 - A. Coils
 - B. Resistance Heaters
 - C. Motors
 - D. Lights
3. Current Measurement
 - A. Resistive Load
 - B. Inductive Load
4. Capacitance Measurement
 - A. Start Capacitors
 - B. Run Capacitors
5. Mega Ohm Measurement (Meggar)
 - A. Operational Safety
 - B. Motor Windings
 - C. Transformers
 - D. Conductors
6. Infrared Thermometer
 - A. Circuit Breakers
 - B. Motors
 - C. Transformers
 - D. Equipment
7. Thermal Imaging Camera
 - A. Electrical Main Panel
 - B. Electrical Sub Panel
 - C. Motor Starter
 - D. Motor
 - E. Transformer

Merced College
Industrial Electrical Training
Part 2

Course Description:

This course builds on Session 1. The course emphasis is on electrical components, electrical symbols, schematic diagrams, and ladder logic diagrams. The learner is introduced to standard industrial components, circuits, and diagnostic methods.

Course Outcomes:

The expected outcome is for the learner to obtain electrical circuit and electrical diagram knowledge. The emphasis will be for the learner to obtain the ability to develop an effective diagnostic procedure for industrial electrical components and systems.

SUBJECTS

1. Electrical Symbols and Components
 - A. Electrical Mechanical
 - B. Electronic
 - C. Sensors
2. Schematics
 - A. Series Circuits
 - B. Parallel Circuits
 - C. Start Stop Station
 - D. Jog Control
 - E. Limit Control
 - F. Fwd- Rev Starter Control
 - G. Proximity Control
 - H. Photo Cell Control
 - I. PLC Integration
3. Ladder Logic
 - A. Ladder Logic Layout
 - B. Start Stop Station with Jog
 - C. Fwd Rev Starter with Limit Control
 - D. PLC Integration
 - E. VFD Motor and Start Commands

Lab

1. Series and Parallel Circuits
 - A. Master Stop Control
 - B. Stop Control
 - C. Start Control
 - D. Diagnostic Processes
2. Motor Starters
 - A. Description
 - B. Layout
 - C. Circuit Options
 - D. Diagnostics
 - E. VFD Control
 - F. PLC Control
3. Start Stop With Jog Control
 - A. Control Layout
 - B. Wiring
4. Fwd Rev With limit Control
 - A. Control Layout
 - B. Wiring
 - C. Diagnostics
 - D. PLC Control
5. Proximity Control
 - A. Control Pin Out
 - B. Circuit Identification
 - C. Wiring
 - D. Diagnostics
 - E. PLC Integration
6. Photo Cell Control
 - A. Control Pin Out
 - B. Control Sensing Requirements
 - C. Circuit Identification
 - D. Wiring
 - E. Diagnostics
7. Programmable logic Controller (PLC) Integration
 - A. PLC Description
 - B. Input Cards
 - C. Output Cards
 - D. Analog Signals

Merced College
Industrial Electrical Training
Part 3

Course Description:

This course builds on Session 2. The course emphasis is on electric motors, motor starters, variable frequency drives, PLC Control, motor protection, and motor diagnostics. The learner is introduced to industrial motor and motor drive systems.

Course Outcomes:

The expected outcome is for the learner to obtain electrical motor, motor drive, and motor protection knowledge. The emphasis will be the learner attaining the ability to effectively diagnose motors and motor drive systems.

Lecture

1. Electric Motors
 - A. Single Phase
 - B. Three Phase
 - C. DC
2. Single Phase
 - A. Shaded Pole
 - B. Split Phase
 - C. Start Devices
 - D. Start Capacitors
 - E. Run Capacitors
 - F. Diagnosis
3. Three Phase
 - A. 9 Wire Motor
 - B. 12 Wire Motor
 - C. Diagnosis
 - D. VFD Control and use
4. DC Motors
 - A. Permanent Magnet
 - B. Series
 - C. Shunt

Lab (12 Hours)

1. Single Phase Motors
 - A. Construction
 - B. Winding Testing
 - C. Capacitor Testing
 - D. Starting Device Testing
2. Three Phase Motors
 - A. Construction
 - B. Winding Testing
 - C. Diagnostics
 - D. VFD Wiring
3. Motor Overload Protection
 - A. Fuses
 - B. Circuit Breakers
 - C. Thermal Overloads
 - D. Electronic Overloads
 - E. Diagnostics
4. Magnetic Motor Starters
 - A. Construction
 - B. Field Servicing
 - C. Diagnostics
5. DC Motors
 - A. Construction
 - B. Controllers
 - C. Field Servicing
 - D. Diagnostics
6. Variable Frequency Drives
 - A. Setup
 - B. Diagnostics
 - C. PLC Integration and Speed Control