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Electrical Engineering

Electrical Motors and Drives: Protection, Maintenance & Troubleshooting

Course Introduction

The course covers all topics relating to both AC motors and their drives. AC motors represent industry's workhorse in all applications. It is no exaggeration to suggest that more than half of the energy consumed worldwide is converted by AC motors into work and these are controlled by drives.

Understanding maintenance and troubleshooting procedures of such vital industrial equipment means that reduced downtime and increased productivity for the company. The protection a requirement along with their function and integration with the overall system ensures that such expensive apparatus is well guarded against failures which further offer safety for operations personnel as well.

Target Audience

- Technician, semiconductor development
- Power-distribution engineer
- Controls design engineer

Learning Objectives

- Understand the various types of AC motors and starters
- Determine the components and operations of variable speed drives
- Explain the different types of variable speed drives
- Analyze the common faults in a variable speed drive
- Design the protection requirements for motors and drives

Course Outline

- **DAY 01**

  Module (01) Introduction to AC Motors

  - 1.1 Fundamentals of Rotating Machines Theory
  - 1.2 Principles of Operation of AC motors
  - 1.3 construction, Rotor Slip and Torque-Speed Characteristic
  - 1.4 Single-phase and three-phase AC motors
  - 1.5 Types, Construction, Characteristics and applications
  - 1.6 Starting of induction motors and associated techniques and acceleration
  - 1.7 Speed control requirements of AC motors and load matching
  - 1.8 Selection of AC motors for industrial applications and service factor
  - 1.9 Medium voltage motors and applications

- **Day 02**

  Module (02) Troubleshooting and Maintenance of Motors

  - 2.1 Characteristics of motors, enclosures and cooling methods
  - 2.2 Predictive maintenance, motor troubleshooting and diagnostic testing
  - 2.3 Failures in three-phase stator windings, rewind scenarios when a motor fails
  - 2.4 Troubleshooting and maintenance of AC motors, routine care
  - 2.5 Slow acceleration or refusal to starting of an AC motor, overheating and noise
  - 2.6 Standards and testing instruments

- **Day 03**

  Module (03) Drives

  - 3.1 Fundamental principles and understanding of AC Variable Speed Drives

- 3.2 Power semiconductors, diode, thyristor (SCR), IGBT, MOSFET, GTO and others.
- 3.3 Voltage-source, current-source and pulse width modulated (PWM) inverters
- 3.4 Benefits and applications of VSD
- 3.5 Two-level PWM, regeneration and dynamic braking, volts per hertz control
- 3.6 Medium voltage VSDs, switching transients, harmonics and power factor

• **Day 04**

Module (04) Troubleshooting and Maintenance of Drives

- 4.1 Soft starters and selecting the correct VSD
- 4.2 VSD analyzers for converter failures, inverters and rectifiers
- 4.3 Troubleshooting techniques and maintenance for VSD
- 4.4 VSD parameter guidelines and settings
- 4.5 VSD bearing failures and remedies
- 4.6 Testing instruments and scope meters for VSD

• **Day 05**

Module (05) Protection of Motors and Drives

- 5.1 Protection of AC motors, requirement and overload protection
- 5.2 Fuses, circuit breakers, magnetic and thermal overload, and solid-state
- 5.3 Motor protection curves, back-up protection
- 5.4 Protection of inverters and electronic converters driving motors
- 5.5 Case studies, selection and design of systems and their protection
- 5.6 Q&A and wrap up session

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 5, 2025	May 9, 2025	5 days	4950.00 $	Spain - Barcelona
Sept. 1, 2025	Sept. 5, 2025	5 days	4250.00 $	UAE - Abu Dhabi
Dec. 22, 2025	Dec. 26, 2025	5 days	4250.00 $	UAE - Abu Dhabi