



Course Information Letter ---- M217

ELECTRICAL FUNDAMENTALS FOR MECHANICAL TECHNICIANS M217

Mechanics have an increasing need to work safely around electrical components. Simply put, this course is intended to (1) emphasize how to be safe from a practical perspective, and (2) provide knowledge regarding the minimum skills required to accomplish the most common tasks. As we know, the ability to work safely and reliably on electrical equipment systems can be dependent upon an individual's knowledge of electrical safety, use of electrical test equipment, grounding systems and electrical print reading. This course is intended to help develop these skills and their application.

Topics include: Production of Electricity, Safety Issues, Test Equipment, Use of Test Equipment, Wire Selection, Installing and Wiring Equipment, Print Reading, Introduction to Electrical Service, AC/DC Motors, National Electric Code, Troubleshooting Techniques.

COURSE OBJECTIVES: Upon completion of this course, the participant should be able to:

1. Demonstrate familiarity with Ohm's Law and the ability to apply this law in interpreting electrical circuits.
2. Describe hazards associated with working with electricity and demonstrate how to protect oneself from this hazard.
3. Demonstrate a working knowledge of the functionality of a multi-meter, voltage tester, a non-intrusive ammeter; and identify the instrument that is used to verify the integrity of wire insulation.
4. Describe the difference between a conductor and cable and how they are classified.
5. Demonstrate the proper technique on how to connect wires using a wire nut or terminal lug as well as to wire an electrical receptacle and/or switch.
6. Demonstrate knowledge regarding the use and application of different types of electrical diagrams.
7. Demonstrate knowledge as to what constitutes an Assured Equipment Grounding Program.
8. Demonstrate operational knowledge and ability to use a Ground Fault Circuit Indicator (GFCI).
9. Demonstrate a basic understanding of troubleshooting techniques involving branch and control circuits and the importance of the Lockout/Tagout concept.
10. Demonstrate knowledge regarding the purpose of the National Electric Code (NEC).
11. Describe why and how electrical circuits should be checked de-energized
12. State the factors affecting insulation resistance.
13. Describe the three purposes of insulation resistance testing.
14. Describe the requirements for equipment grounding and ground conductor selection.
15. Demonstrate the ability to interpret logic diagrams.
16. Describe the fundamental design, construction, application and operation of all motors typically found in an industrial site.
17. Explain how a 3-phase motor direction of rotation is reversed.
18. Define torque, starting current, and armature reaction as they apply to a DC motor.
19. Describe the methods for determining various motor connections.

COURSE OUTLINE

- I. **PRODUCTION OF ELECTRICITY:** Production of Electricity, AC / DC in Facilities, Circuit Parameters, Ohm's Law, Basic Electrical Circuits, Power in Electrical Circuits, Single Phase Versus Three Phase Systems
- II. **SAFETY ISSUES:** Hazards of Working With Electricity, Personal Protective Equipment (PPE), Safe Working Practices, Lockout / Tagout (LOTO), Electrical Safety in the Workplace, Power in Electrical Circuits
- III. **TEST EQUIPMENT:** Multimeters, Voltage Testers, Clamp on Ammeter, Meg-Ohmmeters
- IV. **USE OF TEST EQUIPMENT:** Measuring Circuit Parameters, Verifying Circuit is De energized, Determining Mode of Failure, Meg-Ohmmeters
- V. **WIRE SELECTION:** How a Conductor is Constructed, Classifications and Ratings, Selecting a Conductor
- VI. **INSTALLING AND WIRING EQUIPMENT:** Wire Nuts, Terminals and Crimpers, Switches and Receptacles, Fluorescent Ballasts, AC Motors, DC Motors, Replacement Criteria, Temporary Wiring
- VII. **PRINT READING:** Reading One Line Diagrams, Introduction To Schematic Diagrams, Electrical Service, Major Components
- VIII. **INTRODUCTION TO ELECTRICAL SERVICE:** Assured Equipment Grounding Program, Use of a Ground Fault Circuit Interrupter (GFCI), Precautions
- IX. **AC/DC MOTORS:** Terms and Definitions, Motor Enclosures, Nameplate Data, Introduction to Motor Types and Theory, Induction Motor Construction and Operations, Synchronous Motor Construction and Principle of Operation, Direct Current Motors
- X. **NATIONAL ELECTRIC CODE:** Purpose, Definitions, Terminology, Overview of Installation Requirements, Qualification of Personnel
- XI. **TROUBLESHOOTING TECHNIQUES:** Branch Circuits, Control Circuits, Equipment Isolation, Fuses

WHAT YOU WILL RECEIVE:

- HPC Technical Services' fully illustrated textbook: Electrical Fundamentals for Mechanical Technicians.
- HPC's Certificate of Completion, including 2.9 Continuing Education Units, as authorized by the International Associate of Continuing Education/Training (IACET).

COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, www.hpcnet.com.

FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, stparker@hpcnet.com for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? No.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary and it needs to be priced on an individual need basis. You gain from the customization and price.
- Is HPC Technical Services' consultants available for "technical advise" on the evaluation of your maintenance procedures, systems, tests? Yes. Call Harold Parker, hparker@hpcnet.com for a rate sheet.

INSTRUCTOR(S):

Electrical Fundamentals for Mechanical Technicians – M217

www.hpcnet.com



Mike Whisnant. Mr. Whisnant's career began at the Oconee Nuclear Station in May 1970. Being assigned as the lead tech for the EHC along with all of the support systems for the turbine gave Mike the opportunity to not only learn the EHC System but to master the system during his 31 years with Duke. His involvement with the turbine enabled Mike to gain a working knowledge of the steam cycle within a power plant. This working knowledge of the steam cycle provided many opportunities to work on the electrical circuits involved with the steam cycle processes, which included power distribution, control, alarms, and trip circuits. And as with any electrical circuit, sometimes things go wrong, which leads to taking measurements for troubleshooting purposes. Mike is an excellent troubleshooter and with his wide-ranging knowledge of the different systems within a power plant, it provided the opportunity to travel to other non-Duke plants as a consultant to ensure system readiness after the NRC shut down these plants. After his retirement in June 2001, he joined the staff of H. Parker & Company in September 2001 as their E&I Training Specialist, who provides training courses on steam turbine controls, generators, electrical operating systems, protective systems, etc. His duties have expanded to include being a consultant in the performance of a functional checkout and calibration of the EHC Mark 1 & II along with providing troubleshooting support should it be required?

Leonard Fox. Mr. Fox has approximately 20 years experience working in the electrical field. In his earlier career he worked for several manufacturers of power transformers where he was involved in the installation, checkout and troubleshooting of said transformers. Later in his career he became involved in the inspection of property to ensure safety and code requirements have been met. Over the past few years, Mr. Fox has started to teach some of HPC's electrical maintenance courses.

HPC TECHNICAL SERVICES
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REGISTRATION FORM

Company: _____
Plant: _____
Address: _____
City/State/Zip: _____
Telephone: _____ FAX: _____
Course Number/Title: _____
Course Dates: ____/____/____ Thru ____/____/____
Course Location: _____ Course Fee: _____

Please enroll the following individual(s) listed below:

Student #1: _____
Student #2: _____

Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.

Student #3: _____

Enrolled by: _____ **Date:** _____

METHOD OF PAYMENT

Check to Follow: _____
 Check Enclosed #: _____
 MC/Visa/AMEX #: _____
Expiration Date: _____ CV Code: _____
 Purchase Order #: _____

HOW DID YOU LEARN OF THIS COURSE?

Attended HPC classes in the past.
 Received a fax
 Received an email
 Internet search
 Received a mailing
 Other: _____