



Course Information Letter ---- OP202

ELECTRICAL SYSTEMS FOR OPERATORS

OP202

As an operator you know your job extremely well through training and experience. You know exactly what buttons to push, knobs to turn, and indicators to view to parallel the generator to the grid. In performing these tasks, is there a comprehension of why these tasks have to be done in a certain way and sequence? Is there a big picture of how all the components that make up the electrical side of the power plant are linked together such that power is generated and sent to the grid?

Once the generator is on line, what are the factors affecting the power output of the generator? Are these factors strictly mirroring the characteristics of the load? How are these factors being addressed either manually or automatically?

What electrical sensors are used in a variety of ways through instrumentation to monitor and protect the operation of the electrical equipment?

Do you know how to read an electrical schematic? What do the symbols on the schematic mean? Is there a way to understand the predictability of an electrical circuit?

These questions along with many more will be answered upon attending the Electrical Systems For Operators course.

Who Should Attend?

Power Plant Personnel who have a need to better understand the generation of electrical power and how this energy is used to support plant operations.

COURSE OUTLINE:

- I. INTRODUCTION: Types Of Plants; Prime Movers; Energy Converters; Typical Generating Plant; Energy Sources; Power Generation; Transmission Stations; Distribution Station; Distribution Panels; Operations And Process Control
- II. FUNDAMENTALS OF ELECTRICITY: Electron Flow; Ohm's Law; Series Circuits; Parallel Circuits; Series/Parallel Circuits, Magnetism; Alternating Current; Power
- III. READING ELECTRICAL DIAGRAMS: Single Line Diagrams; Introduction to Schematics; Using Schematics; Schematic and Wiring Diagrams
- IV. PLANT ELECTRICAL EQUIPMENT: Buses and Bus Ducts; Transformers; Circuit Breakers and Switchgear; Instrument Transformers; Fuses; Protective Relays; Control Power; Storage Batteries
- V. MOTORS: Definitions and Purposes; Principles and Operation - DC Motors; Principles and Operation - AC Motors; Synchronous Motors; Induction Motors; AC Commutator Motors; Motor Frame Designations; Motor Bearings; Motor Nameplate Data; DC Motor Operation, Maintenance and Applications; Motor Controls
- VI. GENERATION: Definition and Purpose of AC Generators; Principles of Simple Generators; Principles of Large Generators; Generator Cooling; Generator Regulation; Operation of Generators in Parallel; Maintaining Stability; Unbalanced Phase Currents
- VII. EXCITATION: The Need for Excitation; System Components; DC Generator as an Exciter; Shunt Exciter; Compound Exciter; Differential Compound Exciter; Cooling of DC Exciter Generators; Rectifiers in Exciter Systems; Reserve Exciters

WHAT YOU WILL RECEIVE:

- HPC Technical Services's Textbook Electrical Systems For Operators
- HPC's Certificate of Completion, including 1.9 Continuing Education Units, as authorized by the International Associate of Continuing Education/Training (IACET).

COURSE OBJECTIVES: Upon completion of this course, the participants will be able to:

1. Describe, in basic terms, the types of power plants, the prime movers used to drive their generators, and the transmission lines used to distribute the power generated.
2. Given a block diagram, trace the flow of electrical generation from the original energy source to the end user, the consumer.
3. Explain Ohm's Law and the behavior of voltage, current, and resistance in series, parallel, and series-parallel DC circuits.
4. Define inductance and capacitance to include how they contribute to the impedance of an AC circuit.
5. Describe components making up the power triangle.
6. Identify and explain the purpose of the symbols and standard device function numbers on an electrical schematic.
7. Demonstrate the ability to trace current through the various components on an electrical wiring diagram.
8. Describe the various types of ducts, busses, and their arrangement.
9. Describe how to operate several types of disconnects.
10. Explain the purposes, construction, and operation of current and potential transformers.
11. Describe, in basic terms, circuit breaker construction and operation.
12. Explain the various types of fuses and their application.
13. State the purpose of protective relays and where they are used.
14. Describe battery construction, battery capacity and operations.
15. Describe the operation of AC and DC motors.
16. Demonstrate basic knowledge of AC generator theory.
17. List and describe the major components making up a large generator.
18. Explain the purposes of an excitation system in maintaining system voltage.

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? Yes. \$95 + S&H.
- 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):

Hayes, Robert: Mr. Hayes instructs HPC's Balance-of-Plant O&M courses as well as our popular "Power Plant Blackout Preparedness" course. Mr. Hayes, prior to early retirement, held several positions during his long tenure at Illinois Power: (1) Results Engineer, Results Supervisor. Mr. Hayes had responsibilities, which included equipment performance testing, and rotating machinery vibration analysis and correction. (2) Supervisor Plant Operations. Mr. Hayes had responsibilities which included startup and checkout of new equipment, supervision of four operating shifts, and coal receiving and handling group. (3) Power Plant Operations Specialist. Mr. Hayes had responsibilities, which included frequent visits to all five fossil power stations, participation in control replacement projects, participation in development and implementation of clean air compliance plans, and served as an internal consultant for fossil power generation operations. He led several technical teams that identified and recommended protective system improvements to the large generating units. He conducted root cause analysis of several major equipment failures.

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.

No photograph on file.



Harold Parker. is the founder & President of H Parker & Company, Inc. Mr. Parker has worked in the "Power Generation" industry for 36 years, 14-years with GE as a Field Engineer, Start-Up Engineer, Technical Training Specialist and Manager. In 1983 Mr. Parker resigned from GE and started a training company, Schenectady Learning Systems, in Schenectady NY, which evolved into H Parker & Company, Inc. today. During this post-GE period, Mr. Parker was briefly employed as Manager Turbine-Generator Services with General Physics (2-years) and as a Field Engineer with Mechanical Dynamics & Analysis (2-years). Mr. Parker holds a BSME ('69 from Lawrence Institute of Technology), a MBA ('81 from the State University of New York @ Albany) and is a member of ASME and ASTD

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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 #: _____

Please advise how you found out about this course initially.

Website search

Fax advertisement

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Familiar with HPC

HPC mailing

Other _____