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[www.hpcnet.com](http://www.hpcnet.com)

## Course Information Letter ---- OP316

### PROTECTIVE RELAYS FOR OPERATORS OP316

This course was designed for plant operators who require a solid understanding of the purpose and application of power plant protective relays. The attendees are guided through a discussion on each type of protective relay found in the plant. This discussion is then reinforced by looking at each major piece of electrical equipment in the plant and discussing:

- What types of protection are needed and why.
- Which protective relays are appropriate to provide the needed protection?
- The damaging affects of no protection or faulty protection.

Finally, analyzing the protective relaying schemes for several different plants further reinforces the concepts discussed. We encourage the attendees to bring the one-line electrical diagram(s) showing the protective relays used at their plant. This is a great way to ensure the attendee understands the purpose and application of all the protective relays at his/her plant!

**Topical Outline** includes: The Purpose and Application of Protective Relays, Protective Relay Applications, Protective Relay Fundamentals, Protective Relay Construction, Overcurrent Protection, Voltage Relaying, Frequency Relaying and Differential Relaying:

**OBJECTIVES:** At the completion of this course the participant will be able to:

1. Explain the purpose of a protective relay.
2. Describe the different types of relays available.
3. Discuss a basic relay circuit.
4. Explain the importance of relay coordination.
5. Discuss current and voltage transformers used in protective relaying schemes.
6. Discuss a current, voltage, or differential relaying scheme, from the development of a signal to providing a protective function.
7. Discuss differential relaying and its applications in a power system in protecting generators, transformers, and buses from overloads and faults.

### COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, [www.hpcnet.com](http://www.hpcnet.com).

# Protective Relays for Power Plant Operators OP316

www.hpcnet.com

## COURSE OUTLINE

- I. **The Purpose and Application of Protective Relays:** Protective Relay Applications: The Generic Protective Relay Channel
- II. **Protective Relay Fundamentals:** Relay Ratings and Definitions, Relay Performance Measures, Power System Protection, Power System Functional Layout, Zones of Protection, Coordinating Principles
- III. **Protective Relay Construction:** Types of Relays, Electromagnetic, Solid State
- IV. **Instrument Transformers:** Potential Transformers, Current Transformers
- V. **Overcurrent Protection:** Application, Instantaneous Relays, Time Overcurrent Relays, Overcurrent Relaying Coordination, Solid State Overcurrent Relays
- VI. **Voltage Relaying:** Purpose and Application, Construction and Types
- VII. **Frequency Relaying:** Purpose and Application, Construction, Types
- VIII. **Differential Relaying:** The Differential Principle, Differential Circuit Advantages, Generator Differential Protection, Transformer Differential Protection

## 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](mailto: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, but generally speaking, if you're planning on having 6+ attend, when considering your T&L, it is to your advantage to perform the course at your plant (office). You gain from the customization and price.
- Can HPC Technical Services provide "Technical Assistance" in conducting functional checkouts or troubleshooting problems? Yes we can. Call or contact Harold Parker, [hparker@hpcnet.com](mailto:hparker@hpcnet.com) for our rate sheets and any further information required.

## WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, OP316 Protective Relays for Operators.
2. A "Certificate of Completion" with 1.9 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

## POWER PLANT OPERATOR CERTIFICATION:

This course is one of the courses required for Power Plant Operator Certification.

Those who attend this course are automatically qualified to take HPC Technical Services' Certification Examination. This examination is offered at no additional expense to the participant. An 80% passing grade is required. The examination length will not exceed 2-hours. Those who complete this examination will receive a revised "certificate of completion" that recognizes this accomplishment along with two-copies of a "To Whom It May Concern" letter that states their accomplishment. (Two copies are provided, one for the participants' employer and one for the participants' personal file.)

Consult HPC's website, [www.hpcnet.com](http://www.hpcnet.com), for detail on this certification program.

## RECENT SATISFIED CLIENTS:

ALCOA, American Municipalities of Ohio, Alstom Power, Baltimore Gas & Electric, Cardinal Cogen of Canada, Detroit Edison, Foster Wheeler – Martinez, GE Contractual Services, Hillman Power, Mead Paper Company, Nevada Cogeneration Association, New England Power, Oxbow Geothermal, Salt River Project, Tenaska, Texas New Mexico Power, Tractebel Power, US Army Corps of Engineers

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### INSTRUCTOR (S):

**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 operations & maintenance courses.



**John Marshall.** Mr. Marshall, worked for GE 35 years in the power system service and installation business. 25 years of this time was in the international service business. During his career, Mr. Marshall's positions included Field Engineer, Service Supervisor, Technical Training Instructor and Senior Application Engineer. Mr. Marshall's work covered electrical power distribution and control of power generation equipment. His expertise is GE manufactured excitation systems for large and medium size generators used on gas and steam powered turbines. As a Technical Training Instructor for over 20 years, Mr. Marshall developed and presented training programs for GE manufactured excitation systems. As a Senior Application Engineer, Mr. Marshall's work included the upgrading/replacement of older excitation systems with GE's digital excitation system. His Field Service work was worldwide. BSEE degree from Virginia Polytechnic Institute and State University in Blacksburg, Virginia.

**HPC TECHNICAL SERVICES**  
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**Website: [www.hpcnet.com](http://www.hpcnet.com)**

**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: \_\_\_\_\_ Email: \_\_\_\_\_

Student #2: \_\_\_\_\_ Email: \_\_\_\_\_

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

Student #3: \_\_\_\_\_ Email: \_\_\_\_\_

**ENROLLED BY:** \_\_\_\_\_ **Email:** \_\_\_\_\_

**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
- Magazine advertisement
- Familiar with HPC
- HPC mailing
- Other: \_\_\_\_\_