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

## Course Information Letter ---- E204

### ELECTRONICS FOR ELECTRICIANS E204

Today's electrician is commonly responsible for the maintenance and troubleshooting of electronics based equipment. This course is designed to give the participant practical training in solid-state electronics. The course largely targets analog and digital solid-state electronics and is offered annually by HPC, even though there is a decreasing demand, to service the industry. The course is designed for plant electricians, or anyone who has had little or no formal electronics training. Electronics for Electricians can also serve as a refresher course.

**Topics** include: AC Circuit Fundamentals, Commonly Used Test Equipment, Semiconductor Diodes and Power Supplies, Bipolar Transistors, FETs, UJT's, SCR's, Triacs, and Operational Amplifiers

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

1. Discuss fundamental AC Circuit properties such as resistance, inductance, and capacitance and how they are affected by changes in frequency.
2. Discuss various AC circuit configurations such as RL, RC, LC, and RLC and calculate current flow in series and parallel circuits.
3. Describe the operation of an oscilloscope using a functional block diagram.
4. Explain the selection of probes and how an oscilloscope can be used to measure voltage and frequency.
5. Identify the symbol and describe the operating characteristics of different types of diodes.
6. Explain semiconductor theory and how to properly bias a transistor PN junction and explain current flow for a given transistor configuration.
7. Discuss transistor amplifier classifications for a given input and output waveform
8. Discuss the construction and behavior of field effect transistors (FET) and unijunction transistors (UJT).
9. Explain how to bias an SCR to conduct.
10. Discuss how to properly bias a triac with either a positive or negative gate signal and discuss the direction of current flow possible.
11. Explain the differences between the various basic operational amplifier configurations and discuss their gains.

### COURSE DATES/LOCATION/FEE

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

## COURSE OUTLINE

- I. **AC Circuit Fundamentals:** Inductance, Capacitance, Impedance, Series/Parallel Circuits, Resonance
- II. **Test Equipment:** Basic Meters, Volt-Ohm Meters, Moving-Coil Movements, Analog Multimeters, Digital Multimeters, Sweep/Function Generators, Oscilloscopes
- III. **Semiconductor Diodes and Power Supplies:** Conductors, Semiconductors, Power Supplies, PN Junctions, Diodes, Rectifiers, Filters, Voltage Dividers and Regulators, Semiconductor Types and Applications
- IV. **Bipolar Transistors:** Transistors, Testing, Configurations, Biasing, Stability, Amplifier Classes,
- V. **FETs and UJTs:** Field Effect Transistors, JFET, MOSFET, Uni-junction Transistors, Biasing, Operation
- VI. **SCR's and Triacs:** Construction, Operation, Application
- VII. **Operational Amplifiers:** Inverting, Non-Inverting, Gain, Summing, Integrator, Differentiator

## WHAT YOU WILL RECEIVE:

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

## 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 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](mailto:hparker@hpcnet.com) for a rate sheet.

**INSTRUCTOR(S):**



**Mike Whisnant.** Mr. Whisnant's career in the power industry began in May 1970. He still remembers the question that was asked when applying for an I&C technician's job at the Oconee Nuclear Station of Duke Power. "Do you have any experience in hydraulics?" His reply of working on jet aircraft as an aircraft electrician provided the door in which he walked through and hasn't looked back. 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. Mike's first opportunity to teach the EHC Mark 1 came in January 1979. Realizing that he enjoyed the role of a standup instructor, he joined the training team at Oconee. During his time in training, he developed numerous system classes that were created on the "how". In other words, even though a well-qualified technician needs to know the purpose of a system to broaden their understanding in the big scheme of things within the power plant, the "how" of the system is what makes the system work to perform its intended function. This is the part that breaks; therefore, the technician needs a working knowledge of the "how" so that he/she is better equipped to perform troubleshooting. This "how" is what Mike worked to accomplish above and beyond regular duties. His wide-ranging knowledge of the different systems within a power plant gave Mike 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 turbines, 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 along with providing troubleshooting support should it be required?



**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,ASTD, and IEEE.

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

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?**

- Familiar with HPC courses
- Received a fax
- Received an email
- Internet search
- Other: \_\_\_\_\_