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The Hane – Client Relationship

Our Commitment to You

Hane Training's goal is to provide you, our customer, with effective training which, when employed on the job, will help you ***decrease*** maintenance and operational costs and ***increase*** your quality and productivity. To accomplish our goal we make the following commitments to you:

1. *You will be provided with an instructor who is an experienced troubleshooter in the subject he teaches and who is certified in effective Hane training methodology.*

2. *Every participant will have at least 50% hands-on activities in a workshop.*

3. *Every participant will receive a customized workbook for each course they take. This is not a conventional textbook, but rather a specialized tool designed to actively engage the participants in the workshop, and which makes a particularly suitable "job aid" while troubleshooting on the job.*

4. *All participants who successfully complete the workshop will receive a "Certificate of Achievement" with the appropriate Continuing Education Units (CEU).*

5. *You will receive telephone assistance prior to the workshop to customize the training to suit your exact need and after the training for reinforcement of learning.*

6. *You may videotape the workshop for later retrieval of information by the participants.*

7. *Your operations will be unaffected by Hane during the training – we bring in all our own equipment.*

Unconditional Guarantee

We are so confident that you will benefit from Hane Training, that we offer you an unconditional guarantee of satisfaction. If for any reason you are dissatisfied with the training, and if there is nothing that we can do to remedy the problem to your satisfaction, you will owe us nothing. **No questions asked!**

On-Site Delivery

On-site training has several of the following distinct advantages over other forms of training.

- You save thousands of dollars in travel and per diem costs.
- You have the opportunity to train more people on-site than you could in a public workshop at a lower cost.
- You can customize on-site courses to better suit your plant needs.
- You need not worry about participants unintentionally discussing company proprietary information if the training is confined to your facility.
- You can have an integrated program developed with several courses to meet your specific needs.
- You and your participant's supervisors have the opportunity to sit in on the training – to see what the students are really learning.
- You have a live instructor to answer questions and interact with you and your participants.

Team Based Environment

In accordance with Hane's mission to provide you with total solutions to your training needs. It is very important that we understand your needs and problems before we present you a potential solution.

To achieve your solution multiple people may communicate with you. Every customer has at least one training coordinator, one technical specialist and a member of management at their disposal.

This team is a very powerful combination capable of providing input from all aspects of Hane to ensure that we can provide you an all-inclusive solution to your need.

The Hane Quality Stamp of Approval

Instructor Training Process

New instructor candidates must undergo a rigorous **three-month** training program in course content and Hane methodology.

1. 1 week in orientation and receiving instruction on Hane methodology.

2. 2 weeks in field viewing Hane workshops presented by certified instructors.

3. 2 weeks practicing techniques – including video taping which is critiqued by a professional development team (PDT).

- Instructor candidate will not proceed to the next phase until the PDT is satisfied that he/she is ready.

4. ***"The Dry Run" –*** the instructor candidate delivers portions of a workshop before various Hane colleague.

- If the instructor candidate satisfactorily passes *"The Dry Run"* he/she may proceed to the next phase.

5. ***"The Wet Run" –*** the instructor candidate delivers portions of a workshop in the field. Another certified instructor is present.

- If the instructor candidate's delivery is satisfactory he/she is allowed to gradually deliver larger and larger portions of the workshop.

- This phase normally takes 3 to 4 weeks to complete.

- **A candidate may never proceed to the next phase until they are completely ready.**

6. ***"The Solo Run" –*** the instructor candidate assumes the role of an instructor and delivers an entire workshop to a client. An additional certified instructor acts as an assistant to ensure no problems.

Only those candidates' who successfully complete this program become a certified Hane instructor and only in the course that he/she trained for.

Third Party Endorsements

The International Association for Continuing Education and Training (IACET)

IACET is the caretaker of the Continuing Education Units (CEU). Achieving IACET's organizational certification gives our customers several assurances. First of all, every course at Hane has CEU awarded upon completion. Secondly it ensures our customers that we are devoted to the improvement of the quality and effectiveness of continuing education, training and human resource development.

The American Council on Education (ACE)

A team of college faculty members representing ACE ascertained after a rigorous evaluation of the content and delivery of Hane courses and of our company management processes that many of our courses are equivalent to college level courses. The team recommended that the courses be approved for college transfer credit under ACE's College Credit Recommendation Service.

Any time you see ACE in the upper right corner of the page – you know that this course is ACE approved. All the student has to do is ask for ACE, give their social security number as a unique identifier and score at least a 70% on the post-test.

You benefit by having the opportunity to provide training for your employees that has recommended college transfer credit. With an ACE approved course there are many benefits you can receive. Employers can save tuition costs in assisting their employees with college education. This gives employees an additional company benefit, confirms employers' interest in their welfare, and encourages them to pursue formal post-secondary education, which provides you with a higher quality workforce – and at no additional cost! Your employee's benefit by being offered the opportunity to earn college credits while receiving company sponsored training, which gives them opportunities for growth, development, and advancement.

Methodology of Hane Training

Hane training is designed to ensure that learning occurs. Hane does not leave the learning process to chance. Everything that takes place in a Hane workshop has a carefully thought out purpose and was designed to actively engage participants in the training. One of the key reasons that Hane training has proven to be so effective over the years is the method of instruction that we employ in our training. Hane training has proven to be effective because it takes into consideration the full range of human faculties that can be utilized in the learning process – audio, visual, and kinesthetic.

The main goal of Hane training is to teach participants to effectively and efficiently troubleshoot and correct problems encountered in our clients' equipment. The Hane methodology, with which an Hane instructor must be proficient, has proven to be very successful in accomplishing this.

The Socratic instructional method

This requires the instructor to use skillfully formulated questions to lead the students to predetermined conclusions regarding knowledge of the basics of the subject as well as the use of troubleshooting techniques and repair procedures that apply to the subject.

Periodic review employed to reinforce learning

An appropriate use of repetition has proven time and again to facilitate learning, and if used properly, it allows the materials being presented to be referenced back and tied in with previously covered materials.

At least fifty percent Hands-on

Hane instructors are skilled at teaching students how to use various testing instruments to troubleshoot problems on lab trainers designed by Hane to closely simulate problems found in equipment on the plant floor. Even the discussion portions of the training are highly interactive while the instructor is demonstrating topics; the students are taking measurements and making calculations in their workbooks.

Liberal use of audio-visual aids

The instructors use overhead projectors to display every page as the class moves through the workbook. The workbooks then become particularly suitable job aids for retrieval of information by students while on the job later.

Hane training is enjoyable

Our experience has taught us that the students in our workshops learn best when they enjoy the training; therefore, we do everything possible to make the training fun.

In addition to making them proficient troubleshooters and repairmen, training that is fun produces these additional benefits for students: it reduces their fear and anxiety; it builds their self-confidence; it improves their attitudes; and it permits them to enjoy success.

Effectively trained employees contribute to an increase in the bottom line. We accomplish our mission when we help our clients reduce operational and maintenance costs and increase quality and productivity, and as a result help them to be more competitive and profitable.

Course Numbering System

Hane course numbers have two parts: a two-character department code followed by a three-digit number. The first of the three-digit number represents the level of difficulty, background or prerequisites needed.

For example:

EE 101 – *Electrical Controls* is a fundamental electrical course, which anyone may take.

EE 201 – *Industrial Electronics Maintenance Level One* is more challenging and requires background knowledge.

EE - Electrical / Electronics
FM - Facilities Maintenance
FP - Fluid Power
HS - Health & Safety
ME - Mechanical
NC - Computer Numerical Control (CNC)
PL - Programmable Logic Control (PLC)
PM - Predictive Maintenance

100 - Fundamental
200 - Intermediate
300 - Specialized
400 - Advanced

Our Most Valued Source of Information...You!

Our goal is to develop and maintain long term relationships by delivering customer focused training that meets or exceeds your expectations. How do we fill such a tall order? The answer is actually very simple, we listen to you.

We welcome and appreciate your input. We use your suggestions and comments in the evaluation, modification, and development of our products and services. We are eager to hear from you. You may submit your comments and suggestions to our web site at www.hanetraining.com, or via email to your customer representative, or contact us toll free at 1-800-777-0753.

Course Development

Our most successful courses have been those in which the customers participated in the development process. If you have a need that we do not address with an existing course offering, we would like to know. It may be a course that we are planning to develop and your input could play an important role in determining the content.

Course Improvement and Enhancement

Through student evaluations, contact reports and customer feed back, we determine necessary modifications and enhancements to our courses. Some of these improvements include updating our training equipment. We strive to provide lab activities that facilitate the most accurate hands-on, real world experience possible. Frequently, we update our course content and materials to respond to the new problems that come with today's rapidly changing industries.

We value your input on course content enhancements. Please feel free to contact our development team at 1-800-777-0753 to submit any course or material improvement suggestions.

References

We have provided a limited client list for your reference. You will find many of our customers are among the prestigious ranks of the Fortune 500. We do not list our customers' contact information for privacy and security reasons. If you need additional information or references, please contact us and we will be happy to accommodate you.

Ford Motor Company

General Motors Corporation

Delphi Automotive

DaimlerChrysler

Visteon Automotive

Pratt & Whitney

Eastman Kodak

Carrier Corporation

International Paper

Georgia Pacific

Procter & Gamble

State Farm Insurance

Lucent Technologies

American Electric Power

Willamette Industries

Weyerhauser

Allison Transmission

Anheuser-Busch

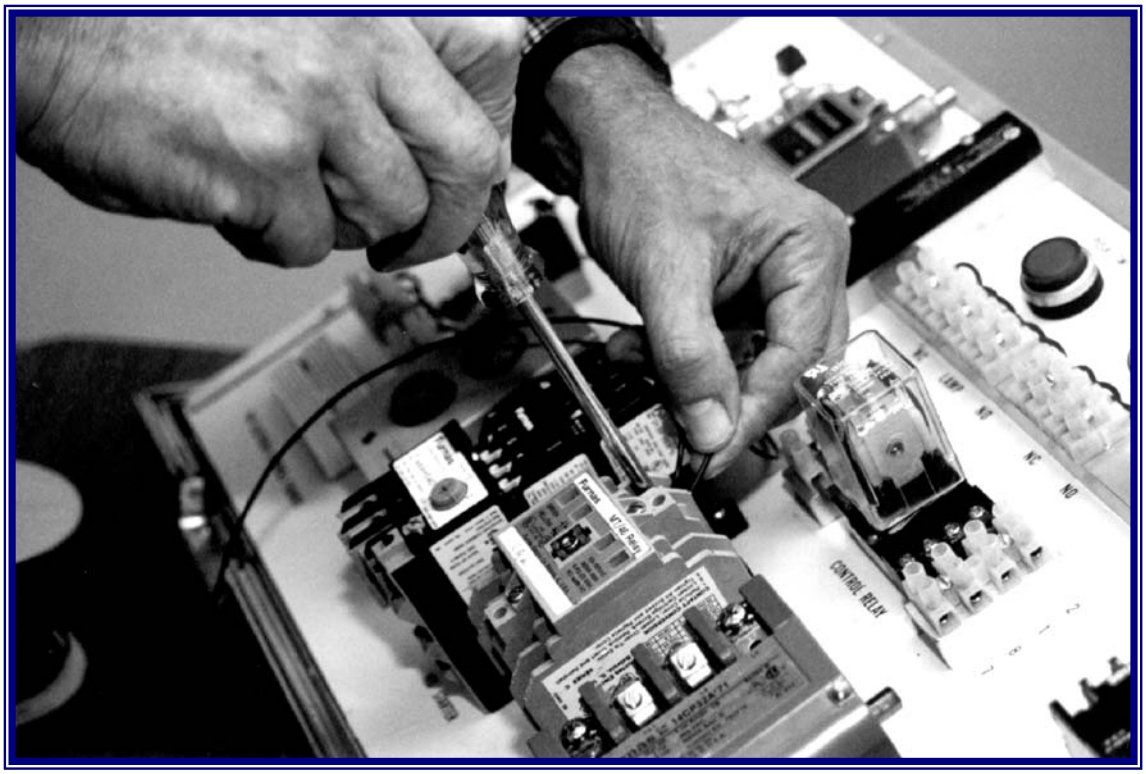
Johnson Control

Alcoa

Boise Cascade

Rubbermaid

ZF Batavia



- **Electrical Controls**
- **Wiring Simplified**
- **Electrical Fundamentals for Mechanical Crafts**
- **Working Safely with Electrical Controls**
- **Electrical Print Reading**
- **2002 National Electrical Code**
- **Industrial Electronics Maintenance Level One**
- **Electronics Maintenance for Mechanical Craft**
- **Industrial Electronics Maintenance Level Two**
- **Electrical / Electronic Maintenance Program**
- **Hydraulics for Electricians & Electronic Technicians**

Electrical Controls

Category A — **Course Number EE 101**

Course Description
This forty-hour course is an introduction to electrical fundamentals. It emphasizes basic electrical components, terminology and working safely with electricity.

Who Should Attend
Beginning electricians, equipment operators and people in skilled trades who are cross training from other disciplines.

Prerequisites
None

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5
College Transfer Credit 2 credit hours recommended

Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives

Participants will learn to:

- Work safely with electricity
- Use simple math to calculate voltage drops, current and resistance
- Use a multimeter to take voltage and current readings
- Use a clamp-on meter to take AC/DC current readings
- Test relays, solenoids, contactors, switches and motor starters
- Read single-line drawings
- Read control-circuit ladder diagrams
- Identify component parts in schematics and ladder diagrams
- Demonstrate an understanding of basic principles of AC and DC motors

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Wiring Simplified

Category D **Course Number EE 121**

Course Description
This three-day course is an introduction to wiring fundamentals. This course covers current, conductors, connectors, conduit bending, and wiring receptacles. Through step-by-step, hands-on lab activities participants will gain a working knowledge of installation and troubleshooting.

Who Should Attend
Anyone involved in the installation and troubleshooting of electrical fixtures: maintenance mechanics, maintenance supervisors, electromechanical repair technicians, and facilities/building maintenance technicians.

Prerequisites
None

Length 24 hours
Class Size Up to 12
CEU Awarded 2.1

Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives

Participants will learn to:

- Practice “electrically-safe” work habits
- Apply National Electrical Code standards
- Describe electrical distribution component functions
- Calculate circuit loads and select conductors
- Select circuit protective devices
- Bend conduit
- Connect components to form electrical circuits
- Route conductors through raceways
- Use a multimeter to troubleshoot circuits
- Repair minor circuit fault

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Electrical Fundamentals for Mechanical Crafts

Category A **Course Number EE 102**

Course Description This forty-hour, hands-on course is an introduction to electrical fundamentals targeting mechanics. It emphasizes basic electrical components, terminology, working safely with electricity and troubleshooting skills.

Who Should Attend Millwrights, mechanics and other skilled trades personnel who are cross training from other areas.

Prerequisites None

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5
College Transfer Credit 2 credit hours recommended

Format Hands-on Workshop. One lab station for every two participants.

Learning Objectives **Participants will learn to:**

- Work safely with electricity
- Use Ohm's law to calculate voltage drops, current and resistance
- Read resistor value from color code
- Use a multimeter to take voltage, current and resistance readings
- Determine time constant for resistor capacitor circuits
- Test relays, solenoids, contactors, switches and motor starters
- Read control-circuit ladder diagrams
- Identify component parts in schematics and ladder diagrams
- Demonstrate a basic understanding of AC and DC motors

Course Customization **Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.**

Working Safely with Electrical Controls

Category A **Course Number EE 104**

Course Description
This forty-hour course is an introduction to electrical fundamentals with a special emphasis on working safely with electricity. The course covers electrical components, electrical controls, terminology and diagrams. There is an emphasis on respect for the potential danger of electricity while building the participant's confidence to work with it safely.

Who Should Attend
Beginning electricians, equipment operators and people in skilled trades who are cross training from other disciplines.

Prerequisites
None

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5

Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives
Participants will learn to:

- Work safely with electricity and understand the dangers of electrical circuits
- Use simple math to calculate voltage drops, current and resistance
- Safely use multimeter to take voltage and current readings
- Use clamp-on meter to measure AC/DC current, voltage and continuity
- Safely test relays, solenoids, contactors, switches, and motor starters
- Read single-line drawings and control-circuit ladder diagrams
- Safely check fuses, circuit breakers and ground fault interrupters
- Identify component parts in schematics and ladder diagrams
- Demonstrate an understanding of basic principles of AC and DC motors

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Electrical Print Reading

Category A **Course Number EE 131**

Course Description
This course is for skilled tradespersons who must be able to read prints for maintenance applications. Although the course heavily emphasizes electrical/electronic print reading, other types of prints are covered sufficiently to account for other areas participants might encounter on the job. Participants are encouraged to bring prints from their facilities.

Who Should Attend
Electrical engineers, contractors, inspectors, construction mechanics, maintenance mechanics, electricians, supervisors, safety engineers and apprentices.

Prerequisites
Participants should have basic knowledge of electrical principles: AC/DC voltage, current, resistance and Ohm's Law.

Length 20 hours
Class Size Up to 12 participants
CEU Awarded 1.75

Format
Demonstration/discussion/exercises

Learning Objectives
Participants will learn to:

- Read and interpret electrical/electronic drawings and prints
- Recognize and partition schematic into power, digital, analog and control circuits as well as demonstrate an understanding of their function and operation
- Trace signal flow through multiple sheet drawings
- Recognize interfaces to hydraulic, pneumatic and other non-electrical systems
- Differentiate between signal and power grounds and locate them on the drawings

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

The 2002 National Electrical Code

Category A **Course Number EE 142**

Course Description The 2002 National Electrical Code course provides the latest information regarding changes to the NEC. The course is composed of a stand-alone, two-day core that teaches participants how to find, interpret, and apply NEC standards. Selecting any or all of four, half-day modules, provides additional subject-specific practice for participants.

Who Should Attend Electrical engineers, contractors, inspectors, construction mechanics, maintenance mechanics, electricians, supervisors, safety engineers and apprentices.

Prerequisites None

Length **Core Course**-16 hours **Subject Specific Modules** - 4 hours each

Class Size Up to 24
CEU Awarded Core: 1.4; Subject Modules .35 each

Format Lecture/discussion with demonstrations

Learning Objectives
Core Module

Participants will learn to:

- Find an applicable section of the 2002 National Electrical Code
- Interpret 2002 National Electrical Code standards
- Apply exceptions to 2002 National Electrical Code standards
- Apply 2002 National Electrical Code requirements to
  - Service, Branch, and Feeder Circuits
  - Overcurrent protective devices
  - Conductor selection and sizing
  - Motor and motor-control circuits
  - Transformers
  - Grounding and bonding circuits

Module One Basic Circuit Standards and Overcurrent Protection

Module Two Grounding and Motor-Circuit Standards

Module Three Wiring Methods, Lighting System, Transformer, and Control Circuit Standards

Module Four Hazardous-Location and Employee-Safety Standards

Course Customization **Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.**

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Industrial Electronics Maintenance Level One

Category A | **Course Number EE 201**

Course Description
This forty hour, hands-on course provides electricians with many of the electronic fundamentals they need to maintain industrial electronic equipment.

Who Should Attend
Industrial electricians, apprentices and any individuals needing electronic cross training from other disciplines. Other participants could include troubleshooters and technical managers who would benefit from an understanding of the concepts and fundamentals of industrial electronics.

Prerequisites
Hane workshop *Electrical Controls (EE 101*) or equivalent knowledge.

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5
College Transfer Credit 2 credit hours recommended

Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives
Participants will learn to:

- Work safely with industrial electronics - protecting people and equipment
- Use simple math to calculate voltage drops, current, resistance and power
- Demonstrate an understanding of resistors, capacitors, inductors, SCR's, TRIAC's and other solid-state devices used in typical industrial circuits
- Read and understand electronic drawings and diagrams
- Use multimeters and scopemeters to observe, checkout and troubleshoot electronic circuits as would be required for industrial maintenance operations
- Demonstrate an understanding of power supplies, operational amplifiers and digital switching circuits and their applications in industry
- Understand fundamentals of industrial electronics so participants can pursue additional training as required

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Electronics Maintenance for Mechanical Crafts

Category A **Course Number EE 202**

Course Description This forty hour, hands-on course provides persons from the mechanical crafts with many of the electronic fundamentals they need to maintain industrial equipment containing electronics.

Who Should Attend Millwrights, mechanics and other skilled craftspersons who are cross training from other disciplines.

Prerequisites Hane workshop *Electrical Fundamentals for Mechanical Crafts (EE 102*) or equivalent knowledge.

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5

Format Hands-on Workshop. One lab station for every two participants.

Learning Objectives **Participants will learn to:**

- Work safely with industrial electronics - protecting people and equipment
- Use simple math to calculate voltage drops, current, resistance and power
- Demonstrate an understanding of resistors, capacitors, inductors, SCR's, TRIAC's and other solid-state devices used in typical industrial circuits
- Read and understand electronic drawings and diagrams
- Use multimeters and scopemeters to observe, checkout and troubleshoot electronic circuits similar to those used in many industrial maintenance operations
- Demonstrate an understanding of power supplies, operational amplifiers and digital switching circuits and some of their applications in industry
- Understand fundamentals of industrial electronics so participants can pursue additional training as required

Course Customization **Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.**

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Industrial Electronics Maintenance Level Two

Category A **Course Number EE 301**

Course Description

This forty hour, hands-on course provides electricians with an additional understanding of electronic fundamentals beyond the *Industrial Electronics Maintenance Level One* course. This understanding will increase their effectiveness in maintaining today's complex industrial electronic equipment.

Who Should Attend

Industrial electricians, apprentices, and any individuals needing additional electronic cross training from other disciplines. Other participants could include troubleshooters and technical managers who would benefit from a thorough understanding of the concepts and fundamentals of industrial electronics.

Prerequisites

Hane workshop *Industrial Electronics Maintenance Level One (EE 201)* or equivalent knowledge.

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5
College Transfer Credit 2 credit hours recommended

Format

Hands-on Workshop. One lab station for every two participants.

Learning Objectives

Participants will learn to:

- Continue to work safely with industrial electronics - protecting people and equipment
- Demonstrate a further understanding of power supplies, analog signal processing amplifiers and circuits, digital switching circuits and functions, analog to digital and digital to analog conversions and their applications to industry
- Demonstrate an understanding of analog and digital interface circuits that are used as the interfaces between various electronic modules and subassemblies in today's industrial electronic equipment
- Use multimeters and scopemeters to observe electrical and electronic signals at interfaces of electronic equipment and subassemblies to perform maintenance and to effectively isolate problem areas
- Demonstrate a further understanding of industrial electronics so participants can pursue additional training as their duties require

Course Customization

Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Electrical / Electronic Maintenance Program

Category D **Course Number EE 311**

Course Description
This concentrated, four-week program is designed to quickly get new hires or those cross training "up to speed" on electrical and electronic maintenance. The courses cover basic electricity and industrial electrical controls, basic electronics with digital and analog circuits as typically found in industry and industrial solid-state motor drives.

Who Should Attend
Industrial electricians, electronics apprentices and other people in skilled trades who are cross training from other disciplines.

Prerequisites
None

Length 160 hours
Class Size Up to 12
CEU Awarded 14.0

Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives
Participants will learn to:

- Work safely with electricity
- Use simple math to calculate voltage drops, current, resistance and power
- Test relays, solenoids, contactors, switches and motor starters
- Demonstrate an understanding of resistors, capacitors, inductors, SCR's, TRIAC's and other solid-state devices used in typical industrial circuits
- Read single-line drawings, control circuit ladder diagrams and electronic schematics
- Use multimeters, clamp on meters and scopemeters to observe, checkout and troubleshoot electrical and electronic circuits as would be required for industrial maintenance operations
- Understand principles of AC and DC motors
- Demonstrate an understanding of power supplies, operational amplifiers and digital switching circuits and their applications in industry
- Understand solid-state drives and how they are connected and controlled in industrial applications

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Hydraulics for Electricians & Electronic Technicians

Category A **Course Number FP 123**

Course Description
If your company is going to a multicraft situation or is in a cross training mode, this course is designed to provide your other skilled trades personnel with a solid background in understanding hydraulic systems.

Who Should Attend
Electricians, electronic technicians and others who are cross training or require knowledge of hydraulics due to a change in job requirements.

Prerequisites
None

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5

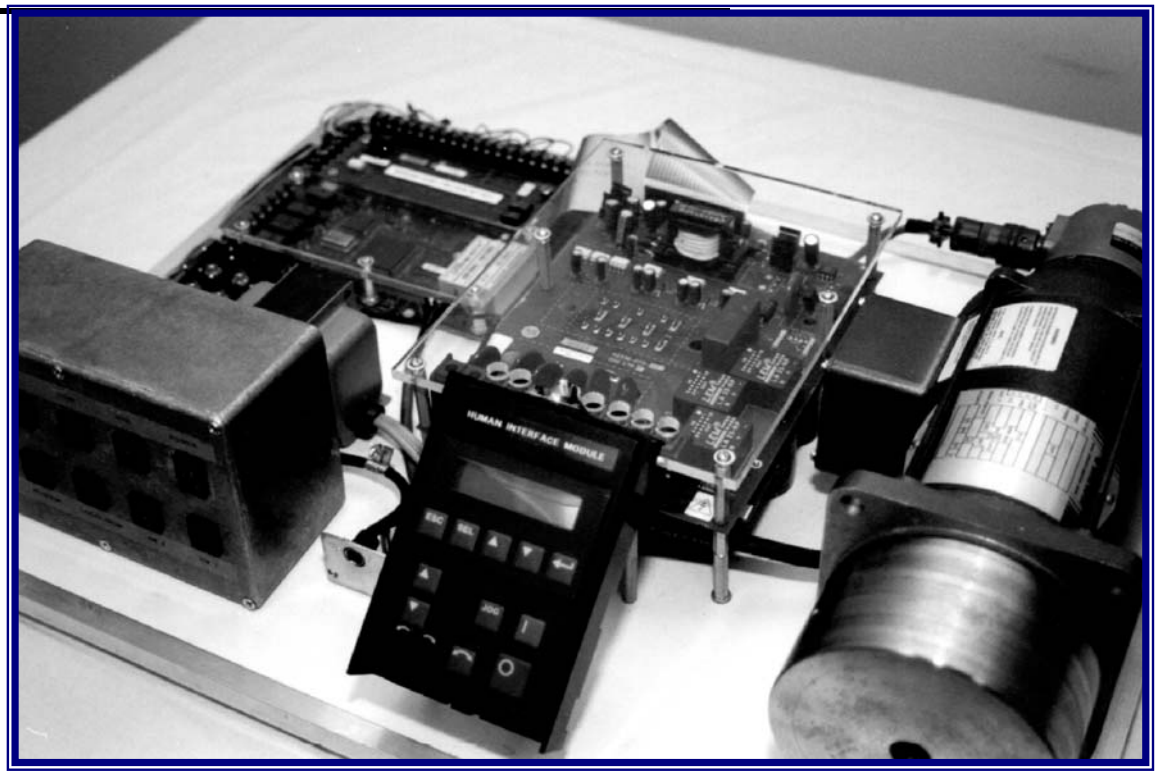
Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives
Participants will learn to:

- Read hydraulic schematics
- Identify and demonstrate an understanding of common hydraulic components
- Demonstrate an understanding of common circuit applications
- Troubleshoot hydraulic power circuits
- Perform preventive maintenance procedures

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.



- **Maintaining & Troubleshooting AC Motor Drives**
- **Maintaining & Troubleshooting Allen-Bradley 1336 Drives (40 hours)**
- **Maintaining & Troubleshooting DC Motor Drives**
- **Maintaining & Troubleshooting GE DC-300 Drives**

Maintaining & Troubleshooting AC Motor Drives

Category B **Course Number EE 351**

Course Description
This forty hour, hands-on course covers Variable-Voltage, Variable-Frequency (VVVF) and Pulse-Width Modulation (PWM) types of AC motor drives and applications. The course covers technology used by Allen-Bradley, Fincor, GE, Emerson, Baldor, Vee Arc and others.

Who Should Attend
Electronic maintenance personnel and their supervisors who work with and troubleshoot AC motor drives.

Prerequisites
Participants must have a thorough understanding of troubleshooting with oscilloscopes and multimeters. This knowledge can be obtained by completing the Hane workshop *Industrial Electronics Maintenance Level One (EE 201).*

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5
College Transfer Credit 2 credit hours recommended

Format
Hands-on Workshop. One lab station for every two participants.

Learning Objectives
Participants will learn to:

- Demonstrate an understanding of three-phase field rotation
- Identify volts/hertz and boost effect on motor operation
- Identify slip and load effects on speed
- Locate faulty power control devices including: high current, DIODES, TRANSISTORS, SCR's and GTO's
- Identify three-phase bridge operation and faults
- Demonstrate an understanding of the operation of converters, inverters and controls
- Perform tests in both PWM and VVVF drives
- Troubleshoot both PWM and VVVF drives

Course Customization
Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Maintaining & Troubleshooting Allen-Bradley 1336 Drives

Category B **Course Number EE 353**

Course Description

This forty hour, hands-on course uses low horsepower Allen-Bradley 1336 Plus variable frequency motor drives that have been configured as trainers. During the workshop the drives are interconnected to a programmable logic controller (PLC). This allows the participant to experience drive/controller interconnectivity as is typical in some industrial applications. The building blocks of the drives are explained along with methods for performing maintenance and troubleshooting. These methods include using the drive parameters along with meter measurements at the drive terminal block interfaces. Representative faults are inserted allowing the participants to do real troubleshooting exercises during the workshop.

Who Should Attend

Journeymen electricians, engineers, and electronic technicians

Prerequisites

Hane workshop *Industrial Electronics Maintenance Level One (EE 201)* or equivalent knowledge. Participants should be familiar with solid-state analog and digital circuits and should know the principles of operation of three-phase AC motors.

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5
College Transfer Credit 2 credit hours recommended

Format

Hands-on Workshop. One lab station for every two participants.

Learning Objectives

Participants will learn to:

- Work safely with electricity
- Understand the functional building blocks of the AB 1336 drive
- Use multimeter and scopemeter to observe electrical signals at the terminal block interfaces to understand the electrical operation of the drive
- Program and read over 100 parameters
- Interconnect to PLC using the AB 1203 Remote I/O
- Control the drive from a PLC
- Program drive to perform typical operations
- Troubleshoot common AB 1336 drive malfunctions
- Use AB 1336 fault codes to aid in troubleshooting

Course Customization

Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Maintaining & Troubleshooting DC Motor Drives

Category B **Course Number EE 361**

Course Description This forty hour, hands-on course covers practical setup, troubleshooting and maintenance of the DC motor drive.

Who Should Attend Electricians, technicians, machine repairmen and anyone responsible for troubleshooting DC motor drives.

Prerequisites Participants must have a thorough understanding of troubleshooting with oscilloscopes and digital multimeters. This knowledge can be obtained by completing the Hane workshop *Industrial Electronics Maintenance Level One (EE 201).*

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5

Format Hands-on Workshop. One lab station for every two participants.

Learning Objectives **Participants will learn to:**

- Read and interpret a functional block diagram
- Identify circuit boards and the parts of the drive
- Properly adjust pots and install jumpers on the DC drive
- Identify the location of the drive test points and the function of each
- Input parameters into the drive
- Setup and get a drive on-line
- Interpret fault codes to aid in troubleshooting
- Use built-in diagnostics to aid in troubleshooting

Course Customization **Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.**

To Schedule please call 1-800-777-0753. Ask for your Client Representative.

Maintaining & Troubleshooting GE DC-300 Drives

Category B **Course Number EE 362**

Course Description This forty hour, hands-on course provides practical information on how to setup, troubleshoot and maintain the GE DC-300 drive.

Who Should Attend Electricians, technicians, machine repairmen and anyone responsible for trouble-shooting the GE DC-300 drive.

Prerequisites An understanding of electronic fundamentals such as the material covered in the Hane workshop *Industrial Electronics Maintenance Level One (EE 201)*.

Length 40 hours
Class Size Up to 12
CEU Awarded 3.5

Format Hands-on Workshop. One lab station for every two participants.

Learning Objectives **Participants will learn to:**

- Read and interpret the GE DC-300 functional block diagram
- Identify circuit boards and the parts of the drive
- Properly adjust pots and install jumpers on the GE DC-300 drive
- Identify the location of the drive test points and the function of each
- Input parameters into the drive
- Setup and get a drive on-line
- Interpret fault codes to aid in troubleshooting
- Use built-in diagnostics to aid in troubleshooting

Course Customization **Call 1-800-777-0753 for a detailed outline or for information about tailoring this course to your specific needs.**

To Schedule please call 1-800-777-0753. Ask for your Client Representative.