



# International Union of Operating Engineers

## 2020 Stationary Training Course Schedule

<b>Course</b>	<b>Instruction Days</b>	<b>Dates</b>
Emergency Generator O & M	3	January 6 - 8, 2020
Basic Building Automation Systems	3	January 11 - 13, 2020
Chiller Efficiency	3	February 3 - 5, 2020
Chief Engineer/Facility Management Seminar	5	February 24 - 28, 2020
Facility Water Chemistry & Wastewater Treatment	4	March 2 - 5, 2020
Mission Critical - Maintaining and Reducing Risks in Critical Environments and Modern Facilities	2	March 9 - 10, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	March 9 - 11, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	March 12 - 14, 2020
Solar Panel Installation Maintenance & Troubleshooting	4	March 16 - 19, 2020
Chiller Efficiency	3	April 1 - 3, 2020
Advanced Controls & Building Automation Systems	3	April 4 - 6, 2020
Solar Panel Installation Maintenance & Troubleshooting	4	May 4 - 7, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	May 11 - 13, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	May 14 - 16, 2020
Pump Maintenance & Repair	4	May 17 - 20, 2020
Boiler System Efficiency	3	<b>NEW</b> May 19-21, 2020
Pump Maintenance & Repair	4	May 21 - 24, 2020
Instrumentation and Controls (PetroChemical)	3	June 2 - 4, 2020
Programmable Logic Controller (PLC)	3	June 6 - 8, 2020
Certified Pool Operator	3	<b>NEW</b> June 22-24, 2020

Revised schedules will be sent out periodically as courses are added throughout the year.



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Boiler System Efficiency	3 <b>NEW</b>	July 7-9, 2020
Solar Panel Installation Maintenance & Troubleshooting	4	July 20 - 23, 2020
Chiller Efficiency	3	July 28 - 30, 2020
Solar Panel Installation Maintenance & Troubleshooting	4	August 4 - 7, 2020
Johnson Controls Products	3	August 11 - 13, 2020
Chiller Efficiency	3	August 12 - 14, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	August 17 - 19, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	August 20 - 22, 2020
Boiler 1 - Introduction to Boilers <b>NEW DATES</b>	3 <b>NEW</b>	September 1-3, 2020
BACNET Protocol	3 <b>NEW</b>	September 9 - 11, 2020
Facility Water Chemistry & Wastewater Treatment	4	September 14 - 17, 2020
Basic Building Automation Systems	3	October 3 - 5, 2020
Johnson Controls Products	3	October 13-15, 2020
Mission Critical - Maintaining and Reducing Risks in Critical Environments and Modern Facilities	2	October 19 - 20, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	November 2 - 4, 2020
Variable Frequency Drive Operation & Building Elect. Troubleshooting Skills	3	November 5 - 7, 2020
Boiler System Efficiency	3 <b>NEW</b>	December 8-10, 2020
Chief Engineer/Facility Management Seminar	5	December 14 - 18, 2020

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### **AIR AND HYDRONIC TESTING & BALANCING TRAIN-THE-TRAINER**

This seminar is designed to enhance an engineer's air and hydronic balancing skills. Students will become familiar with the proper tools, instruments, and common methods of transferring air and water through a facility.

### **ADVANCED CONTROLS & BUILDING AUTOMATION SYSTEMS NEW**

*The 3-day Prerequisite: Students should have taken Basic Controls & Building Automation Systems or have similar work experience*

This advanced course has been developed for individuals who want to develop the understanding of how DDC controls and Building Automation Systems are installed, wired, operated, and programmed, also included is the insight of the various related software packages, that drive and manipulate these systems.

We will discuss and demonstrate advanced control technologies dealing with the architecture of various manufactures of Building Automation Systems. We will demonstrate how they are installed, wired, and then programmed. Also, there will be main topic lectures on BAS Supervisory Controllers, Standalone controllers, and their communication protocols.

There will also be lectures on advanced control strategies and the understanding of building optimization for curtailing the use of energy.

After the completion of this course the participants will be able to:

- Describe the different types of control actions and when to use them
- Identify Building Automation System main components and where their used
- Define and select the proper Automation System for various locations
- Define the different types of Analog and Binary inputs and outputs
- Understand system wiring through various schematic diagrams of installed systems
- Wire Building Automation System main components
- Understand the various types of BAS communication protocols
- Program various type of industry controllers
- Comprehend the different types of operator interfaces and how they communicate
- Describe control strategies and how buildings are optimized for peak efficiency
- Define the different types of programming graphic methods

### **BACNET PROTOCOL**

The 3-day course demonstrates the flexibility of the BACnet Protocol. The course reviews the components of the protocol (PIC statements, BIBBs, BACnet profiles, etc) and explains the functionality of each component. Through multiple examples and hands-on labs, the student pulls and pushes data to and from multiple devices utilizing various protocols and data visibility across multiple platforms. Labs and exercises with also demonstrate the utilization of various datalinks including: BACnet/IP, BACnet/MSTP, and BACnet/Ethernet. Course strengthens the understanding and functionality of BACnet routers, bridges, and gateways, and includes customizing GUI, HI and HMI displays. The course remains Vendor neutral and concentrates on Data Management.

### **BASIC CONTROLS & BUILDING AUTOMATION SYSTEMS NEW**

The This course has been developed for individuals who want to take the mystery out of the understanding of how DDC controls and Building Automation Systems operate, and also the insight of the various related software packages that drive these systems and how they manipulate these systems.

This seminar has also been designed for people not familiar DDC controls and Building Automation Systems. There will be lectures on basic control strategies, the basics of DDC hardware, and also the basic understanding of building optimization for curtailing the use of energy.



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For the experienced people there will be discussions on advanced control technologies dealing with the architecture of Building Automation Systems, discussing how they are installed, wired, and then programmed. Also, there will be main topic lectures on DDC Main Controllers, Stand-alone controllers, and their communication protocols.

After the completion of this seminar the participants will be able to:

- Understand the basic DDC and Analog control technology for the HVAC field
- Describe the different types of control actions and when to use them
- Identify Building Automation System main components and where they are used
- Define and select the proper Automation System for different locations
- Ascertain how Building Automation Systems Operate to maintain human comfort
- Define the different types of Analog and Binary inputs and outputs
- Understand the system wiring through various schematic diagrams of installed systems
- Comprehend the different type of operator interfaces and how they communicate
- Define criteria for control strategies such as with closed loop control
- Describe control strategies and how buildings are optimized for peak efficiency
- Understand how a PID loop is written and how to tweak it in for the maximum performance
- Define the different types of programming methods

### **BOILER 1    NEW**

The Boiler 1 course is intended for stationary engineers looking to gain a good foundation in their understanding of steam and hot water boilers. In this course, students will begin with boiler theory then move onto the fuel systems and the various boiler fittings and components. Feedwater system as well as the overall steam system circuit is then reviewed. An in-depth discussion of the complete firing cycle is offered as well as water treatment and testing and steam boiler logbook requirements.

### **BOILER SYSTEM EFFICIENCY**

This course is designed to assist in the education and development of the individual who has the responsibilities for the day to day operation and maintenance of their boiler and the ancillary equipment. This individual will gain the knowledge and understanding of how to properly operate the equipment safely and more efficiently. This course will also provide the proper sequence of operation or timing that will assist in the troubleshooting area and reduce downtime and increase reliability. The program includes plant tours to reinforce lessons learned.

### **CERTIFIED POOL OPERATOR**

This course will prepare the student for the National Swimming Pool Foundation (NSPF) certified pool operator exam. The test will be administered by an authorized NSPF instructor on the last day of the course. The certification is valid for five years from date of course completion. There is a cost to the student of \$30.00 for the certification.

### **CHIEF ENGINEER/FACILITY MANAGEMENT SEMINAR**

This Seminar is designed for chief engineers or engineers training to make the transition to chief or lead engineer. This seminar will provide the student the necessary administrative and personnel skills to handle the day-to-day leadership challenges associated with this position. The ten sections are: Recommended Skills levels, Planning and Time Management, Budget Preparation, Computer Applications, Record Keeping, Benefits of an Internal Work Force, Reports and Presentations, Health and safety, Human Relations, and Energy Conservation.



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### **CHILLER EFFICIENCY**

Chillers can be one of the largest energy users in a facility. This seminar provides an overview of the fundamentals of several types of chillers and how they function. It also reviews the controls of popular chiller interfaces and what to look for when monitoring them to help ensure they are running at their peak efficiency. Students have the opportunity to work with one of the three chillers in the training center which include Carrier, Trane, and York chillers.

### **COOLING TOWER-OPERATION/ MAINTENANCE**

This seminar is focused on the care of evaporative cooling equipment. The course provides useful information about how to operate equipment for optimal performance and reliability. Students will learn the design of cooling towers. It covers water quality, water flow balance, water quantity, fill condition, fan systems, and overall maintenance.

### **EMERGENCY GENERATOR OPERATIONS & MAINTENANCE**

This class is intended for Apprentice through Mid-level journeyman. It covers for both “theory and practical” knowledge on diesel generator operation. The seminar will have three primary categories::

- 1) Diesel generator maintenance and operation
- 2) Safety with emphasis on OSHA standards, Title 29 1910 & 1926 Code of Federal Regulations
- 3) Basic electrical knowledge as per National Electrical Code guidelines Students will have hands on time with a diesel generator package.

### **FACILITY WATER CHEMISTRY & WASTEWATER TREATMENT**

Formally named Water Treatment, this seminar covers the chemistry behind plant water treatment programs and how it helps ensure that water systems are safe from scale, corrosion, oxygen, carryover, and other issues. Hands on training of actual plant water systems at the training center will also be included. An added day of training is provided for wastewater treatment.

### **INDOOR AIR QUALITY FOR HOSPITALS (ICRA)**

Health care-associated infections, or HAIs, are infections that people acquire while they are visiting a hospital or receiving treatment for another condition in a health care setting. This seminar teaches engineers how to perform Infection Control Risk Assessments (ICRA) as well as provide hands on training in the latest work area isolation equipment. Students get hands on training in using zip walls, mobile dust containment, and negative air machines.

### **INSTRUMENTATION AND CONTROLS NEW**

This course will help prepare learners for a career as an Instrumentation Technician in Petro-Chemical and utility facilities. This course was designed by the Stationary Engineers Apprenticeship and Training Trust (SEATT) using skilled, experienced craftsmen. It is designed for new Instrument Techs or someone who may be preparing to enter the craft. This course will cover a lot of material over 3 days. The first two days we will cover Safety Basics, Basic and Specialized Tools, the four basic principles (pressure, flow, level, and temperature) of Instrumentation, and central concepts used in process control and how they are related. The last day we will cover control valves and controllers, types of control schemes used, proper application, parts of a control valves. During this course learners will be able to demonstrate calibrating transmitters, changing transmitters parameters, and troubleshooting using our Instrumentation Process Trainer that is a self-contained control loop containing all the four types of transmitters and the control valves covered in this course.





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### **JOHNSON CONTROLS PRODUCTS**

The 3-day course concentrates on legacy and current Johnson Control products. The course includes: VAV, Unitary, and Digital Extension Modules (DX) devices, HVAC PRO and GX9100 configuration tools, and Visio Graphic tools; Controller Configuration Tool (CCT) and the Graphic Generation Tool (GGT), and the most current Metasys UI tool. The course provides frequent labs and demonstrates to increase a student's understanding and functionality of Johnson Controls products. However, basic product familiarity will be helpful.

### **LIGHTING TECHNOLOGY & EFFICIENCY**

This seminar is designed to teach the various lighting systems used in facilities and discuss upgrades for better lighting and energy savings. It reviews lighting quality, quantity, heat, effects on electrical consumption and other factors useful when considering the lighting needs of a facility.

### **MISSION CRITICAL - MAINTAINING AND REDUCING RISKS IN CRITICAL ENVIRONMENTS AND MODERN FACILITIES**

This seminar is lecture based and designed as an introduction and overview of the book "Maintaining Mission Critical Systems in a 24/7 Environment" and is for the Building Engineer that manages various types of Mission Critical Systems in the Data Centers and High Risk Environments. The seminar will begin with how a data center operates followed by how and why data centers have evolved into what they are today and in the future based on the evolving connected world. The remainder of the seminar will be more advanced discussions relating to the equipment and how to reduce downtime to promote a 24/7 Data Center Operation including preventative maintenance and the commissioning of critical equipment.

Weaved into the seminar will be the mission critical Industry and how it has evolved over the last half decade as well as the services and associated challenges that are required to support the entire infrastructure starting with employees who will be retiring and how the reins are handed off to the next generation engineer. A discussion on the impact of the data that is being generated at exponential rates and how it is globally moving us towards the age of Yottabyte (that is 1 followed by 24 zeros) with computer processing power dispersing across corporate enterprises. This trend for a more distributed architecture will multiply and expand as the convergence of new technologies and developments such as IoT, 5G, AI, autonomous cars and smart cities, and everything connected and processed in Hyper-Scale to Micro-Datacenters to Edge Computing facilities, enriching new ways of using, analyzing, and managing data for a more productive, resilient, and safe digital society.

#### Agenda:

- Present to all attendees an overview of "Maintaining Mission Critical Systems in a 24/7 Environment"
- Review of NFPA 70E, Condition Based Maintenance and Failure Patterns
- Overview of the cause and effects of human error and ways to mitigate it
- Critical Awareness and Operations within complex and high stress environments
- Risk Management and Reliability within critical operations
- Testing and Commissioning
- Fundamentals of Data Center Power Distribution
- UPS and Battery Systems
- Automatic Transfer Switches
- Static Transfer Switches
- Emergency Generators and Fuel Oil Systems
- Electrical Distribution
- Alarm Response Plans and Root-Cause Analysis
- IoT Sensors, Controls, Energy Efficiency, and Conservation
- The Next Generation of Technology in the Mission Critical Industry



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### **PHOTO VOLTAIC SYSTEM TROUBLESHOOTING**

This course work will include information on site location, system sizing, mounting options, system components, configurations, mechanical, electrical integration and code requirements.

Topics also include Solar Radiation, System Components, Cells, Modules, and Arrays, Batteries, Inverters, System Sizing, Mechanical Integration, Electrical Integration, Utility Interconnection, Permitting and Inspection, Commissioning, Maintenance, and Troubleshooting

### **PROGRAMMABLE LOGIC CONTROLLER (PLC)**

This course is intended to instruct stationary engineers on the basics of programmable logic controllers. It covers basic programming of some of the most common equipment in the industry, basics needed for configuring and troubleshooting devices on a network, and industry best practices for installing and maintaining these systems. It will provide students with the tools needed to install and program PLCs. It will also orient students on methods of networking and troubleshooting SCADA systems and familiarize them with terminology and methods so that they can adapt these lessons to their facility's equipment.

### **PUMP MAINTENANCE**

The successful and efficient operations and maintenance of any mechanical system can only be accomplished with a clear understanding components that make up the mechanical system and how they interact with each other. In the field of stationary engineering, engineers are responsible for the operations and maintenance of systems such as the Chilled Water, Condenser Water and Hot Water systems to just name a few. The heart of each of these is the pump.

In this course students will become familiar with different types of pumps, their operating principles, how to diagnose and troubleshoot issues, and their proper maintenance and repair procedures.

### **ROOFTOP HVAC TROUBLESHOOTING & MAINTENANCE**

Light commercial HVAC units on roofs are the topic of this seminar. Learn all aspects of working in this environment and on these units. This is designed for maintenance and service engineers and provides a concentration troubleshooting best practices.

### **SOLAR PANEL INSTALLATION MAINTENANCE & TROUBLESHOOTING**

This course work will include information on site location, system sizing, mounting options, system components, configurations, mechanical, electrical integration and code requirements. Topics also include Solar Radiation, System Components, Cells, Modules, and Arrays, Batteries, Inverters, System Sizing, Mechanical Integration, Electrical Integration, Utility Interconnection, Permitting and Inspection, Commissioning, Maintenance, and Troubleshooting. Students obtain hands on training in aspects of the installation of solar panels.

### **TEACHING TECHNIQUES I**

The Basic Teaching Techniques course is designed especially for part-time, new or recently hired instructors. The course presents useful introductory concepts and also requires actual practice teaching with constructive feedback.

It is conducted over a 4-½ day period. It will provide instructors with all materials and demonstrate various teaching techniques for classroom application. It meets the U.S. Department of Labor requirements for instructor training.



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### TEACHING TECHNIQUES II

**PRE-REQUISITE:** Teaching Techniques I and basic computer skills

The Intermediate Teaching Techniques course is a new component of the IUOE Master Instructor curriculum. This course is designed for instructors with previous classroom teaching experience. It builds on introductory concepts and covers multi-media technologies including PowerPoint presentations and the NTF's Blackboard online education system.

### THERMOGRAPHY AND VIBRATION ANALYSIS

Two important tools of our trade will be covered in detail. Get hands on training using the latest Fluke Thermal Imagers for testing and troubleshooting. Thermal imagers give engineers insights into how equipment is actually running and can identify problems before component failure occurs. The vibration analysis portion gives students hands on training to test the alignment and vibration of pumps and motors. Plant tours and hookups to actual plant equipment is also provided.

### TORCHES AND TUBES FOR STATIONARY ENGINEERS

Every facility has tubes and pipes for various systems including plumbing, HVAC, fuel lines, and sprinklers. Students will work with various pipes including copper plumbing, copper refrigeration, black iron, brass, and others. With much hands on, learn how to braze, sweat, heat, swedge, and thread. This seminar includes destructive testing and time allowing, will also include arc welding.

### VARIABLE FREQUENCY DRIVE OPERATION AND BUILDING ELECTRICAL TROUBLESHOOTING SKILLS

This three-day seminar is designed to provide the knowledge and skills required when selecting, installing, testing and troubleshooting VFDs, the motors they control, and the control circuits connected to them. In this hands-on seminar, students will build, program and test VFD, motors and control circuits. Test instruments covered and used include digital multi-meters (DMMs), current clamps, power quality analyzers, and meter attachments.

Topics, circuits, and equipment covered include:

- Test instrument terminology, symbols and measurement functions for each type of instrument used is covered to learn what test instruments should and should not be used on VFD circuits
- Learn the safe and correct way to take electrical measurements and what the measurements actually mean.
- Learn where and how to use special meter functions like MIN/MAX, RELATIVE, LoZ, Peak, kVA, kW, and PF measurement functions.
- Learn how to test for grounding problems.
- Understanding VFD and motor nameplate data.
- Learn how to test and wire any three-phase motor without using the motors wiring diagram and what the expected readings should be before power is applied and how to troubleshoot the motor after power is applied.
- Circuits built include using, magnetic motor starters (to understand moving from mechanical starters to VFDs), mechanical and solid-state switches, such as, selector switches, proximity switches, photoelectric switches, analog inputs (photovoltaic and potentiometers), and other commonly used electrical devices.
- Connect, program, and test two different types of VFDs (variable frequency drives).
- VFD related system control functions such as timers, mechanical and solid-state relays, and PLCs will also be covered, connected, and tested.
- Take power measurements (P.F., kVA, kW, and harmonic) to understand power quality problems in VFD controlled systems.