

Program Description

Program Name: HVAC Training – C (Certificate Program)

Course Fee: \$480.00 (Check for promotions, if any, on our Home Page button: CURRENT PROMOTIONS)

You are entitled to a 15% discount if you pay the course price in full (\$408.00 instead of \$480.00)

Note: The program fee includes the necessary textbook - provided to students in USA at no additional cost.*

Standard Time to Complete Course**: 396 hours

Professional Development Hours (PDHs)**: 396.0 hours

Continuous Education Units (CEUs): 39.6

Access Allowed to the Course after Registration: 365 days

Instructor: Houston Industrial Training Institute Staff

7 Calendar Days, No Questions Asked Refund Policy

We are committed to provide a zero-risk learning opportunity for prospective students. To this end, we will issue a full refund on monies paid by a student if a refund is asked for within seven calendar days of payment. This applies to all monies paid during the preceding 7 calendar days. Please note that no refund is allowable if the completion certificate has been made available to the student or if more than 7 calendar days have passed.

Notes:

- *Students outside the USA may have to cover shipping & handling charges for the textbook.
- ** Note: The program consists of a number of Learning Modules all of them are listed below with the standard completion time. The standard-completion-time number shown here is the sum of standard completion time for all of the modules. The standard learning-module completion time is based on the average of time taken by actual or study-group students or our judgment in this matter. The standard module-completion time assessment excludes breaks of any kind. Depending upon the experience and educational background of a particular student, the actual time taken by a particular student may be more or less than what is noted here. We give credit for PDHs and CEUs per information provided in this document, and NOT the actual time taken by a particular student.



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Who is this course for?

This course is meant for people who seek a good grasp of basic technical aspects of the subject technology at the technician level. The program is based on the US technical practices and covers a wide range of foundational subjects.

Any person who can use email will be able to participate in this program – no additional skills are required. This is a broad-based program – with a focus on the underlying technology. A career in this field will most likely require you to meet certain licensing, training, and other requirements that can vary by vocation and state. You should check with your state, local government and/or licensing board to find out the requirements may be applicable to you.

The following career-related information (from US Department of Labor) is provided strictly for your information, planning and reference.



Occupational Employment Statistics

Occupational Employment and Wages, May 2014

49-9021 Heating, Air Conditioning, and Refrigeration Mechanics and Installers

Install or repair heating, central air conditioning, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.

National estimates for this occupation: Top

Employment estimate and mean wage estimates for this occupation:

| Employment (1) | Employment RSE (3) | Mean hourly wage | Mean annual wage (2) | Wage RSE (3) |
|----------------|-----------------------|---------------------|-------------------------|--------------|
| 261,390 | 1.3 % | \$22.54 | \$46,880 | 0.5 % |

Percentile wage estimates for this occupation:

HVAC Certification

Houston Industrial Training Institute partners with ESCO Institute to guide you and provide you with an opportunity for basic HVAC certification.



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ESCO Institute is a member of the ESCO Group; it is one of the largest providers of EPA Section 608 heating and air conditioning certification testing. We provide students who successfully pass the course with a copy of the EPA Section 608 study guide, FREE of charge. The ESCO preparatory manual is user-friendly and contains necessary information for the Universal exam. Students, who successfully pass the course, are provided with a \$75.00 voucher to be used against the cost of the ESCO Institute Certification exam; in addition we provide the graduating students a set of starter tools including a digital multimeter.



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Program Structure

This program consists of a number of learning modules. The beginning (or earlier) modules are self-sufficient and no additional textbooks are required. For the later modules one or more textbooks are necessary – we provide all of the necessary textbooks at no cost to the student. The textbook is shipped out to the student well before it is needed.

- a. The course provides industry-ready information in a manner that allows almost anyone, with any background, to participate in it. Unlike regular classroom-based learning, this course allows a user to go over the learning materials a number of times and write the test a number of times this results in exceptionally high quality of learning.
- c. To augment learning, in many learning modules animations and simulations are provided allowing the students to interact with the learning materials and get a feeling for the dynamism of technical or scientific concepts.
- d. The program consists of a number of learning modules. Each of the modules consists of learning materials as well as a written test. To pass the course a student has to pass each of the modules. The pass mark is 75%. After going through the learning materials, the student is expected to email the answer sheets for evaluation.
- e. Where necessary, the online modules provide you with a listing of reference material in case you want to build a personal library or want to do additional research.

Note: Please do not share our course material with others and do not use it for any commercial or professional application. Under all circumstances we maintain copyright to all of the material presented in the course.

Course Availability: Anytime, from anywhere. This is a totally web-based online course – no physical classroom attendance is required. Prospective students may enroll at anytime from anywhere. Also, students can start and participate in the course at anytime from anywhere.

Course Pre-requisites: Our courses include all of the necessary math and science material relevant to the course. Any person who can use email will be able to participate in this course – no additional skills are required.



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How to Register: Visit our Home Page www.HoustonIndustrialTraining.com Please click on the REGISTER button located on the left hand panel. In addition, feel free to ask for clarifications and help by via email:

Registrar@HoustonIndustrialTraining.com. Additional informatory material is available via How-To Guide button located on our Home Page.

Help for Registered Students: Students can ask for help at any time via email. Send an email to instructor@HoustonIndustrialTraining.com. In your email, please include your name, your Student Code, your course name, your phone number and your email address. Our aim is to respond to students within two working days.

Third Party Commercial Interest Disclosure Policy

We do not allow anyone, including the instructors, to solicit any business from the students other than HITI products. Further, no instructor is allowed to present any third party products or software or events to the students. HITI does not allow any third-party compensation related to the learning events or programs.



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Required Equipment

1. An ordinary PC (not older than five years).

<u>Note:</u> We do not test our courses on computers other than PC. We have found most of our clients are able to use other computers successfully. If your computer is not a PC, we encourage you to take our FREE sample course to ensure your hardware is compatible with our delivery system. We ask you to do this test BEFORE registering for the course.

- 2. A good Internet connection. We design most of our instruction pages to download in less than five seconds. Some of the graphics-heavy pages may take longer to download.
- 3. Adobe Flash Player. Almost all PCs come equipped with this Flash Player. If your computer does not have it, you can download it for free from www.adobe.com.

Notes:

** Note: The course consists of a number of Learning Modules – all of them are listed below with the standard completion time. The standard-completion-time number shown here is the sum of standard completion time for all of the modules. The standard learning-module completion time is based on the average of time taken by actual or study-group students or our judgment in this matter. The standard module-completion time assessment excludes breaks of any kind. Depending upon the experience and educational background of a particular student, the actual time taken by a particular student may be more or less than what is noted here. We give credit for PDHs and CEUs per information provided in this document, and NOT the actual time taken by a particular student.

Professional Development Hours (PDHs) are equal to the standard learning-module completion time. The corresponding Continuing Education Units (CUEs) are obtained by dividing the standard time by ten.



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Listing of included Learning Modules

Basic Industrial Safety

Standard Time to Complete: 6 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **DESCRIBE** why paying attention to safety is important in an industrial plant.
- 2. **DESCRIBE** employer and employee responsibilities in reference to personnel safety.
- 3. With reference to an industrial plant, **IDENTIFY** common hazards and possible protection against them.
- 4. EXPLAIN why special attention is paid to hazards associated with Hydrogen Sulfide gas.
- 5. **DESCRIBE** safety hazards posed by electricity, confined spaces and toxic gases.
- 6. **SELECT** basic protective equipment for common hazards in an industrial plant.





Learning Outcomes

- 1. **DESCRIBE** the purpose and the key elements of the Federal Hazard Communication Standard (HCS.) You will also be able to IDENTIFY other common names used to refer to this standard.
- 2. **DESCRIBE** how a hazardous chemical is identified in a workplace.
- 3. **DESCRIBE** the purpose and what is meant by the term MSDS. You will also be able to describe the key elements of an MSDS. Using MSDSs, you will also be able to **SELECT** appropriate protective measures when handling chemicals.
- 4. **DESCRIBE** the nature of the NFPA and HMIS/HMIG hazard communication methods. You will also be able to DESCRIBE what is meant by the terms TLV, PEL, TWA, Acute Effect, Acute Toxicity, Chronic Effect, Chronic Toxicity, Carcinogen, Flammable Liquid, Combustible Liquid, and Chemical Reactivity.
- 5. **DESCRIBE** the nature of the DOT methods for hazard chemical identification.





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6. **DESCRIBE** the necessary training activities required to comply with the Federal Communication Standard (HCS.)

Basic Lockout-Tagout

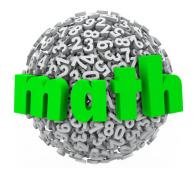
Standard Time to Complete: 10 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **DESCRIBE** the key reasons for implementation of lockout-tagout procedures.
- 2. **DESCRIBE** what is meant by the term "energized equipment." You will be able to list various ways by which equipment "energized state" can occur.
- 3. **DESCRIBE** under what conditions lockout-tagout procedures are required. You will also be able to **DESCRIBE** the employer's responsibilities for implementation of such procedures.
- 4. **DESCRIBE** the training requirements prescribed by OSHA for lockout-tagout procedures. You will also be able to **DESCRIBE** the prescribed worker training requirements under OSHA's regulations.
- 5. **DESCRIBE** the key items that need to be considered for electric power lockout-tagout systems. In reference to the electrical requirements, you will be able to **DESCRIBE** what is meant by the term "qualified employees;" you will also be able to **DESCRIBE** the responsibilities of such employees.
- 6. **DESCRIBE** the ten general procedural steps, outlined in the learning module, for implementation of Lockout-Tagout Procedure.





Math for Technicians and Operators

Standard Time to Complete: 20 hours Learning Outcomes

- 1. ADD, MULITPLY, DIVIDE, and SIMPLIFY fractional numbers; you will also be able to ADD, MULITPLY, DIVIDE, and SIMPLIFY decimal numbers; you will also be able to CONVERT fractional numbers into decimal numbers and vice versa.
- 2. CALCULATE areas and volumes of simple figures.
- 3. MANIPULATE and WORK WITH simple equations.



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- 4. **CREATE** graphical representations of two-dimensional numeric relationships.
- 5. **CALCULATE** percentage values of simple quantities.
- 6. **CONVERT** one measurement unit into another measurement unit.

Physics for Technicians 1

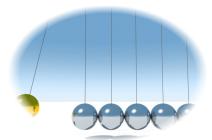
Standard Time to Complete: 20 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **DESCRIBE** what is meant by the English and the SI measurement systems. You will also be able to **STATE** some common conversion factors.
- 2. **DESCRIBE** what is meant by the terms: mass, weight, matter, weight density, and specific gravity.
- 3. **DESCRIBE** what is meant by the terms: Buoyancy, and Archimedes' principle.
- 4. **DIFFERENTIATE** between heat and temperature. You will also be able to DESCRIBE the following concepts: Fahrenheit scale, Celsius scale, Rankine scale, and Kelvin scale. You will also be able to **CONVERT** a given temperature in any scale to any of the three other scales.
- 5. **DIFFERENTIATE** between the terms sensible heat and latent heat. You will also be able to **DESCRIBE** the terms: thermal conductivity, heat convection, heat radiation, and heat conduction.
- 6. **DESCRIBE**, using latent heat concepts, how water at room temperature is converted into superheated steam.





Physics for Technicians 2

Standard Time to Complete: 20 hours

Learning Outcomes:

- 1. **DESCRIBE** the meaning of and **DIFFERENTIATE** between the terms: Mass, weight, and energy. You will also be able to **DIFFERENTIATE** between various types of energy such as potential energy, kinetic energy, electrical energy, thermal energy, etc.
- 2. **DESCRIBE** how pressure is exerted by various forms of matter, and **DIFFERENTIATE** between various forms of pressure measuring units such as psig, psia, inches of water, head, inches of mercury pressure, inches of mercury vacuum, etc.



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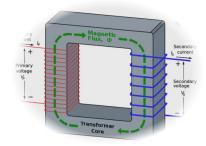
- 3. **DESCRIBE** how gases exert pressure. You will also be able to **DESCRIBE** the three gas laws, including the ability to use the formula PV=RT to calculate any of the variables, provided the other variables are given.
- 4. **DESCRIBE** how liquids exert pressure and what is meant by static pressure and how it varies according to the liquid depth.
- 5. **DESCRIBE** the nature of a manometer and how it can be used to measure pressure and vacuum.
- 6. **DESCRIBE** what is meant by the term "Vapor Pressure" and how it varies with liquid temperature.

Physics for Technicians 3

Standard Time to Complete: 40 hours

Learning Outcomes:

- 1. **DESCRIBE** what is meant by the terms: Work, Energy and Power; also **DESCRIBE** how these concepts relate to each other.
- 2. **DESCRIBE** what is meant by the term Force Transformers; also **DIFFERENTIATE** between different classes of levers, and **ANALYZE** to **IDENTIFY** similarities and differences between levers and pulleys.
- 3. **DESCRIBE**, in terms of electron flow, how electric current flows. You will also be able to DESCRIBE what forces the current to flow.
- 4. **DESCRIBE** how electromotive force (EMF) can be generated in a number of different ways.
- 5. **DESCRIBE** how alternating current (AC) is generated. You will also be able to **DIFFERENTIATE** between alternating current (AC) and direct current (DC.)
- 6. **SOLVE** simple numerical problems relating to electric circuits. You will also be able to **DESCRIBE** what is meant by the term "electric power" and how to **CALCULATE** it.





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Electrical Safety

Estimated Time to Complete: 20 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **IDENTIFY** the key components of a basic electric circuit. You will also be able to **EXPLAIN** the function of key components of a basic electric circuit.
- 2. **DESCRIBE** the common hazards posed by electricity. You will also be able to STATE the protective measures that should be taken by workers and electricians.
- 3. **DESCRIBE** what is meant by the term "grounding," and how it is accomplished.
- 4. **DESCRIBE** how an improperly grounded system can become hazardous for workers.
- 5. **DESCRIBE** how a properly grounded system works and provides safety for workers and electricians. You will also be able to **DIFFERENTIATE** between a Service Ground and an Equipment Ground.
- DESCRIBE how a Ground Fault Current Interrupter (GFCI) works and provides safety.



Expected Time to Complete: 40 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

DANGE

- ${\bf 1.} \ \textbf{DESCRIBE} \ the \ basic \ principles \ of \ electromagnetism \ and \ magnetic \ induction.$
- 2. **PERFORM** calculations for simple electric circuits. For $\underline{\text{example}}$, calculation of current in an electric circuit that has following parameters:
- a. The circuit is provided with two opposing batteries of voltage ratings 20 volts and 5 volts.
- b. The circuit consists of two resistors connected in parallel, one rated at 20 ohms and the other at 15 ohms.
- 3. **DIFFERENTIATE** between AC and DC. You will also be able to describe the following terms: Wavelength, period, amplitude, root mean square value and amplitude.
- 4. **DESCRIBE** how AC is generated. You will also be able to **DESCRIBE** Fleming's Right Hand Rule and the Left Hand Rule.
- 5. **DIFFERENTIATE** between the following types of faults: phase to phase, phase to neutral, and a 3-phase fault.
- 6. **DESCRIBE** the function of the terms related to a power distribution system: Transmission line, power transformer, power circuit breaker, high voltage fuses and





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high voltage capacitors. You will also be able to **DIFFERENTIATE** between a wound rotor induction motor and a squirrel cage induction motor.

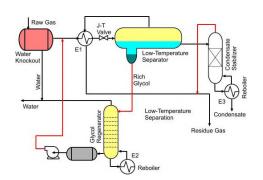
Reading Technical Drawings

Standard Time to Complete: 20 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **READ** and **IDENTIFY** symbols for pressure instruments such as pressure transmitters, pressure sensors, pressure control valves and pressure control loops.
- 2. **READ** and **IDENTIFY** symbols for temperature instruments such as temperature transmitters, temperature sensors, temperature control valves and temperature control loops.
- 3. **READ** and **IDENTIFY** symbols for flow instruments such as flow transmitters, flow sensors, flow control valves and flow control loops.
- 4. READ and UNDERSTAND Process Flow Diagrams (PFDs).
- 5. **READ** and **UNDERSTAND** Process Block Diagrams.
- 6. READ and UNDERSTAND Piping and Instrument Diagrams (P&IDs).

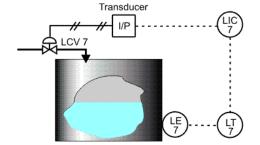


Basic Process Instrumentation and Control

Standard Time to Complete: 40 hours Learning Outcomes

At the completion of this course you will be able to:

- 1. **DIFFERENTIATE** between manual and automatic control systems. You will also be able to **DESCRIBE** what the following terms mean: setpoint, process variable, primary element, final element, and indicating controllers.
- 2. **DESCRIBE** the operation of control loops pertaining to flow, pressure, temperature and pressure.
- 3. **DESCRIBE** how a manometer works. You will also be able to **DESCRIBE** how a displacement-type level monitoring system works.
- 4. **DESCRIBE** the relationship between the liquid density and the static pressure at the bottom of a tank.
- 5. **DESCRIBE** functions of components of the faceplate of a simple controller. You will also





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be able to **DIFFERENTIATE** between acceptable and unacceptable dynamic response of a controller.

6. **DIFFERENTIATE** between direct and indirect level measuring systems. You will also be able to **DESCRIBE** how a cascaded control system works.

HVACR1100 – Refrigerant Temperature-Pressure Relationship

Standard Time to Complete: 30 hours

Learning Outcomes

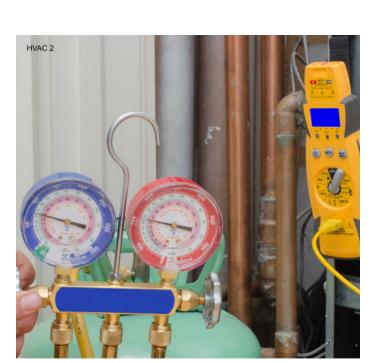
- 1. **DESCRIBE** the following concepts: Refrigeration, rating refrigeration equipment, the refrigeration process, and the basic principles of a window air-conditioning unit.
- 2. **DESCRIBE** the temperature-pressure relationship of water explaining how water can be made to boil at 10 deg F if the pressure is 0.031 psia, and at 50 deg F if the pressure is 0.178 psia, etc.
- 3. **DESCRIBE** the temperature-pressure relationship for water and water vapor. You will also be able to **DESCRIBE** how water can be made to vaporize at a low temperature. You will also be able to DESCRIBE how pressure determines the boiling point of water.
- 4. USING the refrigerant R-22, **DESCRIBE** how to read the temperature-pressure relationship chart. You will also be able to **DESCRIBE** how under different temperature conditions R22 vaporizes at different pressures.
- 5. **DESCRIBE** function of the main components of a typical refrigeration system: The evaporator, the compressor, the condenser, and the refrigerant metering device.
- $\hbox{\bf 6. } \textbf{DESCRIBE} \ operation \ of a \ typical \ R-22 \ air-conditioning \ system. \\$





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HVACR1200 - HVACR Safety - Piping-Tubing Handling

Standard Time to Complete: 30 hours

Learning Outcomes:

- 1. **DESCRIBE** the nature of older refrigerants R-12, R-22, R-500, and R-502 as well as the newer refrigerants: R134a, R-404a, R-407a, R-407c, and R-410a. You will also be able to **DESCRIBE** color coding of refrigerant cylinders.
- 2. **DESCRIBE** the key characteristics of good refrigerants: refrigerants must be safe, refrigerants must be detectable, boiling point of the refrigerant must be low, and the desirable pumping characteristics of refrigerants.
- 3. **DESCRIBE** general safety issues for handling pressurized cylinders holding refrigerants.
- 4. **DESCRIBE** safety hazards posed by refrigerants to the worker breathing space. You will also be able to **DESCRIBE** ANSI/AHSRAE Safety Classification of Refrigerants.
- 5. In reference to tubing and piping **DESCRIBE** the following: Purpose of tubing and piping, types and sizes of tubing, tubing insulation, line sets. You will also be able to **DESCRIBE** general procedures for cutting and bending tubing.
- 6. **DESCRIBE** key principles for soldering and brazing procedures used for tubing. You will also be able to **DESCRIBE** general principles associated with making flare joints, compression fittings and swaging techniques.



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HVACR1300 - Leak Detection - Charging - Expansion

Standard Time to Complete: 30 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **DESCRIBE** main types of refrigerant leaks and basic leak detection methods.
- 2. **DESCRIBE** the purpose and methods for refrigerant evacuation. You will also be able to **DESCRIBE** the meaning of the phrase "pulling a vacuum."
- 3. DESCRIBE the **purpose** and operation of Schrader valves and Gauge Manifold Hoses.
- 4. **DESCRIBE** impact of refrigerants on ozone depletion and global warming.
- 5. **DESCRIBE** general procedures associated with vapor and liquid refrigerant charging.
- 6. **DESCRIBE** the purpose and operation of expansion devices. You will also be able to **DESCRIBE** the function of key components of a thermostatic expansion valve (TXV).





HVACR1400 – Fundamentals of Gas Heating Furnaces

Standard Time to Complete: 30 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

1. In reference to natural gas furnaces, **DESCRIBE** the main safety precautions. Also **DESCRIBE** the main types of furnaces and how manifold pressure is measured.

- 2. **DESCRIBE** basic principles of gas combustion and conditions that may cause explosions. You will also be able to **DESCRIBE** operation of gas regulators, gas valves, solenoid valves and diaphragm valves.
- 3. **DESCRIBE** the operation of a heat motor-controlled valve. You will also be able to **DESCRIBE** the terms: manifold, orifice, burners, and heat exchanger.
- 4. **DESCRIBE** the function of the following: fan switch, limit switch, and pilots. You will also be able to **DESCRIBE** the main safety devices associated with pilots.



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- 5. **DESCRIBE** the main types of ignition systems for gas furnaces.
- 6. **DESCRIBE** the purpose, function and requirements for furnace venting.

HVACR1500 – Refrigerators and Room AC Fundamentals

Standard Time to Complete: 30 hours

Learning Outcomes

On successful completion of this learning module, you will be able to:

- 1. **DESCRIBE** the operation of domestic refrigerators. You will also be able to **DESCRIBE** the operation of the evaporator coil in the domestic refrigerators.
- 2. **DESCRIBE** the operation of the compressor and condenser of domestic refrigerators.
- 3. **DESCRIBE** in general terms how gauge connections are made in domestic refrigerators and how low refrigerant charge and excess refrigerant charge conditions are diagnosed and rectified.
- 4. **DESCRIBE** operation of room air conditioners. You will also be able to **DESCRIBE** the refrigeration cycle for a typical room air conditioner.
- 5. **DESCRIBE** the operation of a room air conditioner's heat pump operation.
- 6. **DESCRIBE** the key items to be considered for installation of a room air conditioner.



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Course Accreditation



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Houston Industrial Training Institute has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102. In obtaining this approval, HITI has demonstrated that it complies with the ANSI/IACET 1-2007 Standard which is widely recognized as the Standard of good practice internationally. As a result of their Authorized Provider membership status, HITI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET 1-2007 Standard."

Information: Registrar@HoustonIndustrialTraining.com. Please the Contact Us button located on our Home Page.



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