

On-line Distance Learning

PROCESS HEATING 2011 Winter Courses

- ① Fundamentals of Process Heating**
- ② Advanced Industrial Process Heating**

Registration Opens: Nov. 15

Registration Closes: Jan. 14

Courses Begin: Jan. 24.



REGISTER ONLINE
www.ihea.org

**Earn CEU
Credits!**

For More Info Visit
www.ihea.org



IT'S ON-LINE

It's Convenient, and it's starting soon

ABOUT THE INSTRUCTOR

William Clark

Certified Energy Mgr.

Northampton
Community College

Emerging Technology
Applications Center



William Clark is a mechanical engineer with over 20 years' experience in the field of energy efficiency. He has managed programs to improve manufacturers' energy efficiency, waste management, and productivity, and assessed their feasibility and costs. He has designed and directed training in manufacturing improvements for energy management professionals and has performed numerous assessments of industrial and commercial facilities. Mr. Clark is a member of the NCC Energy Management faculty and leads their efforts in energy management curriculum development and the creation of distance learning courses.

Mr. Clark holds a B.S. in Mechanical Engineering, Colorado State University and has been highly praised by former students of IHEA's On-Line Distance Learning Courses.

About The Courses



IHEA the Industrial Heating Equipment Association, in conjunction with the Emerging Technology Applications Center of Northampton Community College, is offering its distance learning courses for the upcoming Winter semester. Registration opens November 15, 2010. Classes begin on January 24, 2011 for both the Fundamentals of Industrial Process Heating and the Advanced Industrial Process Heating courses.

Our on-line courses offer you the opportunity to keep current with Industrial Process Heating in the comfort and convenience of your own workplace or home. They are designed to give you the flexibility you need, with the interaction of a live instructor and message boards to communicate with other students in "your class." The courses have proven to be very educational by those who have taken the courses to date.

Course Materials

Students will receive a Course spiral bound textbook prior to the start of the course.

To Register For Either Course

Go to www.ihea.org and click the On-Line Distance Learning button on the right side of the home page.

Registration Closes

January 14, 2011



Photo courtesy of Eclipse Combustion



Photo courtesy of Bloom Engineering

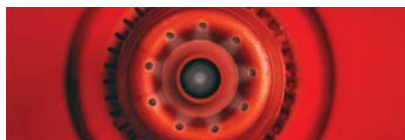


Photo courtesy of WS Thermal Processing



Photo courtesy of WS Thermal Processing

QUOTES

Students are continually impressed with the courses and the instructor. Here's what some of them have had to say after completing the course:

"This was the first Distance Learning Course I have taken; I enjoyed the flexibility of working at my own pace, yet having the interaction with the other students. Also, the instructor was extremely helpful and very knowledgeable, I would definitely participate in another online course because of the very positive experience."

"It was well organized, and the course material is well written, informative and useful. I enjoyed the forum interaction with the professor, and his responses are both thoughtful and humorous."

"There was a balance between providing theoretical information and practical problem solving. I was pleased that the project was somewhat "defined" and required some assumptions. I think that better prepares a person for working in the process heating industry. Excellent choice of text for this class."

"All the learning here will help with my general awareness of combustion systems. I will be able to identify and discuss the deeper workings of the combustion equipment and heat transfers when I go onto a job site."

"Because of balancing an extremely busy workload and family life, I am not able to be on a regular schedule or take time in the evening to travel to a class. The advantage for me is that I can check in when time permits and still stay up to date on all activities. The blackboard is very user friendly and the course is set up very well. The course information is directly related to my work and I found it to be very beneficial. It is also very rewarding to have an instructor with the credentials of Mr. Clark. I have enjoyed and taken more away from this course than any other."

FUNDAMENTALS of Industrial Process Heating



COURSE CEU CREDITS:

1.6 CEU credits will be given for passing the course.

Registration Opens November 15
Registration Closes January 14
Courses Begin Monday, January 24

COURSE FEES:

IHEA Members \$485
Non-Members \$600

Discounts available for groups of three or more

COURSE DESCRIPTION:

This course provides an overview of the fundamentals of heat transfer, fuels and combustion, energy use, furnace design, refractories, automatic control, and atmospheres as applied to industrial process heating. Students will gain a basic understanding of heat transfer principles, fuels and combustion equipment, electric heating, and instrumentation and control for efficient operation of furnaces and ovens in process heating.

COURSE LEARNING OUTCOMES

Students successfully completing this course will be able to:

- Understand how materials are heated in industrial applications
- Perform heat balance and thermal efficiency calculations
- Develop an understanding of the basic principles of heat transfer
- Develop an understanding of furnace and oven design and operation

Topical Outline

Combustion Fundamentals and Fuels

- Arithmetic and algebraic operations
- Energy forms and terms
- Conversion factors and units
- Combustion chemistry
- Gaseous Fuels
- Liquid Fuels

Combustion Equipment for Gaseous and Liquid Fuels

- Gas Burners
- Oil Burners
- Dual Fuel Burners
- Control of Fuel-Air Ratios
- Oil Flow Control
- Combustion Air Sources
- Oxygen-Enriched Combustion
- Ignition of Fuel
- Combustion Safety Equipment

Elements of Heat Transmission

- Convection
- Conduction
- Radiation
- Heat to Charge
- Heat Transfer Calculations

Advanced Heat Transfer Principles

- Heat Transfer in Furnace Loads
- Rate of Heat Absorption by the Charge
- Industrial Furnace Applications of Heat Transfer
- Burner Selection
- Heat Transfer in Continuous Slot-Type

Furnaces for Upsetting

- Heat Transfer in High Temperature Convective Furnaces
- Heat Transfer in Low Temperature Convective Furnaces
- Furnace Heat Transfer Calculations and Procedures

Heat Balance and Efficiency Calculations

- Furnace Heat Balance
- Simplified Heat Balance
- Furnace Wall Losses
- Furnace Opening Losses
- Conveyor and Fixture Losses
- Heat Storage Losses
- Excess Air Losses
- Software Tools
- Turndown Requirements

Fundamentals of Electrical Heating

- Electrical Heating Advantages
- Comparative Costs of Electric vs. Fuel-Fired
- Types of Electric Heating Elements
- Element Life
- Design and Selection of Elements
- Safety
- Power Control Arrangements



Earn CEU Credits!

Photo courtesy of Eclipse Combustion

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ADVANCED Industrial Process Heating



COURSE CEU CREDITS

2.4 CEU credits will be given for passing the course.

Registration Opens November 15
Registration Closes January 14
Courses Begin Monday, January 24

COURSE FEES

IHEA Members \$615

Non-Members \$770

Discounts available for groups of three or more

COURSE DESCRIPTION

This course is a compliment to the Fundamentals of Industrial Process Heating and provides the student with an in depth view of the control and efficient operation of industrial process heating equipment. Students will become familiar with a variety of oven, furnace, and kiln types used in industry. Upon completion of the course the student will have general knowledge of instrumentation and control for efficient

operation of furnaces and ovens in process heating. The student will learn about the wide variety of refractories and insulation used in process heating equipment as well as their operating considerations. The use of vacuum heat processing, recuperators, regenerators, gas atmospheres, and quenching will also be presented. Particular attention is spent on efficient operation of process heating equipment and methods to achieve cost savings.

Topical Outline

Ovens and Furnaces

- Ovens
- Batch Ovens
- Continuous Ovens
- Criteria for Oven Construction
- Furnaces
- Kilns

Vacuum Heat Processing

- Comparison to Atmospheric Processes
- Volatilization, Dissociation, and Degassing
- Vacuum Furnace Equipment
- Heat Treatment Processes

Refractories and Insulation

- Furnace Lining Function and Design
- Forms of Refractories and Insulation
- Varieties and Characteristics of Refractories and Insulation
- Heavy Fire Brick
- Monolithic Refractories
- Refractories for Special Service
- Insulating Refractories
- Methods of Construction
- Ceramic Fiber Refractories
- Operating Considerations

Recuperators and Regenerators

- Energy Saving by Air Preheating
- Performance of Recuperators and Regenerators
- General Classifications and Heat Transfer Characteristics
- Practical Recuperators and Regenerators

Instrumentation and Control I

- Measured Variables
- Temperature Detectors
- Pressure
- Flow
- Furnace Atmospheres
- Specifications

Instrumentation and Control II

- Process Control
- Controller Types
- Control Algorithms
- Tuning
- Recorders
- Final Control Elements

Furnace Atmospheres

- Primary Furnace Gases
- Classification of Prepared Atmospheres
- Atmospheres to Heat Treating Processes
- Gas Generating Equipment
- Furnace Designs

Quenching Media and Equipment

- Classification of Methods
- Mechanism of Quenching
- Cooling Curves
- Metallurgical Aspects
- Testing and Evaluation of Quenching Media

Course Learning Outcomes

Students successfully completing this course will be able to:

- Demonstrate knowledge of the types of ovens, furnaces, and kilns.
- Develop an understanding of the types and operation of refractories and insulation
- Determine the energy savings associated with the use of recuperators and regenerators.
- Develop an understanding of the instrumentation and controls used in process heating equipment.
- Discuss the types of gas atmospheres used in process heating and the equipment used.
- Describe the mechanisms, metallurgical aspects, testing and evaluation associated with quenching.
- Develop an understanding of vacuum heat processing.

Infrared Heating

- Characteristics of Infrared Radiation
- Infrared Emitters
- Electric
- Natural Gas and Propane
- Infrared versus Convection Heating
- Infrared Heating Process Control
- Zoning
- Applications



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