

Process Heating On-line Distance Learning 2010 Winter Courses

Earn CEU
Credits!



**Fundamentals of
Process Heating**

**Advanced Industrial
Process Heating**

REGISTER TODAY!

Go Online: www.ETCTR.com

**Registration
Opens Nov. 30**

**Registration
Closes Jan. 15**

**Courses Begin
Monday, Jan. 25**

**FOR MORE INFO,
VISIT www.ihea.org**



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.etctr.com and click on the IHEA logo on the left side of the main page.

Registration Closes

January 15, 2010



About The Courses

About The Instructor

William Clark, Certified Energy Manager
Northampton Community College
Electrotechnology 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.

IHEA the Industrial Heating Equipment Association, in conjunction with the Electrotechnologies Application Center of Northampton Community College, is offering its distance learning courses for the upcoming Fall semester. Registration opens November 30, 2009. Classes begin on January 25, 2010 for both the **Fundamentals of Industrial Process Heating** and the **Advanced Industrial Process Heating** courses.

Our on-line courses, now in their second year, 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.

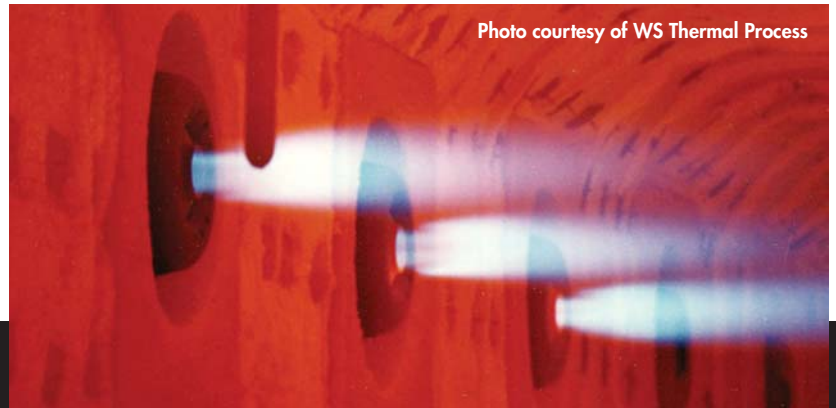


Photo courtesy of WS Thermal Process

OUR STUDENTS Rave About Our Courses!

For the past two years, students who have taken the courses have given the courses and the instructor high marks. Check out our student feedback:

"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."

"I enjoyed reviewing the practical example problems which are provided in the course textbook. They were relevant to real world applications, which make them a great reference for future design of industrial applications. The topics covered in the textbook were useful and relevant to the understanding of industrial combustion."

"The information I've obtained through this course will help me in the design and construction process when working with customers. The information will allow me to better service the needs of my customers, and will better able me to provide intelligent and detailed information about combustion to my customers."

"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 each course.

Registration Opens November 30

Registration Closes January 15

Courses Begin Monday, January 25th

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

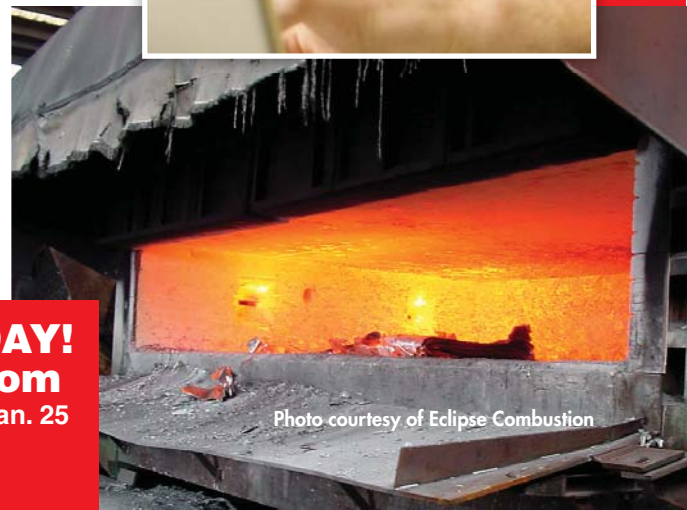
- Heat Transfer in High Temperature Convective Furnaces
- Heat Transfer in Low Temperature Convective Furnaces
- Furnace Heat Transfer Calculations and Procedures

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



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Photo courtesy of Eclipse Combustion

ADVANCED Industrial Process Heating

COURSE CEU CREDITS

2.4 CEU credits will be given for passing each course.

Registration Opens November 30

Registration Closes January 15

Courses Begin Monday, January 25th

COURSE FEES

IHEA Members \$615

Non-Members \$770

Discounts available for groups of three or more

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.

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.

- 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

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

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