

# Agenda

Presented by S. Bobby Rauf, PE, CEM, CMT, MBA

**Agenda Day One:**  
**Monday, March 18, 2024 | 10:00 am - 2:00 pm CDT**

Fundamentals for thermodynamics

- Definition, units, and law of conservation of energy
- The concept of “system” as it pertains to thermodynamic analysis
- Importance of correct assignment of signs to work, and energy of various sorts, including heat energy
- Energy conversion and heat calculation case study
- Definition and calculation of power in thermodynamic systems
- “Steam to wire” flow of energy and power
- Energy unit conversions and associated case study
- Enthalpy and entropy
- Heat transfer and illustration of entropy calculation through a case study
- Heat of fusion, heat of evaporation and heat of sublimation and phases of water saturated and superheated steam tables

Class exercise to reinforce understanding and use of steam tables – predicting the phase of water, at given pressure and temperature

Critical point, triple point, and critical properties of water

Mollier diagram and associated exercise

Closed and open thermodynamic systems

**Agenda Day Two:**  
**Tuesday, March 19, 2024 | 10:00 am - 2:00 pm CDT**

First law of thermodynamics

- Development and understanding of SFEE, Steady Flow Energy Equation

Second law of thermodynamics

Thermodynamic processes

- Adiabatic, isobaric, isochoric, isometric, isentropic, isothermal, throttling, quasi-static, quasi-equilibrium, polytropic, reversible, and irreversible processes

Topping cycle, bottoming cycle, and combined cycle processes

Turbines

- Impulse vs. reaction turbine

Station Zebra case study

Psychrometrics and psychrometric chart

- Simple vs. comprehensive psychrometric charts
- Understanding and application of psychrometric charts
- Instrumentation commonly used to acquire psychrometric chart data.
- Comprehensive psychrometric chart case study

HVAC and refrigeration cycle

Automated HVAC system

Refrigeration cycle case study

- DuPont® 134a refrigerant pressure enthalpy graph-based analysis

## Thermodynamics Fundamentals with Heating/Cooling Applications

Online - Monday, March 18 and Tuesday, March 19, 2024

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## Learning Objectives

**You'll be able to:**

**Understand** thermodynamics fundamentals, including the law of conservation of energy.

**Examine** the difference between closed and open thermodynamic systems.

**Discuss** the first law of thermodynamics and identify the steady flow energy equation.

**Explore** the second law of thermodynamics and analyze the reversible and irreversible processes.

**Utilize** psychrometrics and psychrometric charts.

**Review** the HVAC and refrigeration cycle and explore an actual refrigeration cycle case study.

HalfMoon Education Live Webinars

# Thermodynamics Fundamentals with Heating/Cooling Applications

*Live, Interactive Webinar*

*Monday, March 18 and Tuesday, March 19, 2024*



**Explore** the law of conservation of energy

**Consider** an energy conversion and heat calculation case study

**Discuss** heat transfer and entropy calculations

**Examine** the first and second laws of thermodynamics

**Explore** the psychrometric chart

**Discuss** the HVAC and refrigeration cycle

### Continuing Education Credits

**Professional Engineers**  
7.0 PDHs

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**International Code Council**  
.7 CEUs (Energy)

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# Webinar Information

**Day One: Monday, March 18, 2024**  
10:00 am - 2:00 pm CDT (includes 30 minutes of breaks)

**Day Two: Tuesday, March 19, 2024**  
10:00 am - 2:00 pm CDT (includes 30 minutes of breaks)  
*(please log into the webinar 15 - 30 minutes before start time)*

**Tuition**  
**\$319** for individual registration.  
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# Faculty



**S. Bobby Rauf, PE, CEM, CMT, MBA**  
*President, Chief Consultant and a Senior Instructor at Sem-Train, LLC*  
Professor Rauf has over 25 years of experience in teaching undergraduate and post graduate engineering, science, math, business administration and MBA courses, seminars, and workshops. He earned his BS degree in Electrical Engineering, with honors, from North Carolina State University in Raleigh, North Carolina. Professor Rauf earned his Executive MBA degree from Pfeiffer University in Misenheimer, North Carolina. He is a registered professional engineer in the States of Virginia, Wyoming, and North Carolina and is a Certified Energy Manager. Professor Rauf holds a patent in process controls technology. His last full-time engineering employment in the corporate world, was at PPG Industries, Inc., where he served as a senior staff engineer. Professor Rauf was inducted as "Legend in Energy" by AEE, in 2014. He is a member of ASEE, the American Society of Engineering Education. Professor Rauf has developed and instructed Professional Engineering and Fundamentals of Engineering Exam (NCEES) Prep Courses over the past 20 years. He develops and instructs PDHs (Professional Development Hours) and continuing education, engineering skill-building seminars and courses. Professor Rauf is also an adjunct professor at Gardner-Webb University. He has published multiple texts over the last 10 years. Professor Rauf also provides text editorial services to River Publishers.

# Additional Learning

**2021 International Residential Code: Energy Conservation**  
- Tuesday, February 20, 2024 | 12:00 - 4:30 pm CST

**Managing Construction Costs & Supply Chain Issues**  
- Tuesday, February 20, 2024 | 12:00 - 2:00 pm CST

**Roadmap to Ethical Issues in Construction: A Primer for Design Professionals**  
- Wednesday, February 21, 2024 | 11:00 am - 1:00 pm CST

**Stream Restoration in the Eastern U.S.**  
- Wednesday, February 21, 2024 | 7:30 am - 3:30 pm CST

**Learn about Remote Pilot Training and Certification**  
- Tuesday, February 27, 2024 | 9:00 am - 1:45 pm CST  
- Wednesday, February 28, 2024 | 9:00 am - 1:45 pm CST

**Fire Protection for Special Occupancies: Health Care Facilities**  
- Wednesday, February 28, 2024 | 9:00 am - 12:15 pm CST

**Fire Protection for Special Occupancies: Industrial Facilities**  
- Wednesday, February 28, 2024 | 1:00 - 4:15 pm CST

# Credit Information

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HalfMoon Education is an approved continuing education sponsor for engineers in Florida (Provider License No: CEA362), Indiana (License No. CE21700059), Maryland, New Jersey (Approval No. 24GP00000700) and North Carolina (S-0130). HalfMoon Education is deemed an approved continuing education sponsor for New York engineers and architects via its registration with the American Institute of Architects Continuing Education System (Regulations of the Commissioner §68.14(i)(2) and §69.6(i)(2)). Other states do not preapprove continuing education providers or courses.

The American Institute of Architects Continuing Education System has approved this course for 7.0 HSW LUs (Sponsor No. J885). Only full participation is reportable to the AIA/CES.

The International Code Council has approved this event for .7 CEUs in the specialty area of Energy (Preferred Provider No. 1232).

Attendance will be monitored, and attendance certificates will be available after the webinar for those who attend the entire course and score a minimum 80% on the quiz that follows the course (multiple attempts allowed).

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7.0 HSW LUs (AIA)

**Pumping and Piping Systems**  
- Thursday, February 29, 2024 | 11:00 am - 2:15 pm  
- Friday, March 1, 2024 | 11:00 am - 2:15 pm CST

**International Residential Code 2021**  
- Friday, March 1, 2024 | 8:30 am - 5:00 pm CST

**2021 International Residential Code: Mechanical Systems**  
- Tuesday, March 5, 2024 | 12:00 - 4:30 pm CST

**Residential Energy Efficiency Code Compliance and Stretch Code Requirements**  
- Thursday, March 7, 2024 | 8:30 am - 4:30 pm CST

**Practical Fluid Mechanics**  
- Friday, March 8, 2024 | 8:30 am - 3:30 pm CST

**Current Issues in New Urbanism**  
- Thursday, March 14, 2024 | 9:00 am - 4:00 pm CDT

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