

Course: ME 50101: **Energy Assessment of Industrial Processes**

Catalog Description: Credit 3, class 3

Course analyzes fundamental of common industrial processes in terms of energy consumption, efficiency improvement and energy saving. Topics include review of thermodynamics laws, compressors, electric motors, pumps, steam distribution, heating and cooling processes, waste heat recovery, insulation, lighting, control systems, maintenance and building envelop principle. The course is an interpersonal skill development to aid students in analyzing energy efficiency, energy auditing and cost savings.

Pre-requisites: Graduate or consent of instructor

Co-requisites: None

Text Book: Lecture note materials

Reference Books:

1. Guide to Energy Management, 7th Edition, Barney L. Capehart, Wayne C. Turner, William J. Kennedy. ISBN 0-88173-605-8, CRC press
2. Energy Efficiency Manual, 1th Edition, Donald R. Wulfinghoff, ISBN: 0-9657926-7-6, Publisher: Energy Institute press.
3. Simple Solution to Energy Calculations, 4th Edition, Richard R. Vaillencourt , ISBN: 0-88173-356-3, The Fairmont Press

Coordinator: Ali Razban

Goals: The objective of this course is to give the students a functional understanding of industrial processes and equipment, energy consumption, and potential energy saving for industrial processes.

Outcomes: Upon successful completion of this course, students will be able to:

1. Understand the common industrial equipment and processes and to be evaluate them in terms of energy consumption [e].

2. Identify and describe basic concepts, terminology, and industrial applications of various energy sources [a4, e].
3. Identify the energy assessment process for various industrial processes [a4, c, e, h].
4. Be able to make recommendation for energy consumption improvement [e, h].
5. Be able to quantify energy saving based of the improvement recommendation [e].
6. Provide accurate measurements using basic metrology equipment[e].

Note: The letters within the brackets indicate the Program Outcomes of Mechanical Engineering.

Topics:

1. **Review of basic engineering science for industrial application**
 - a) First and second laws of Thermodynamics
 - b) Basic Fluid dynamics
 - c) Basic Heat transfer

2. **Analysis of industrial equipment and processes in term the energy consumption and energy saving**
 - a) Motor drives
 - b) Compressors
 - c) Boilers
 - d) Heating and cooling process
 - e) Lighting
 - f) Steam Distribution Systems
 - g) Control Systems and Computers
 - h) Available sensors
 - i) Insulation
 - j) The Facility Survey
 - k) Measurement & Verification of Energy Efficiency Savings in Industrial Facilities.

3. **Waste-Heat-Recovery**
 - a) Waste-Heat-Recovery concept
 - b) Waste-Heat exchangers
 - c) Commercial options in Waste-Heat Recovery equipment.

4. Energy Performance

- a) Model energy code
- b) Superior Energy Performance

5. Maintenance procedures in industry

- a) Measuring instruments.
- b) Saving energy in materials and storage

6. Building envelop principle

- a) Principles of envelope analysis
- b) Elements in envelope components
- c) Thermal “Weight”.
- d) Envelope analysis for new and existing buildings

Evaluation Methods: homework assignments, midterm exam, team project and final exam.

Professional

Components: Energy Engineering Management

Prepared by: Ali Razban

ABET Category: Engineering Science

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