

Syllabus for E- Learning Course On Energy Efficiency

Course Information

Title: **FUNDAMENTALS OF ENERGY EFFICIENCY IN INDUSTRIAL ENTERPRISES**

Duration 31st OCT. 2005 - 21st DEC. 2005 (8 WEEKS)

Instructors:

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Course Summary

With the ever increasing prices and the limited availability of the fossil fuels, it has become pertinent to conserve our fossil fuel resources as far as possible. Energy usage in industries accounts for 15 to 25% of the total energy consumed by the country and there is a tremendous scope for energy conservation, especially in the developing countries. The course content is designed, such that it would enable the professionals working in the industries to identify the energy conservation measures in various equipments and utilities, thus increasing the bottom line of the enterprises. During the course emphasis would be on the practical aspects of energy conservation and how to use the various rules of thumb to estimate the losses occurring in a system. The worksheets for calculating the performance assessment studies of energy systems have much value and can be used across multiple industrial sectors.

Course Requirements

- *Assignments*

There will be a series of assignments throughout the course. Assignments are due the week after they are given in class. Keeping up with assignments is critical to having a successful learning experience. All of the assignments must be completed to pass the course. Assignments must be submitted on time unless an extension has been pre-arranged. **STUDENT MUST RETAIN A COPY OF ALL WORK HANDED IN.**

- **Off-Line Time**
The candidates will have to devote at least 6 hours of their time per week. Contributing towards discussion topics would be highly encouraged and would help the candidates in better understanding of the subject.

REQUIRED TEXT: Would be provided for each module. In addition to this references would be cited at the end of each module and the candidates encouraged to use them.

Course Schedule

Module -1: **Basics of Energy, Fuels and Combustion:**
Energy & Its Various Forms: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption **Electricity basics**- DC & AC currents, electricity tariff, **Thermal Basics**-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion. **Fuels And Combustion:** Introduction to fuels, properties of fuel oil, coal and gas, storage, handling and preparation of fuels, principles of combustion, combustion of oil, coal and gas.

Module -2: **Boilers**
Types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities. Thermic Fluid Heaters and Fluidized Bed Combustion Boilers.

Module -3: **Steam System & Insulation:**
Properties of steam, assessment of steam distribution losses, steam leakages, steam trapping, condensate and flash steam recovery system, identifying opportunities for energy savings. Insulation-types and application, economic thickness of insulation, heat savings and application criteria

Module -4: **Furnaces and Waste Heat Recovery:**
Classification, general fuel economy measures in furnaces, excess air, heat distribution, temperature control, draft control, waste heat recovery. **Waste Heat Recovery Systems:** Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential

Module -5: **Electrical system & Electric Motors:**
Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. **Electric motors:** Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors

Module -6: **Compressed Air System:**
Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment and leakage test, factors affecting the performance and savings opportunities

Module -7:

Fans and blowers:

Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Pumps and Pumping System:

Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

Module -8:

Cooling Tower and Energy Efficient Technologies:

Types and performance evaluation, efficient system operation, flow control strategies and energy saving opportunities assessment of cooling towers Different types of Energy Efficient Technologies.