

Energy Systems Design

B.E. Sem. VIII [CHEM]

(Elective – III)

EVALUATION SYSTEM

| | Time | Marks |
|------------------|--------|-------|
| Theory Exam | 3 Hrs. | 100 |
| Practical & Oral | – | – |
| Oral Exam | – | – |
| Term Work | – | 25 |

SYLLABUS

1. Energy Audit

Introduction; methodology and steps taken; Target setting, Reduction in losses, Improvements in the operations, Operating equipment near its best efficiency, more efficient equipment; preventive maintenance for energy efficiency; high frequency equipments. Energy efficient process technologies.

2. Energy Integration in the Process Industries

Design Of Heat Exchanger Networks (HENS): Minimizing utilities in heat Temperature interval method using graphical displays. Linear Programming method. Stream matching at minimum utilities. Stream matching at the pinch concepts of optimum approach temperature, Superstructures for minimization of annualized cost.

3. Heat Integration in Process Units

Multiple Effect Evaporators: With and without vapor recompression.
Distillation Column: Effect of pressure on heat integration, multiple effect distillation, Heat pumping, vapor recompression and reboiler flashing, Superstructures for minimization of annualized cost.

4. Heat Integration in Process Units

Distillation Column: Effect of pressure on heat integration, multiple effect distillation, Heat pumping, vapor recompression and reboiler flashing, Superstructures for minimization of annualized cost.

5. Co-generation of Energy

Introduction, advantages of co-generation, Waste heat boilers, Different types of co-generation power plants, Steam turbine systems, Gas turbine systems. Combined gas steam turbine systems, Diesel engine systems.

6. Renewable sources of energy

Solar energy- Photo voltaic cells, solar boilers, solar refrigerators, Wind energy; Fuel cells; Biogas, Biodiesel, Biomass gasification etc.
Introduction to Tidal, Geothermal sources of Energy, Comparison with Nuclear Energy.

Reference Books :

1. Process Design Principles (*Seider W. D., and Seader J. D. and Lewin D. R.*) John Wiley and Sons. Inc., 1988.
2. Conceptual Design of Chemical Process (*Douglas J. M.*) McGraw Hill Book Co., 1988.
3. Systematic Methods of Chemical Process Design (*Biegler L. T., Grossman E. I. and Westerberg A. W.*) Prentice Hall International Ltd., 1997.
4. Fuel Cells Explained (*Larminie James*) John Wiley and Sons., 2000.
5. Principles of Solar Energy (*Kreith F.*) McGraw Hill Book Co., 1978.
6. Wind Energy Conversion System (*Freris L. L.*) Prentice Hall, 1990.
7. Energy Management Hand Book (*Turner*) John Wiley and Sons., 2000

