Chemical Engineering Design - II - Web course

Coordinators:

Dr. Animes Kr. Golder
Department of Chemical EngineeringIIT Guwahati

Prof. Vaibhav V. Goud
Department of Chemical EngineeringIIT Guwahati

COURSE OUTLINE

Chemical Industries involve problems in process design, unit operations, equipment design and overall plant design. In design of a chemical plant these problems cannot be segregated. However, these problems may be advantageously segregated for study and development because of different principles involved in it. The course goes deeper into the various aspects of mechanical design in the chemical process plant. It stresses upon the design and analysis of the basic process equipment viz. vessels, distillation column, absorption column, heat exchanger, driers and evaporators etc.

The course emphasizes on the development of design skills among the students to take design related decisions. Whatever be the earlier conception, today a chemical engineer is expected to be able to make complete design of a piece of chemical equipment. The course will be very useful to undergraduate students and practitioners. A number of problems will be solved to illustrate the concepts clearly.

COURSE CONTENT

Design of evaporator: Introduction, types of evaporators, methods of feeding of evaporators, general design consideration of evaporator.
Design of driers: Introduction, types driers, design consideration of driers
Process Design of Heat Exchanger: Types of Heat exchanger, process design of shell and tube heat exchanger, condenser, and reboilers.
Mechanical design of heat exchanger: Mechanical design of shell & tube hear exchanger
Separation Equipments: General design considerations of cyclone separators, centrifuges, separation equipments etc.
Design of tall vessels: Introduction, axial stresses due to dead loads, axial stresses due to pressure, longitudinal bending stresses due to dynamic loads, design considerations of distillation (tall) and absorption column (tower).
Process design of mass transfer column:
Design of distillation and absorption column

- Column sizing approximation
- Plate contactors
- Plate hydraulic design

Mechanical design of mass transfer column
Design of distillation and absorption column

- Stresses in column shell
- Design and construction features of column internals

Process Hazards and Safety Measures in Equipment Design:
Process Hazards, Safety Measures, safety measures in equipment design, Pressure relief Devices

COURSE DETAIL

Sl. No.	Module/ Lecture Topics	No. of Hours (Total), Coordinator
1	**Process Design of Heat Exchanger**: Types of heat exchanger, Process design of shell and tube heat exchanger, Condenser, and reboilers.	**6 (6), AKG**
2	**Mechanical design of heat exchanger**: Mechanical	**4 (10), AKG**

2	design of shell & tube heat exchanger.	**4 (10), AKG**
3	**Design of evaporator**: Introduction, types of evaporators, Methods of feeding of evaporators, General design consideration of evaporator.	**05 (15), AKG**
4	**Design of driers**: Introduction, Type of driers, Design consideration of driers.	**05 (20), VVG**
5	**Separation Equipments**: General design considerations of cyclone separators, Centrifuges, Separation equipments.	**5 (25), VVG**
6	**Design of tall vessels**: Introduction, Axial stresses due to dead loads, Axial stresses due to pressure, Longitudinal bending stresses due to dynamic loads, Design considerations of distillation (tall) and absorption column (tower).	**5 (30), VVG**
7	**Process design of mass transfer column** Design of distillation and absorption column • Column sizing approximation • Plate contactors • Plate hydraulic design	**6 (36), AKG**
8	**Mechanical design of mass transfer column** Design of distillation and absorption column • Stresses in column shell • Design and construction features of column internals	**2 (38), AKG**
9	**Process Hazards and Safety Measures in Equipment Design:** Process Hazards, Safety measures, Safety measures in equipment design, Pressure relief devices.	**3 (41), VVG**

References:

1. L. E. Brownell, E. H. Youg, “Process Equipment Design” John Wiley & Sons Publications, 2004.
2. J.M. Coulson and J. Richardson, “Chemical Engineering”, Vol. 6, Asian Books Printers Ltd.
3. Indian Standard Specifications IS-803, 1962; IS-4072, 1967; IS-2825, 1969. Indian Standards Institution, New Delhi.
4. R.H. Perry, “Chemical Engineers’ Handbook”, McGraw-Hill.
5. W.L. McCabe, J.C. Smith and P. Harriot, “Unit Operation of Chemical Engineering”, McGraw-Hill, 2001.
6. B. C. Bhattacharyya, "Introduction to Chemical Equipment Design, CBS Publishers & Distributors, New Delhi, 2003