

CH403 CHEMICAL PROCESS EQUIPMENT DESIGN**Course Description & Objectives:**

This course teaches the student about selection and design of chemical process equipments. To learn about the design procedures of process equipment used in chemical process plants.

Course Outcomes:

1. Able to design heat transfer equipment and mass transfer equipment
2. Able to design cooling and heating systems of chemical reactors
3. Able to use software tools for the analysis of process equipment

UNIT I - Design of Shell and Tube Heat Exchangers

1-2 heat exchanger, arrangements for increased heat recovery, and calculations for process conditions. Design calculations of a double-pipe heat exchanger: Double pipe exchangers in series-parallel arrangement.

UNIT II - Pressure Vessels

Introduction, vessels subjected to internal pressure & combined loading, stresses induced in vessels, optimum proportions of a vessel, optimum vessel size. problems.

UNIT III - Design Of Dryers

Design of Dryers: Design of rotary dryer, tray dryer and spray dryer.

Design of Packed Towers for Absorption: Flow of liquid over packing's, limiting gas velocities, Pressure-drop calculations, design of packed towers using absorption coefficients, design of packed tower using transfer-unit method.

UNIT IV - Design Of Sieve Tray Tower For Distillation

Introduction, sieve tray, tower diameter, plate spacing, entrainment, flooding, weepage, tray layout, hydraulic parameters.

UNIT V – Cooling Towers

Cooling Tower Practice: Mechanism, types, rating duty and physical size of cooling towers, Cooling tower components, construction material, practical aspects of tower selection

Cooling Tower Design Calculations: Heat transfer calculations, selection of tower size for a given duty, corrections for altitude, use of charts for calculation of cooling tower duties.

TEXT BOOKS

1. D.Q. Kern, "Process Heat Transfer", 1st ed., Tata McGraw Hill, 2001.
2. S. D. Dawande, "Process Equipment Design", Vol 1 & 2, 4th ed., Central Techno Publishers, 2005.

REFERENCE BOOKS

1. Robert E. Treybal, "Mass Transfer Operations", McGraw Hill, 1982.
2. Morris and Jackson, "Absorption Towers", Butter Worth's Scientific Publications, 1985.
3. Pring and Osborn Butter Worth, "Cooling Tower Principles and Practice", Heinemann - Hill, 1986.
4. Coulson & Richardson Series, "Chemical Engineering", Volume 6, Pergaman Press, 1983.