

Department of Chemical Engineering
List of Major Courses
Specialization A : Process Engineering

S.N.	Sem	Name of Course	NPTEL Sem (Even/Odd)	Instructor's Name	Duration (weeks)	Credits
1	V	Chemical Process Safety	odd	Prof. Shishir Sinha ,IIT Roorkee	12	4
1	VI	Transport Processes I : Heat and Mass Transfer	Even	Prof. V. Kumaran IISc Bangalore	12	4
2	VI	Process Control : Design, analysis and assessment	Even	Prof. R. Raghunathan, IIT Madras	12	4
3	VII	Plant Design and Economics	Odd	Prof. Debasis Sarkar IIT Kharagpur	12	4
5	VII	Chemical Process Intensification	odd	Prof. S. K. Majumdar IITGuwahati	12	4

Note to Students : The sequence of subjects, choice of semester is suggestive, tentative and depends upon availability of NPTEL course at that time.

Syllabus for Major Courses

Specialization A : Process Engineering

1. Chemical Process Safety

Syllabus

Unit1 :

Safety and accident loss statistics, risk management, nature of accident and major disasters, accident loss statistics, toxicological studies, dose response relationship, industrial hygiene regulation

Unit 2 :

Material safety data sheet, noise vibration and radiation, industrial hygiene control, source models studies and problems , fire and explosion

Unit 3

Fire extinguishers, Design to prevent fire and explosion, sprinklers, types of reliefs, relief sizing

Unit 4 :

Hazard identification, HAZOP, safety review and risk assessment, event trees and fault trees, Cause consequence analysis, Bow-tie analysis

Unit 5 :

Accident investigation, Different case studies, Nuclear radiation, Process safety management, safety laws dregulations

2. Transport Processes 1 : Heat and Mass Transfer

Syllabus

Unit 1 : Dimensional analysis, diffusion

Unit 2 : Transport in one direction, spherical and cylindrical coordinates

Unit 3 : Pressure and body forces in fluid flow, conservation equations

Unit 4 : Diffusive Transport I and II

Unit 5 : Forced and natural convection, transport in turbulent flows

3. Process Control : Design, analysis and assessment

Syllabus

Unit 1 : Introductory concepts, Models for control, control structures, state space modeling

Unit 2 : Analysis of Transfer function models, Laplace transforms, stability, Controllers and closed loop transfer functions,

Unit 3 : Stability analysis, Controller tuning : Stability based methods, frequency response analysis, traditional advanced control strategies

Unit 4 : Controller tuning : Direct Synthesis, Nyquist stability criterion, traditional multivariable control, Multivariable control

Unit 5 ; Model predictive control fundamentals and its implementation, Controller performance assessment and diagnosis fundamentals and its implementation, MATLAB tutorials

4. Plant Design and Economics

Syllabus

Unit 1 : Process design aspects, selection of process equipment and utilities

Unit 2 : Plant location, layout and site selection, Engineering Economics

Unit 3 : Conceptual process synthesis, Reactor network synthesis

Unit 4 : Separation system synthesis, Heat exchanger network synthesis

Unit 5 : Chemical process Safety, optimum design and Production Scheduling

5. Chemical Process Intensification

Syllabus

Unit 1 :

Introduction, mechanism involved in process intensification, role of process intensification in sustainable environment

Unit 2 :

Design techniques for process intensification, stochastic optimization for process intensification

Unit 3 :

Process intensification by cavitation, Process intensification by monolith reactor, Process intensification by interface modification and residence time

Unit 4 :

Process intensification in distillation, Process intensification in extraction

Unit 5 :

Process Intensification by membrane, Micro process Technology in process intensification