

# UCH 1201 Principles of Chemical Engineering

## Introduction to the Course

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# Syllabus Topics

## **UCH1201 Principles of Chemical Engineering**

Unit-I Introduction

Unit-II Stoichiometry and Fluid Flow

Unit-III Heat Transfer

Unit-IV Mass Transfer

Unit-V Reaction Engineering

# Syllabus Contents

## **UCH1201 Principles of Chemical Engineering**

### **Unit-I Introduction & Basic Principles of Chemical Engineering**

Introduction to Chemical Engineering - Chemical process industries: History and their role in Society. Role of Chemical Engineer.

Description of different Unit Processes and Unit Operations.

Flow sheet representation of process plants – Sulphuric acid and Soda ash manufacture

Basic Laws in Chemical Engineering - Units and Dimensions - Conversion factors.

# Syllabus Contents (contd..)

## **Unit-II Stoichiometry and Flow of Fluids**

Physico-Chemical Calculations - Energy - Equivalent mass - humidity & saturation - Concept of material and Energy balance.

Fluids - Fluid Static's and application in chemical Engineering.

Fluid flow - viscosity - Conservation of mass and energy - laminar and turbulent flow - frictional losses.

Introduction and classification of pumps- Cavitation - Water Hammer.

# Syllabus Contents (contd..)

## **Unit-III Heat Transfer**

Heat transfer - conduction, convection and radiation (Omit correlations for heat transfer coefficient and change of phase)

Flow arrangement in heat exchangers - Variation of Fluid temperature in heat exchangers.

Heat transfer equipment - Double pipe and Shell and tube heat exchangers

Evaporators - long tube vertical and forced circulation type evaporators, multiple effect evaporators.

# Syllabus Contents (contd..)

## **Univ-IV Mass Transfer**

Diffusion - Mass transfer operation

Absorption

Vapour-Liquid Equilibrium - Relative volatility - Distillation with reflux.

Equipment for Gas-Liquid Operations - Selection of Equipment for Gas-Liquid Operations.

Liquid-Liquid Extraction -Distribution coefficient - Selection of solvent.

Drying - Equipment for Drying.

# Syllabus Contents (contd..)

## **Unit-V Chemical Reaction Engineering**

Chemical Kinetics - Elementary and non-elementary reactions

Thermodynamics - Heat of reaction - Feasibility of a chemical reaction - Chemical Equilibrium - LeChatelier's Principle -

Effect of temperature of reaction rate

Catalysis.

Reactors - Batch and flow reactors

Use of computers in Chemical Engineering discipline.

## Books (Listed in Syllabus)

- ▶ Pushpavanam, S., Introduction to Chemical Engineering, PHI Learning Private Limited, New Delhi, 2012.
- ▶ Salil K. Ghosal, Shyamal K Sanyal, Siddhartha Datta, Introduction to Chemical Engineering, Tata McGraw-Hill Education(India) Private Limited, New Delhi 2016.
- ▶ Badger W.L. and Banchero J.T., Introduction to Chemical Engineering, 6th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2011.



## Contact Hours

Day	Period
Mon	2
Tue	-
Wed	3
Thurs	2
Fri	-

# Outcome of the Course

- ▶ Basic idea of the following core-subjects of chemical engineering will be given:
  - ▶ Chemical Process Industries
  - ▶ Process Calculations
  - ▶ Fluid Mechanics
  - ▶ Heat Transfer
  - ▶ Mass Transfer
  - ▶ Reaction Engineering

# Questionnaire

1. 1 foot = \_\_\_\_\_ inch = \_\_\_\_\_ m.
2. For inflating 2-wheeler tyres the air-man set the air-pressure values of 32 for back-wheel and 25 for the front. What is the unit of pressure used there?
3. Express the pressure of 1 atm in terms of heights of: (i) mercury column, (ii) water column.
4. Oiling of hair helps to keep the human body at comfortable temperature (during summer). Why?
5. What is the most common operation followed in a industry for separating the components of a multicomponent liquid solution?
6. What is the effect of pressure on boiling point of a component?

## Questionnaire (contd..)

7. After putting ice in a tumbler having water, you see water droplets on the outer surface of tumbler. What is the reason for this droplets formation?
8. What is the reason for having agitator(s) in a large chemical reactor?
9. In a multi-storey building, water from a overhead tank is coming out at a much \_\_\_\_\_(lower / higher) velocity for the ground floor pipelines than that ones at upper floors. What is the reason for this phenomena?
10. What are the core chemical engineering courses covered in this syllabus of UCH 1201?