Branch Specific Courses for Chemical Engineering Department

Introduction to Chemical Engineering

CHCH 102 S1

	L	T	P	Credit
Scheme	3	1	0	04

- **INTRODUCTION** **(5 Hours)**
  Introduction: Unit operations, basic laws, useful mathematical methods, unit and dimensions, dimensional analysis, monography

- **PHYSICO-CHEMICAL CALCULATIONS** **(4 Hours)**
  Introduction: Energy, equivalent mass, solutions, electrochemical processes, hardness of water, humidity and saturation

- **MATERIAL AND ENERGY BALANCE** **(4 Hours)**
  Introduction: Material balance, energy balance

- **FLOW OF FLUIDS** **(4 Hours)**
  Introduction: nature of fluid, viscosity, flow field, flow of a fluid past a solid surface, conservation of mass and energy, friction losses in laminar and turbulent flow, fluidization, cavitations, pumping of fluids

- **HEAT TRANSFER** **(4 Hours)**
  Introduction: Conduction, convection, radiation, flow arrangement in heat exchanger, temperature profile of fluids in heat exchanger, heat transfer equipments, evaporation

- **MASS TRANSFER** **(5 Hours)**
  Introduction: Diffusion, mass transfer operations, absorption, vapour-liquid equilibrium, relative volatility, boiling point diagram, distillation, reflux, terminology and equipment of gas-liquid mass transfer operation, liquid-liquid extraction, classification of industrial liquid-liquid contactors, crystallization, drying, adsorption

- **CHEMICAL KINETICS** (**4 Hours)**
  Introduction: Thermodynamic review, determination of the rate equation, effect of temperature, catalysis, reactors, some useful terms in chemical processing

- **MEASURING DEVICES** **(2 Hours)**
  Chemical composition, pressure, temperature, and flowrate measurement, other common parameter measurements

- **COMPUTERS AND CHEMICAL ENGINEERING** **(4 Hours)**
  Introduction to Mathematical Software Packages, writing codes in C-Language and or MATLAB to solve common chemical engineering problems. Validation of the same using MS Excel (graphical as well as numerical problems)

- **NATURAL RESOURCES AND THEIR UTILIZATION** (**3 Hours)**
  Introduction: Renewable raw materials, non- renewable raw materials

- **SAFETY, HEALTH, ENVIRONMENT AND ETHICS** (**3 hours)**
  Introduction: Safety and chemical Engineering, health issues, environment concerns and ethics

(Total Lecture Hours: 42 + Tutorial Hours: 14)

BOOKS RECCOMENDED

1. Salil K Ghosal, Siddhartha Datta, Shyamal K Sanyal, Introduction to Chemical Engineering, Tata McGraw - Hill Publication, 2004.
2. S. Pushpavanam, Introduction to Chemical Engineering, PHI Learning Pvt. Ltd., 2012.
3. Vivek Utgikar, Fundamental Concepts and Computations in Chemical Engineering, Prentice Hall, 2017.
4. Walter L Badger and Julius T Banchero, Introduction to Chemical Engineering, McGraw – Hill Publication, 1955.
5. D. M. Himmelblau, J. B. Riggs, Basic Principles & Calculations in Chemical Engineering Prentice Hall (India), 2012.
6. L. B. Andersen & L. A. Wenzel, Introduction to Chemical Engineering by McGraw Hill Publication, 1961.

Process Calculations

CHCH 113 S2

	L	T	P	Credit
Scheme	**3**	**1**	**0**	**04**

- **INTRODUCTION** **(4 Hours)**
  Introduction, Dimension and Units, system of units, conversion of units and equations, dimensional homogeneity and dimensionless quantities

- **BASIC CHEMICAL ENGINEERING CALCULATIONS** **(5 Hours)**
  Process Variables: Density, Flowrate, Pressure and Temperature, moles, average molecular weight, Chemical Composition. Equation of States for Gases, Phase Equilibria

- **MATERIAL BALANCE ON NON-REACTIVE SYSTEMS** (**4 Hours)**
  Law of conservation of mass, differential and integral balances, Material balances for unit operations including distillation, evaporation, drying, crystallization, extraction, mixing, gas absorption

- **MATERIAL BALANCE ON NON-REACTIVE SYSTEMS WITH MULTIPLE UNITS AND RECYCLE** **(4 Hours)**
  Balances on multiple unit operations with recycle, bypass systems, Degree of freedom analysis for non-reactive systems

- **MATERIAL BALANCE ON REACTIVE SYSTEMS** **(4 Hours)**
  The chemical equation and stoichiometry, Different approaches to solve material balance problems such as molecular balance, atomic balance and extent of reaction for reactive processes

- **MATERIAL BALANCE ON REACTIVE SYSTEMS WITH MULTIPLE UNITS AND RECYCLE** **(5 Hours)**
  Material balances on reactive system with recycle, bypass and purge systems, Degree of freedom analysis for reactive systems

- **ENERGY BALANCE WITH AND WITHOUT REACTIVE** (**5 Hours)**
  Law of conservation of energy, Energy balance for closed and open system, calculations of enthalpy changes of processes

- **ENERGY BALANCE WITH CHEMICAL REACTION** **(8 Hours)**
  Calculations of enthalpy changes of reactions, heats of reaction, heat capacity calculations, Formation reactions and heats of formation and combustion, energy balances for reactive systems, Combustion reactions. Estimation of calorific values of fuels

- **MATERIAL BALANCES ON UNSTEADY STATE PROCESSES** **(3 Hours)**

(Total Lecture Hours: 42 + Tutorial Hours: 14)

BOOKS RECCOMENDED

1. Felder R. M. & Rousseau R.W., "Elementary principles of chemical processes", 3rd Ed., John Wiley & Sons, Inc., New York, 2000.
2. Himmelblau D.M., "Basics Principles and Calculations in Chemical Engineering" 6th Ed., Prentice-Hall India,1996.
3. Bhatt B.I. & Vora S.M., "Stoichiometry", 4th Ed., Tata-McGraw-Hill, New Delhi, 2004.
4. Hougen O.A., Watson K.M. & Ragatz R.A., "Chemical Process Principals: Part-I", 2nd Ed., CBS Publishers and Distributors, New Delhi, 1995.