CH214	CHEMICAL PROCESS CALCULATIONS	L	T	P	C	Int	Ext
		2	1	-	3.0	30	70

Semester III [Second Year]

COURSE OBJECTIVES:

1. Understand the stoichiometric approach to chemical reactions
2. Comprehends and solves the material balances without chemical reaction, by pass, recycle and purge
3. Comprehends and solves the material balances in a chemical operation with chemical reaction, by pass, recycle and purge
4. Solves the energy balance in unit operations and processes

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Evaluate Physico-chemical quantities from one system units to another
2. Solve material balances without chemical reaction& processes including bypass, recycle and purge
3. Solve material balances with chemical reaction& processes including bypass, recycle and purge
4. Evaluate energy balances on unit operations and processes

UNIT I [CO:1] **(12)**

Stoichiometric and composition relationships:

Units and dimensions, unit conversions, Conservation of mass, Stoichiometric relations, Basis of calculations, Methods of expressing the composition of mixtures and solutions, density and specific gravity.

Vapor Pressure, Humidity and Saturation (Theoretical Concepts only):

Introduction, boiling point, Effect of Temperature on Vapor Pressure, Vapor of Immiscible liquids and Solutions, Humidity, Saturation, Vaporization Process, Condensation process, dew point, humid heat, wet-bulb thermometer, dry-bulb thermometer, Psychometric chart.

UNIT II [CO:2] **(12)**

Material Balances for unit operations (without chemical reaction):

Material balances without chemical reaction, inert, tie component, steps for solving material balance problems, Material balance on single unit processÃ¢â‚¬â€œMixing, Evaporation, Drying, Solubility and Crystallization.

Material balance on Multi unit process Ã¢â‚¬â€œBypass, Recycle, Purge

UNIT III [CO:3] **(12)**

Material Balances for unit Processes:

Conversion, Yield, Limiting reactant and excess reactant

Material balances with chemical reaction, recycle, bypass and purge.

UNIT IV [CO:4] **(12)**

Introduction, Energy, energy balances, heat capacity of gases, heat capacities of solids, heat capacity of liquid and solutions, latent heats, heat of vaporization

Introduction to heat of reaction, sensible heat, latent heat, heat of reaction, heat of formation, heat of combustion, Effect of temperature on heat of reaction, temperature of reaction, theoretical flame

temperature.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Chemical process Principles PartÃ¢â‚¬â€œ1, Material and Energy Balances by O.A.Hougen, K.M. Watson, and R.A.Ragatz, 2nd Edition, John Wiley & Sons(2004)
2. Basic Principles and Calculations in Chemical Engineering by David M. Himmelblau and James B.Riqqs, 7th edition, Prentice Hall India (2003)

REFERENCE BOOK(s):

1. Stoichiometry and Process Calculations by K. V. Narayanan and B. Lakshmikutty, Prentice-Hall of India Private Limited, New Delhi
2. Stoichiometry by B. Bhatt and S. Vora, fourth edition, Tata McGraw Hill (2004).
3. Elementary Principles of Chemical Processes, Felder, R. M.; Rousseau, R. W., third Edition, John Wiley & Sons, 2000.
4. Process Calculations, V. Venkataramani, N. Anantharaman, Begum, K. M. Meera Sheriffa, Second Edition, Prentice Hall of India.
5. Chemical Process Calculations, D. C. Sikdar, Prentice Hall of India.